

# ELECTRIC RAILWAY JOURNAL

GREATER HIGHWAYS—GREATER WHITES

LYCEUM AND CANTON GENE  
HOUSTON, TEXAS.



THE NEW

## WHITE SIX BUS

OPENS THE NEW ERA IN HIGHWAY TRANSPORTATION

/// ADVANCED ENGINEERING /// ADVANCED PERFORMANCE BEYOND ALL PRESENT-DAY STANDARDS

**100-H. P. ENGINE**—in the chassis, on the road.

**SEVEN-BEARING CRANKSHAFT**—3" in diameter; main bearings mounted in deep, rigid crankcase.

**OVERHEAD VALVES**—All parts automatically and fully lubricated, fully enclosed.

**FOUR-WHEEL BRAKES**—Air compressor part of motor; lubricated by the engine lubricating system.

**5. NINE-INCH BALLOON TIRES**—Balloon tires and easy steering; semi-center point steering; straight drag link; straight tie rod.

**6. DOUBLE DROP FRAME**—Security and comfort, carrying the load close to the road; easy entrance and exit.

**7. TWO STAGE SPRINGS**—Hotchkiss drive; springs 5' 4" long.

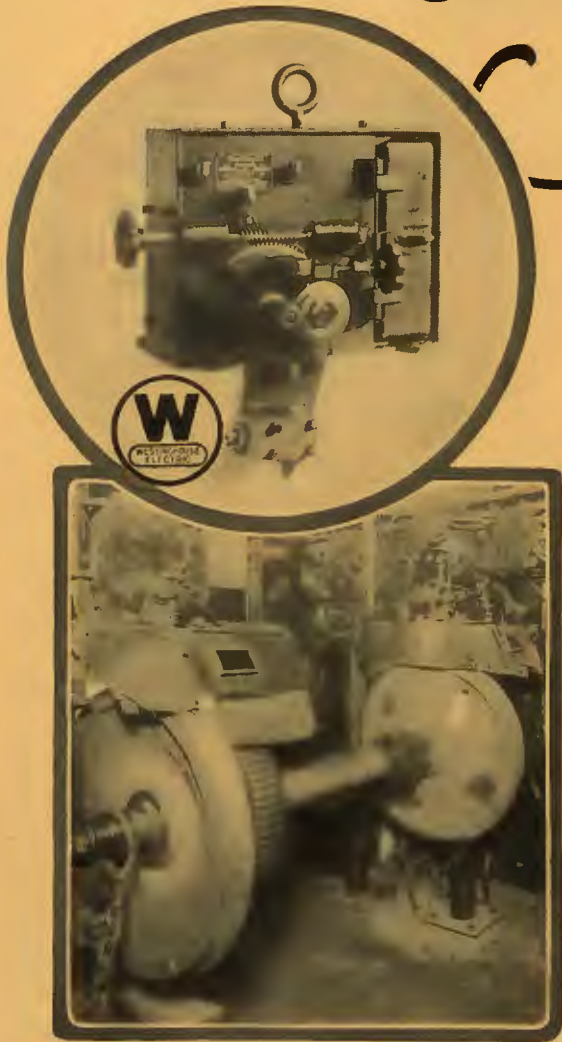
**8. SUPERIOR PERFORMANCE, ECONOMY AND COMFORT**—A new sensation in bus performance.

### OTHER FEATURES

Right-line drive /// Ejector type of exhaust manifold /// Seasonal and climatic heating connection /// Steering connection fully enclosed and lubricated /// Single deck. 227" wheelbase. Capacity, 23 passengers in de luxe model with baggage, up to 29 without baggage /// Six-cylinder motor, 100, 4 3/8" bore by 5 3/4" stroke. Overhead valves. 7-bearing crankshaft. Full force feed, automatic lubrication.

THE WHITE COMPANY, CLEVELAND

# Announcing the Westinghouse *Auto-Arc*



An Automatic Arc Welding  
Machine with these  
Important NEW  
Advantages

**FLEXIBILITY**—Adaptable to the lightest or the heaviest work, with any commercial size electrode.

**SENSITIVITY**—Instant response to variations of the contour of the work, depositing evenly over the surface—even on welded metal or multi-layer work.

**SIMPLICITY**—No delicate adjustments—no complicated control.

**STURDINESS**—A sturdy, workwise tool that can be depended upon to do its work, without undue maintenance.

**POSITIVE FEED** that eliminates any possibility of freezing of electrodes and stoppage of work.

## *Auto-Arc works for Pittsburgh Railways*

For two hours this pair of wheels revolved under the Auto-Arc; then the flanges, worn so badly they were unserviceable, were completely rebuilt, and the cost of a new pair of wheels was saved. But rebuilding flanges is only one of the many jobs the Auto-Arc does for Pittsburgh Railways—jobs done better, and at less cost.

The Auto-Arc employs important new Westinghouse developments that will permanently establish Automatic Arc Welding as a production process. Although this is the first announcement, the Auto-Arc has been serving industry for nearly a year; it has been tried and proved in actual operation on the production floor. Now, a complete, substantial, advanced machine, it is ready for you.

The nearest Westinghouse branch office will send you detailed information.

Westinghouse Electric & Manufacturing Company  
East Pittsburgh Pennsylvania

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



1926

# Westinghouse *Auto-Arc*

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# ELECTRIC RAILWAY JOURNAL

CHARLES GORDON, Editor

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

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## Putting Articles to Work

ARTICLES in ELECTRIC RAILWAY JOURNAL, while avoiding unnecessary and tiring detail, are nevertheless prepared so as to give the important facts needed by the busy executive or engineer.

Recently a prominent railway executive conducted a JOURNAL editor through a new bus garage erected by his company. The editor was struck by the excellence of the design and the care with which many important details of arrangement, construction and equipment had been worked out. He was frank in commenting on this impression.

"You may be interested to know," replied his host, "that this garage is a composite of four or five designs which we selected from those published in ELECTRIC RAILWAY JOURNAL during the past few years. The data from these several designs were carefully compiled. The general arrangements were studied, the equipment listed and the manufacturers of specialties and building contractors noted. Consequently we were able to hold cost to a minimum while at the same time being guided by the best thought and practice from other properties."

This railway knows how to put articles from the JOURNAL to work.

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*Successful Methods*

*Journal of Electricity*

*(Published in San Francisco)*

*American Machinist—European Edition*

*(Published in London)*



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## Variable Load Brakes for Canada!

One of Canada's progressive traction properties, the Montreal Tramways Company, is now putting into service fifty new city cars that are equipped with modern devices, assuring the fullest measure of operating safety and efficiency.

The Westinghouse Variable Load Brake is among these important devices.

This equipment eliminates the difference in retarding effect on empty and loaded cars—by an automatic adjustment of brake cylinder pressure with the changing load—and assures that stops will be as short under all conditions as would normally be possible only on an empty car. The uniformly short stops are translated into the important advantages of greater safety and speedier schedules.

The Variable Load Brake will therefore share in safeguarding and expediting the movement of traffic over this important transportation system.

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

Gives  
Uniform Braking  
with  
Varying Load



Westinghouse Traction Brake Company  
General Office and Works: Wilmerding, Pa.

# WESTINGHOUSE TRACTION BRAKES



Type Z, for ordinary city service. Furnished with plain or grid door. Casing and door are cast iron.



Type WDP is a portable headlight for city and suburban service. Door plain or grid. Casing is sheet steel.



Type DCP, for interurban service, is the most powerful incandescent headlight made. Casing and door are sheet steel.

## O-B Imperials Fit Every Service

NO other line of headlights gives the Master Mechanic as great a variety from which to choose—is as complete, in every sense—as the O-B Imperial line. O-B Imperials fit every possible operating condition, are suitable for every type of car.

Back of each headlight is a record of service demonstrating the ability to give

efficient, low cost illumination over unusually long periods.

You will assure yourself of all the advantages that only years of specialization in making headlights give, by specifying O-B Imperials on your next headlight order.

Complete particulars concerning design, materials, and applications are given in Catalog No. 210. May we send you a copy?

Ohio Brass Company, Mansfield, Ohio  
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 Niagara Falls, Canada  
225C

# Ohio Brass Co.



PORCELAIN  
 INSULATORS  
 LINE MATERIALS  
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 CAR EQUIPMENT  
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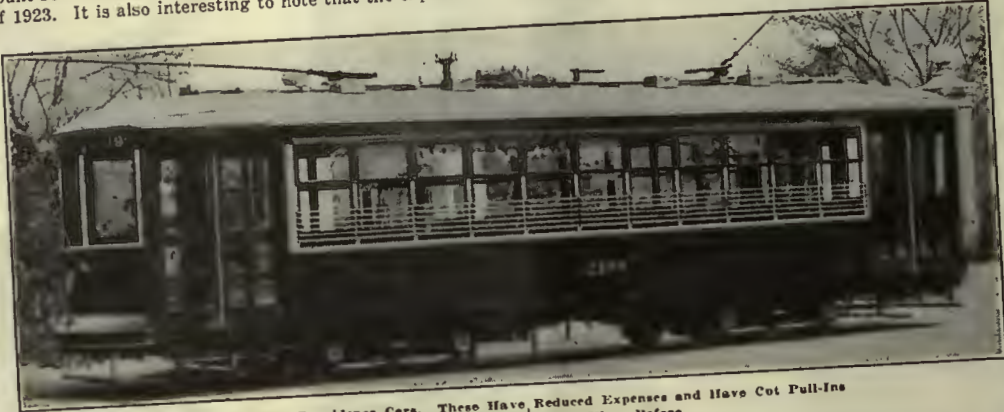
June 26, 1926

ELECTRIC RAILWAY JOURNAL

1095

due to the use of lighter cars) as the modern cars are geared for the same car speed as those replaced. High-  
count 80 and 61 per cent for account 33 from the figures of 1923. It is also interesting to note that the expendi-

teen new single-end light-weight one-man interurban cars seating 54 and weighing only 37,000 lb. These cars are equipped with four 35-hp motors. The cost of these cars was \$10,000. With the increase to 70 per cent in interurban passenger car mileage, operating expenses



One of the New Providence Cars. These Have Reduced Expenses and Have Cut Pull-Ins to Less Than Half What They Were Before

for maintaining the old cars was reduced to a

in 1925 were about \$39,000 less than in 1923. Meanwhile, the passenger revenue increased \$33,000. The total gain of \$72,000 represents a gross return on the investment of about 39 per cent. Detail figures are given in Tables I, II and III.

**PROVIDENCE MAKES LARGE SAVING**

Prior to the modernization program of the United Electric Railways of Providence, R. I., 41,000-lb. two-man cars were being operated. Early in 1922, 25 Birney cars were placed in service. About the middle of the next year 150 one-man, two-man cars were added. At present 222 cars are required in base service and a total of 1,242 in rush hours. With the advent of the new cars 222 closed and 269 summer cars were taken from service. At the present time 79 per cent of the cars in base service are of the modern, low-wheel type. In addition, 35 double-truck cars were received in June, making the equipment for base service 85 per cent modern and 100 per cent one-man operated.

About the time of the advent of the new cars a number of changes were made in routing service and fare collection.

# Safety and Economy by an act of PROVIDENCE and Safety Car Control Equipment



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

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

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

*It is a safety car if equipped with our standard Safety Car Control Devices*



## Modernizing Your System!

Start with better Track by using

### STEEL TWIN TIES

In concrete they cost no more than other track designs and will outlast the rail. Steel Twin Tie Track requires a minimum of maintenance during the life of the rail.

Construction and cost data and information or quotations on your requirements will be gladly furnished.

The International Steel Tie Co.  
Cleveland, Ohio

# Steel Twin Tie Track

Renewable Track—Permanent Foundation

# Would you try to row a boat with one oar?



It can be done, but the inefficiency of steering against the turning effect of the one-sided force is obvious.

Similarly, balanced braking (the double shoe clasp type) is vastly superior to the single brake shoe rigging. The heavy braking load is equally balanced on opposite sides of the wheel. There is no shifting of the journal box bearing; no unbalanced load on truck frames and truck springs; less brake shoe wear; less journal box wear; fewer hot boxes; fewer slid-flat wheels; smoother and shorter stops; less train resistance in starting.

In other words, dozens of advantages—all making for economy and better transportation service.



**AMERICAN MULTIPLE-UNIT  
CLASP BRAKES**



## **AMERICAN STEEL FOUNDRIES**

NEW YORK

CHICAGO

ST. LOUIS





## Added attractiveness obtained with de luxe type lighting fixtures

In days gone by an electric railway car was merely a car—a conveyance in which people rode because there was no alternative.

Nowadays, competition has educated people to select a conveyance that not only gets them somewhere but is also attractive.

To help improve the appearance of electric railway cars the newly designed *Dome Type Safety Car Lighting Fixtures* give a luxurious Pullman effect.

These fixtures have beautiful Druid glass bowls which produce a soft, pleasing well diffused light. Substantially made to withstand extreme vibration, these fixtures use 94 watt lamps and compensated circuit.

*Full particulars gladly sent on request*

### **ELECTRIC SERVICE SUPPLIES Co.**

PHILADELPHIA 17th and Cambria Sts.	NEW YORK 50 Church St.	CHICAGO Illinois Merchants' Bank Bldg.
PITTSBURGH 1123 Bessemer Bldg.	BOSTON 88 Broad St.	SCRANTON 316 N. Washington Ave.
		DETROIT General Motors Building
Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Vancouver		



And now on fifty more new P.R.T. Cars

**T**HE fifty new cars recently received by the Philadelphia Rapid Transit Company, to augment their service for the Sesqui-Centennial Exposition, are equipped with "STANDARD" Rolled Steel Wheels.



Rolled Steel Wheels  
 Quenched and Tempered  
 Carbon Steel Axles  
 Coil and Elliptic Springs

**STANDARD  
 STEEL**

WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES:

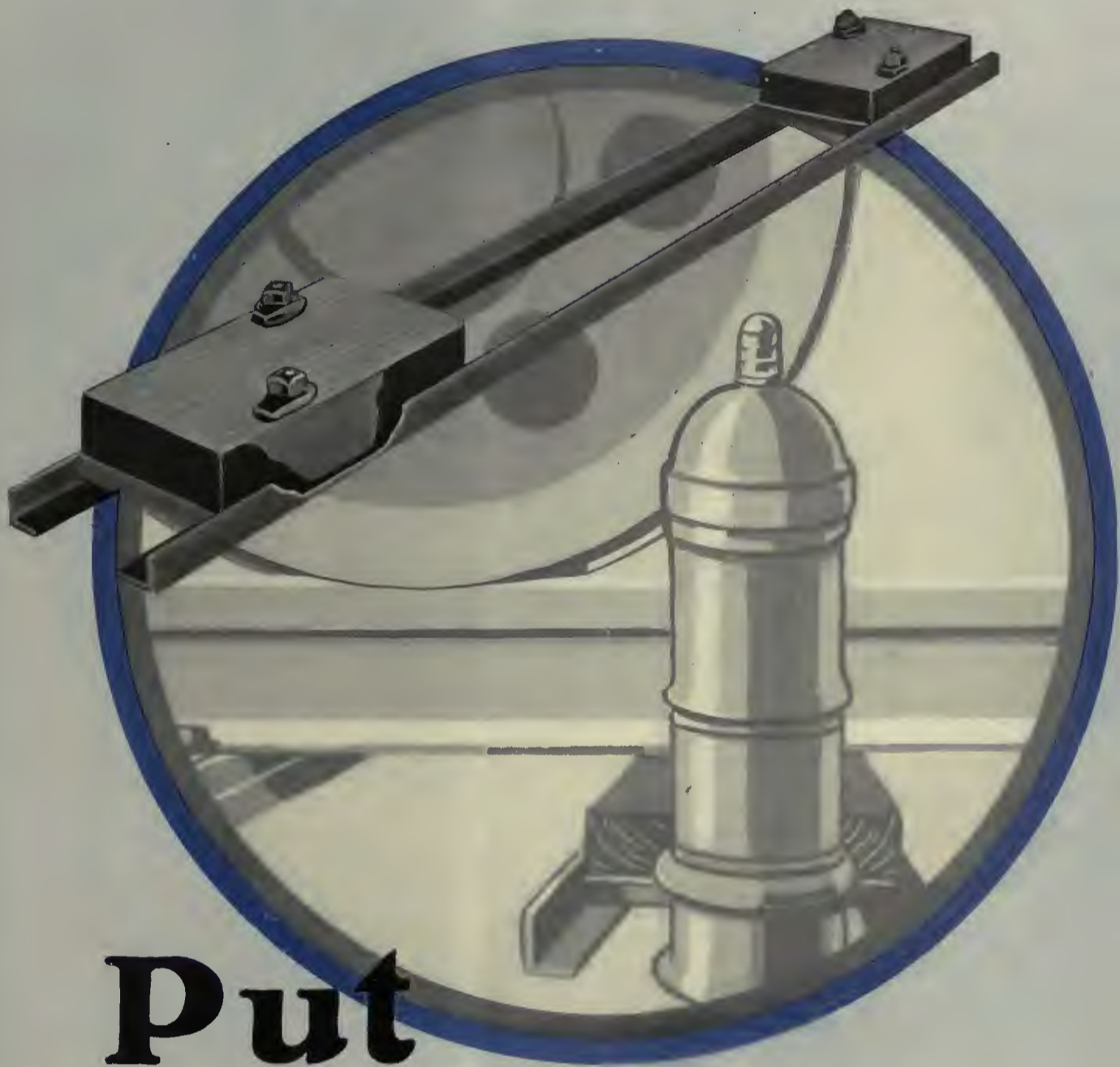
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Portland, Ore.  
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St. Paul, Minn.  
 Pittsburgh, Pa.  
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WORKS: BURNHAM, PA.

# Dayton Ties



**Put  
Shock Absorbers  
Under Your Tracks**

# Dayton Shock Absorber Tracks

*Reduce Expense  
Increase Revenue*

Fifteen years of service under heavy traffic—  
Not a penny of maintenance—Tracks perfectly  
smooth today—

These are the records which have made Dayton  
Mechanical Ties standard in over one hundred  
cities, not only in this country, but in other  
countries of the world.

Rolling Stock repairs are kept low by the  
permanently smooth tracks. Patrons prefer  
smooth tracks, so Dayton Ties have a definite  
patronage building value.

Dayton Tie Track is less expensive in first  
cost—the advantages are obtained at no addi-  
tional investment.

There are Dayton Tracks near you, write for  
information, and then talk to the engineer who  
is using them.

**Dayton Mechanical Tie Co.**

DAYTON, OHIO





## DO YOU TAKE FULL ADVANTAGE OF YOUR MODERN CARS?

In modernizing old equipment or in purchasing new cars, railway operators are striving to attain more speed, higher braking efficiency and faster acceleration. But why gain time in operation only to *lose* time in interchange of passengers? The running speed of modern cars counts for little if offset by slow and inefficient operation of car doors. If your patrons are to derive full benefit from the speed, safety and comfort of modern equipment, car doors should be operated with the modern National Pneumatic Door and Step Controlling Mechanisms.

### NATIONAL PNEUMATIC COMPANY

*Executive Office, 50 Church Street, New York*

*General Works, Rahway, New Jersey*

CHICAGO  
518 McCormick Building

MANUFACTURED IN  
TORONTO, CANADA, BY

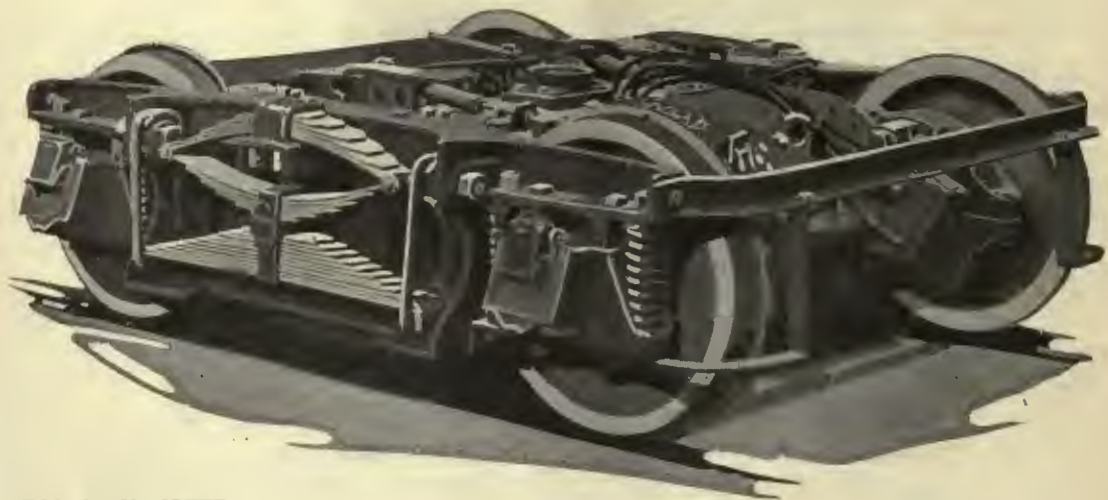
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA  
1010 Colonial Trust Building

# Balanced design

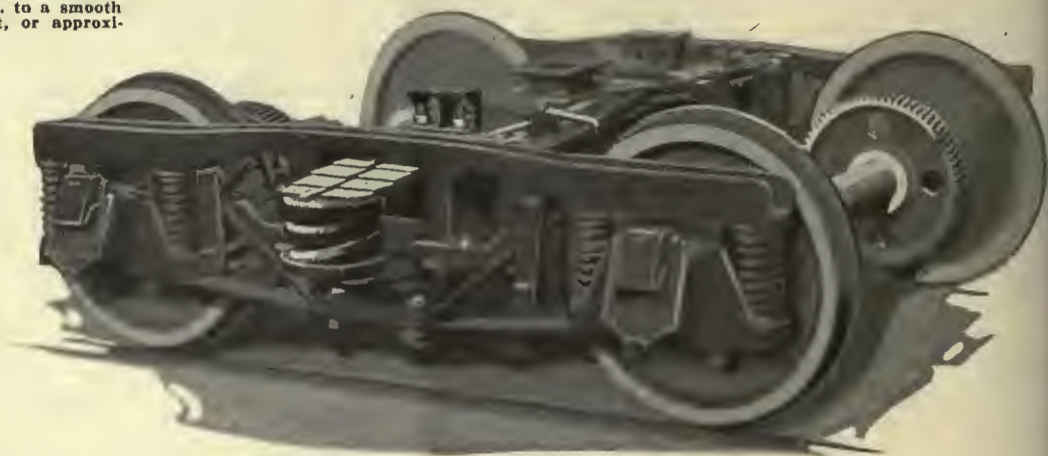
for instance:

You will notice these differences  
in Cincinnati Trucks



## FOR HIGH-SPEED INTERURBAN SERVICE

"Sixty miles an hour with safety."  
Elimination of "nosing" and "side-  
sway." Duplex Air and Magnetic  
Brakes which will decelerate a 19-  
ton car from 60 mph. to a smooth  
full stop in 800 feet, or approxi-  
mately 14 seconds.



## FOR MODERATE SPEED INTERURBAN OR CITY SERVICE

Top and bottom elliptic bolster springs  
equipped with series coiled springs to  
dampen road oscillation, with an additional  
snubbing device on the bolster transom.  
Construction marked by a very generous  
use of high carbon alloy steel. Special type  
brake shoes and rigging eliminate chatter.

# ives you *Light Weight* -but with *quietness* *comfort and safety* *far in advance of* *conventional practice*

Balanced Design, by working toward the perfection of the finished car as a *complete* transportation unit, has faced and overcome many problems coincident to lightweight.

A high speed truck has been developed which eliminates "nosing" and "sidesway," even on light cars traveling at 60 mph. Duplex Air and Magnetic Brakes give the greater stopping power necessary in such operation.

Improved springing in city type trucks has reduced track vibration to a point where it becomes unnoticeable. And drastic insulation not only of truck parts but of body and framework, too, has made silence an outstanding feature rather than a comparative term.

Yet features such as these are but the more obvious differences of car designs in which every part has been so accurately balanced in its relation to the whole, and to modern operating conditions, that the obvious economies of lightweight have been effectively combined with ride merchandising features of proved efficiency.

It is significant that every installation made to date has shown that it *pays and pays well* to modernize with Cincinnati New Lightweight Cars.

Detailed engineering and operating data is immediately available to all interested railway executives.

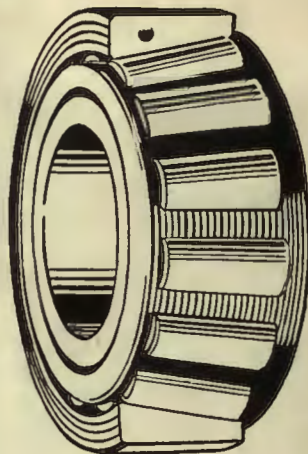
CINCINNATI CAR COMPANY  
CINCINNATI, OHIO

CINCINNATI  
*New*  
CARS

*A step ahead of the modern trend*

In his own interest one of the most highly-reputed manufacturers of machine tools published the advertisement reproduced below. His statements are typical of the best thought today, among makers and users of Timken-equipped machinery of every type, for every purpose.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO



## Why we adopted Timkens

**K**EARNEY & TRECKER'S latest and largest milling machine — the New No. 4 — is equipped with Timken Roller Bearings.

This is not in answer to a popular appeal, nor to add another "talking point". Kearney & Trecker milling machines are not designed that way. Every improvement or new feature must stand the test of rigid experiment, otherwise it is never adopted.

In October 1921 we first put Timken Roller bearings into a milling machine. That pioneer machine has been running day in and day out in our own shop ever since. For five years it has been submitted to all manner of service far more severe

than would ever be encountered in normal operation.

Exhaustive experiments have borne out the fact that anti-friction bearings provide (1) Greater load carrying capacity (2) Increased mechanical efficiency and (3) Longer life. Not only that, the reduction in overhanging loads and clearances required, all make for greater rigidity of drive.

Anti-friction bearings have earned their way into Kearney & Trecker milling machines by sheer merit. In our judgment, they accomplish the greatest usefulness in the bigger sizes of machines where it is necessary to transmit a large amount of power.

That is "why we adopted Timkens" in our new No. 4.

MILWAUKEE MILLING MACHINES  
**KEARNEY & TRECKER**  
 MAIN OFFICE AND WORKS: MILWAUKEE, WISCONSIN



# Comfortable Cars for Contented Passengers!

**E**QUIP your lines with St. Louis-built "Quality Cars"—a real reason for the public to leave its automobiles at home and ride the rails in safety and comfort.



*Single End Double Truck City Cars  
with Smoking Compartment in Rear*

**New and Better Designed Cars**  
to meet the demands of a  
**Discriminating Public**  
*for further particulars, write*

**St. Louis Car Company**

St. Louis, Mo.

*"The Birthplace of the Safety Car"*

# American BROWN BOVERI

## 5. Negligible

The rectifier proper, and its few pieces of auxiliary apparatus, are so simple and so rugged, that there is little or nothing to wear out, or require attention. The arc itself operates in a vacuum, so there is no deterioration of the anode or of the mercury. Anodes examined after years of operation show same micrometer measurements as when installed. Absence of moving parts obviates frictional wear and tear. There is no vibration in operation.

steel enclosed—  
no glass parts



### Principal Products

Mercury-Arc Power Rectifiers (steel enclosed)	Mining Locomotives	Relays
Electric Locomotives—for any system of current, high or low tensions	Switches, Controllers and all Auxiliary Equipment	Turbo Compressors and Blowers
Complete equipment for rail- way electrification	Steam Turbo Generators for normal or high pressures and superheats	Electric Furnaces
Rotary Converters	Automatic Regulators	Induction Regulators
Motor Generators	Oil Switches	Ships
Diesel-Electric Locomotives	Condensers and Auxiliaries	Diesel Driven
		Turbine Driven
		Electrical Driven
		Structural Steel Fabrication



# Mercury-Arc Power Rectifiers

## Maintenance

With a BROWN BOVERI MERCURY ARC RECTIFIER, characterized by unusually high efficiency at partial loads, the Average Converting Losses are, at extremely Low Load Factor, cut down tremendously, even at Rail Voltages as low as 600 V.

Below is shown what can be done in an Actual Case by the use of Mercury Arc Rectifiers. The reference is to an Inter-urban Railroad in one of the Eastern States. The substation

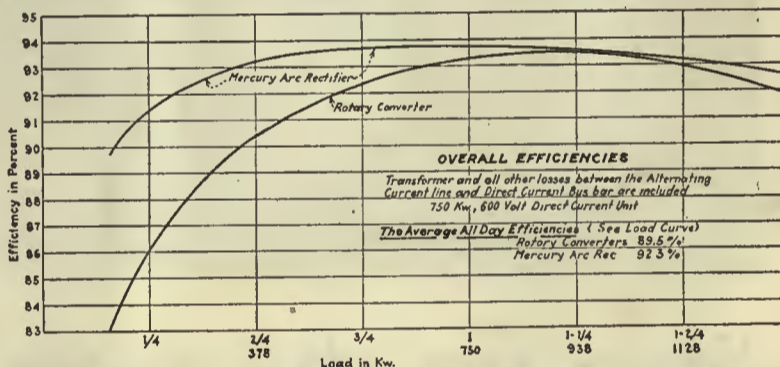
rating is 750 Kw.-H., 600 V. The part of a record roll reproduced on this page shows the usual output over a period of six hours.

The AVERAGE ALL DAY OVERALL EFFICIENCY was found to be:

for Rotary Converters..... 89.5%  
for Mercury Arc Rectifiers..... 92.5%

### Chief Advantages

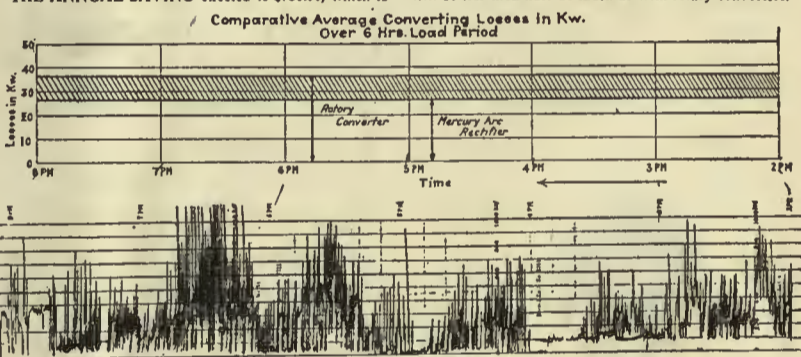
- (1) Efficiency high over the whole working range.
- (2) Simple operation and minimum attention.
- (3) No synchronizing.
- (4) Very high momentary overload capacity and insensibility to short circuits.
- (5) Negligible maintenance.
- (6) Low weight. No special foundations.
- (7) Noiseless and vibrationless operation, consequently rectifier substations can be erected in densely populated localities.
- (8) New sub-stations 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.



The saving obtained in six hours (represented by the shaded area) when extended over a 20-hr. day, amounts to MORE THAN 200 KW.-H., or, at 1c. per Kw.-H., THE ANNUAL SAVING effected is \$730.00, which is

the INTEREST on MORE THAN \$10,000.00.

In addition to the power saving, the maintenance cost will be less than half as much as with rotary converters.



American Brown Boveri Electric Corporation

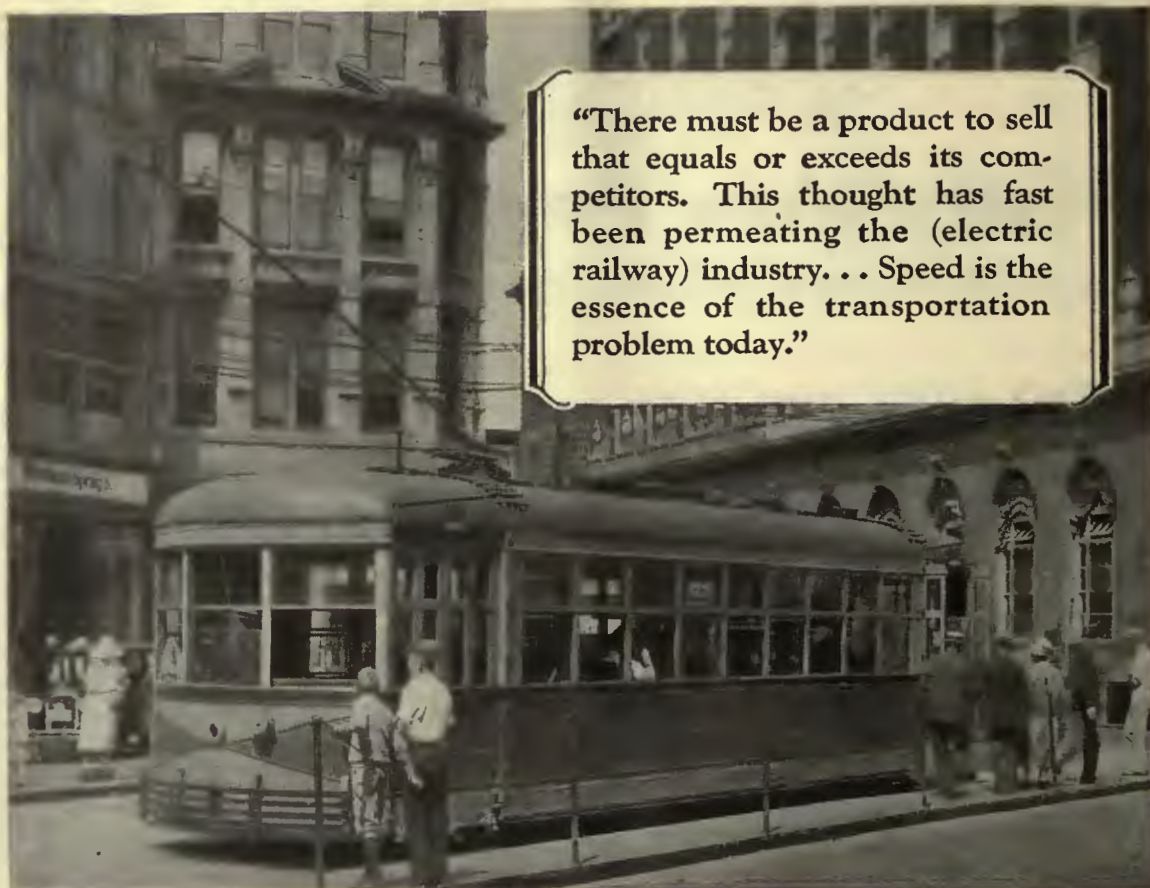
165 Broadway, New York, N. Y.

Camden, New Jersey

922 Witherspoon Bldg., Philadelphia 842 Summer Street, Boston 230 South Clark Street, Chicago



# AMERICAN BROWN BOVERI



"There must be a product to sell that equals or exceeds its competitors. This thought has fast been permeating the (electric railway) industry. . . Speed is the essence of the transportation problem today."

## Step up the speed— step down the costs

Here you have in a few words the policy of the Grand Rapids Railway—an objective of every electric railway that aims to be progressive.



The cooperation of General Electric is offered for the development of any improvement or the production of any electrical equipment necessary to a program of car modernization. Many instances can be cited in which modern G-E equipped cars have achieved notable savings or developed new sources of revenue.

This company felt that the time had come for an entirely new street car, designed to serve and satisfy the riding public, and to have a better *net*-earning power. It has put in operation 27 new light-weight cars which embody the latest results of practical experience in the equipment of electric rail coaches, and which have

- developed schedule speeds of 9.5 miles per hr.
- decreased energy consumption over 40%
- increased passengers per car-mile over 60%

This is one of many instances in which G-E Equipment has had a part in demonstrating the earning possibilities of modern cars. Your G-E railway representative can give you maintenance figures for similar G-E Equipment covering a period of years.

# GENERAL ELECTRIC

330-27

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

# 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, October 23, 1926

Number 17

## Changes from Conventional Truck Design Are Attracting Increased Attention

**D**URING recent years many radical experiments in truck developments have taken place in Europe. Both in Germany and France marked changes from conventional practice have been incorporated in new equipment that has gone into service. Articles covering some of these designs have appeared in recent issues of this paper.

There is a growing feeling among equipment engineers in this country that further substantial improvement in car performance cannot be made without undertaking distinctly radical changes in truck and motor suspension design. The conviction is growing that the elimination of noise, improvement of riding qualities and reduction of wear on expensive track and special work are dependent on reducing the excessive unsprung weight in conventional design.

Removal of the motor from its present position on the car axle is a step in this direction. Application of this idea in Europe has been limited largely to single-truck cars. On double-truck equipment this construction offers additional problems, but these seem far from impossible of solution. At the present time there are under consideration in this country several experimental designs of this character. In most cases these go considerably further toward the adoption of automotive type spring suspensions and driving arrangement than do the foreign designs.

Various advantages seem to accrue from this general form of truck arrangement. In addition to the reduction of unsprung weight, which eliminates much pounding on track and special work, there is to be expected a marked reduction in gear noises through the provision of oil-tight housings in which the gears can be maintained in accurate alignment and kept immersed in an oil bath. Reduction of the mechanical strain on motor frames and of vibration, wear, tear and shock, resulting from the removal of the motor from the car axle, permits the use of increased armature speeds and reduced motor weight.

There are, of course, many problems of design to be worked out. Some of these will require heavy expense and considerable time for final solution. It is also probable that any such general change in construction will make running parts less accessible for maintenance, will require a more skillful class of maintenance workmanship and may prove more costly to repair in the event of mechanical failure. On the whole, however, the advantages which seem to be offered appear to outweigh the possible disadvantages.

Simplicity and ease of accessibility have been the principal advantages attaching to the present conventional form of truck construction and motor suspension. But on some properties where track is rigid and

service severe, serious difficulties from broken armature shafts and open armature leads have never been successfully overcome. When the present form of single reduction gearing was adopted as the most reliable and simple construction for car propulsion, the general art of gear and bearing design was in a very rudimentary stage. The automobile has brought about a most remarkable development in gearing and anti-friction bearings. These now make possible changes in conventional car practice which would have been inconceivable in the days when the present form of construction was adopted.

Europe is apparently achieving a considerable measure of success with radical changes in truck construction. Some of the experiments in this direction have been in progress for a length of time to warrant more than passing attention on the part of every one in this country who is interested in car improvement. Now that the entire industry has become keenly alive to the advantage of both improved appearance and performance of its cars, it is to be hoped that some of the designs which have been contemplated for some time may soon be constructed and put into service.

## Operating Men Have an Important Part in Stimulating Development

**I**N THIS era when high-class electric railway service is foremost in the thoughts of railway operating officials, it is quite natural and essential that many new developments should be proposed. Manufacturers who originate the improved equipment, of course, are anxious to have it tried so that any weaknesses which may develop can be corrected and so that general sale can be undertaken. The electric railways can help materially by trying out and testing new ideas.

The average electric railway man hesitates to put into service any new device which does not have the stamp of extended operating success. Installation of experimental apparatus often results in annoyance and considerable expense. If real results are to be obtained the trial must be watched carefully. Frequent inspections and adjustments may keep a car from service when it is needed urgently. Failure may also result in damage to another piece of equipment. These, however, are the contributions which electric railways must make to the industry in order to promote active development of many much-needed devices.

The duties of electric railway men should not end with a trial of a device which may result in failure. Further improvements should be suggested by the operators. Sometimes a failure is the only means of showing where weaknesses lie and what changes should be made. Some of our most useful pieces of equipment were only moderately successful at the start. Severe service was required to disclose weaknesses and the

This is the issue in October that is devoted essentially to maintenance and construction subjects

application of many minds was needed to produce necessary improvements.

Electric railway officials and manufacturers must co-operate to bring about the advances in equipment which are so urgently needed. Imagination is essential. Intelligent merchandising effort demands close study of the desires and preferences of the customer. Railway mechanical men must acquire this modern viewpoint regarding their work. We are living in an age of prosperity and all classes demand luxury. Car riders do not know that special spring combinations are needed to produce easy riding trucks or that certain features of track construction influence the amount of noise produced. When these improvements are effected, however, they must be of a nature to make the passengers sense the increased comfort that comes in their ride. Some suggested improvements may be visionary, but it is important that the railway man do his part in co-operating with the manufacturer by entering into the spirit of experimentation with a full realization that very often progress is made only after many preliminary and costly failures.

### Good Will Thrives on Straightforward Human Relationships

**T**EAMWORK is an attribute which has never proved more valuable nor more practicable than at the present time. Between individuals it is useful. Between companies it is essential. Between railways and the communities which they serve it is utterly indispensable. In the whole field of track and paving work the possibilities of profitable co-operation between city engineering departments and the railways are limitless. Nor are the advantages all on one side, for the city may profit equally with the railway in laying out paving and track-replacement programs so as to avoid duplication of work. Strangely enough, when real co-operation exists between city officials and the transportation company, little is heard about the matter. Let a city and its transportation agencies work together on a smooth basis of mutual accord and few laymen are the wiser, save for a vague feeling that things seem to get along pretty well in their community. But let the municipal authorities, either through indifference or with seeming deliberateness, give no heed to the financial resources or physical abilities of the railway, or let the railway executives fail to lay their cards on the table and play fair with the city, then immediately there is a tumult and uproar in the community, which, sadly enough, usually seems to center over the heads of the electric railway men, regardless of their degree of innocence or of their culpability in the matter.

In communities where thinking along these lines is sound, arrangements have been made to confer on programs for track and paving work some time in advance of the date when operations are actually to be started, so that the two elements may be fitted together as effectively as possible. Under these conditions municipal authorities have shown a readiness to lend an attentive ear to expositions of the railway viewpoint, while the managers of the property have, for their part, overlooked no opportunity to accede to aldermanic requests whenever possible to do so. That the latter course is profitable is evidenced by the fact that municipalities have in several instances volunteered to stand the expense of paving the track strip in return for an evident desire by the railway to plan its track construction

so as to tie in with the paving program of the municipality's street department.

Of course, co-operation in any form is largely a matter of human relationships, and it is well worth the effort on the part of railway men to make a careful study of the individuals with whom they must deal. Few men are so immersed in their own ego that they cannot be reached and influenced by a straightforward presentation of facts and a friendly and cordial attitude which does not savor of pandering.

### It's Not the First Cost but the Upkeep that Determines

**M**AINTENANCE of electric locomotives may prove to be a determining factor in the selection of systems. From time to time the industry is apprised of new units of electrified railroads that have been put into operation, but the operating statistics are not so frequently made a matter of public analysis. In this issue, Dr. Neithammer tells of a 284-mile section between Stockholm and Göteborg, Sweden, recently electrified. He submits the statement that the single-phase system does not appear to be materially inferior to the direct current system of electrification.

What the industry needs are facts to determine whether one system or one type of locomotive has points of superiority over others. Unquestionably, the first cost is an important element, but the factor that will gain in weight as time goes on is the cost of maintenance. A study of the maintenance costs per locomotive-mile or per ton-mile for the electrifications in this country varies through astonishing ranges.

The difference in fixed charges between any of the major systems of electrification when reduced to cents per locomotive-mile would be small in comparison to the variation in maintenance costs that can be found between any of the major systems. In short, it is not the first cost but the upkeep that counts, and the sooner such maintenance cost differences are determined and capitalized the sooner opinions will give way to facts.

### Kansas City Reorganization Gives a Fresh Start

**R**ESTORATION of the property of the Kansas City Railways to its owners has been made and the receivership has been ended. The successor company is the Kansas City Public Service Company. It starts out under circumstances that seem to be propitious. To some the plan of reorganization appeared to be too drastic in that it wiped out equities which they felt were entitled to more consideration than they received. The scaling down of securities was drastic, but it has had the sanction of the courts.

In handling the property the receivers did well, as did also the operating organization which functioned subject to their direction. During the years of the receivership—and for one reason or another the receivership was a long one, but one not unduly protracted considering all the problems involved—much was done to restore the road to prestige. Much more remains to be done. The successor organization realizes this, and it has already started on a program of improvements based on a knowledge of the needs of the system and founded on the belief that the city is prepared to co-operate. That the municipality is so disposed is shown by the twelve-year extension of the company's franchise, making the term of that grant 30 years. This is a

period none too long. Meanwhile, the advisability of revising the terms of the grant are being considered so as to bring them more nearly in line with modern thought on grants of this kind.

The new company has at its command all the money turned over to it by the receivers, but this sum will be entirely inadequate to meet the costs of the \$6,000,000 reconstruction program which is required. Concessions in fare have already been authorized. But the new company is pledged without reservation. It can do only certain things under the grant as at present extended. It cannot, however, do under these terms all the things that are possible under a modern franchise with provisions designed to give flexibility in meeting the exigencies of modern operating conditions. Lifting of the receivership is a highly desirable accomplishment. It marks, however, the beginning of a new period rather than the ending of an old one. And the course which events take in the future is as much in the hands of the city as in those of the management. The obligation is a mutual one.

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### Service Equipment, Too, Affects the Public's Opinion

**K**EEPING an eye on the things which appeal to the man in the street subconsciously rather than consciously is not the least important phase of transportation merchandising. For example, there is the matter of keeping the wrecking cars and trucks in first-class physical condition and fully stocked with all necessary tools and equipment. It cannot be gainsaid that this has a distinctly favorable psychological effect on public and employees alike. Likewise is it essential to have the wrecking crew fully organized and drilled with the precision of a fire department so that no time or motion will be lost in getting to the scene of trouble.

When a street car becomes involved in a street accident, for whatever reason, or succumbs to mechanical ailments, there invariably are native wits on the sidewalks to "wise crack" at its expense. As long as it remains thus exposed to public view the car forms a distinctly adverse object lesson for public observance and it therefore behooves the railway to remove it or repair it at the earliest possible moment.

Appearance of service equipment may at first glance seem secondary to the condition of passenger rolling stock. However, a well-painted, fully stocked wrecking car or truck appearing at the scene of an accident or breakdown cannot fail to impress spectators with the progressive, efficient attitude of the railway. Sometimes when a decrepit, unpainted, broken-down appearing service car clatters along the street, people are inclined to speculate as to which is the savior and which the saved.

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### Dollars and Sense the Measures of Co-operation

**F**OR every day use a good hypothesis would be one which states that the maximum of co-operation between maintenance and operating departments will bring a maximum return in dollars and sense. The latter is perhaps a poor pun. However, it at least suggests a corollary for the above hypothesis, namely, that the dictates of common sense should preclude any unnecessary abuse of rolling stock and other railway equipment. It is the job of the maintenance forces to keep cars and buses "up to scratch" in so far as physical condition and efficiency are concerned. It is just as

much the job of the transportation department to see that this equipment is not subjected to greater punishment than reasonable service conditions require.

As a "horrible example" there is one electric railway property when the transportation men pride themselves on the fact that no allowances are made in the operation of equipment throughout the most adverse water and snow conditions. Regardless of the depth of water over the tracks the operators are permitted to send their cars through at speeds which literally invite electrical trouble. To no avail has the master mechanic torn his hair and presented report after report to show the very real cost of this foolhardy attitude. There have been times when a large proportion of the company's rolling stock has been waiting its turn in the shops, as a result of failure by the operating department to exercise a little judgment on where and how fast cars might be operated during the temporary existence of water obstacles.

Service maintained in the face of adverse weather conditions is, of course, one of the first principles of satisfactory transportation. It is a laudable ambition on the part of the transportation department to defy the elements in keeping its cars moving. But its responsibility goes further than merely running the cars. It is equally important that the greatest possible diligence be exercised in protecting the equipment by limiting speeds at bad spots, cutting off power when running through water and otherwise helping to prevent electrical trouble. To do otherwise is flirting with inevitable disaster and is not in keeping with the modern spirit of team work between departments. A little headwork at the proper time will save a lot of back work later, and, incidentally, many dollars.

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### Greater Interest Can Be Enlisted in Engineering Association Work

**A** GOOD start was made during the past year to bring about greater co-operation between the American Electric Railway Association and the various state and sectional associations throughout the country. This is undoubtedly a step in the right direction, which will tend to knit the industry closer together and to bring about greater co-ordination of effort in handling common problems.

Contact between the engineering association and the equipment, track and electrical men in sectional associations would likewise bring better understanding of common problems and greater unity of action. In the case of engineering association work, one of the greatest difficulties has been that of getting adequate representation of the industry on the various committees, and of bringing about general acceptance of recommendations and standards after they have been adopted.

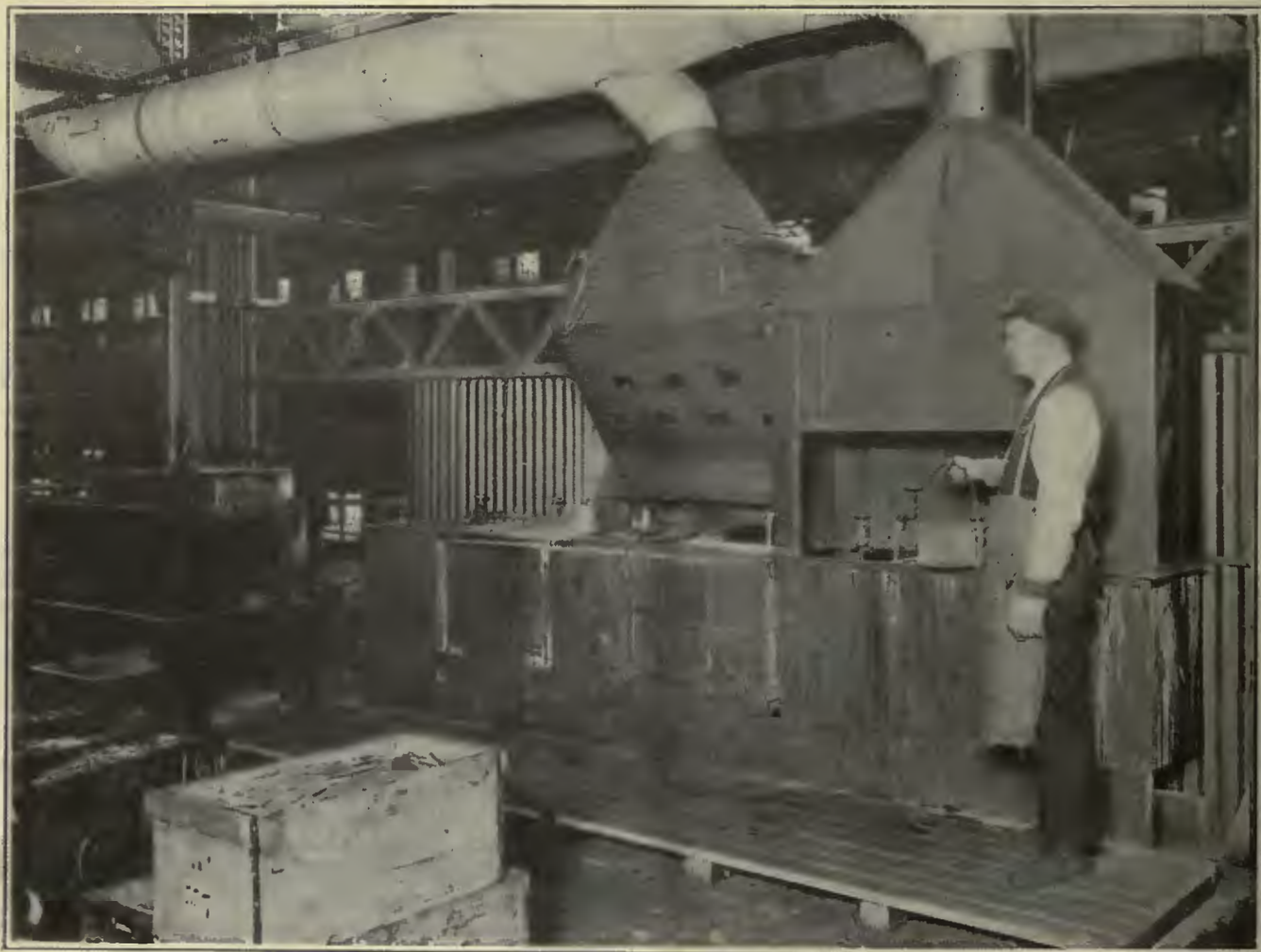
In most sectional association meetings considerable time is devoted to the discussion of construction and maintenance subjects. Here there is an opportunity to discuss topics that are on the program of American Electric Railway Engineering Association committees. Membership on some of the more important engineering association committees might well be selected with a view toward having representation from the various sectional associations. Thus current subjects that are being studied could be taken up at sectional association meetings, and the assistance enlisted of those in charge of maintenance on many properties that are not directly represented on engineering committees.

# Important Considerations in Replacing Commutator Bars

Pure Hard-Drawn Copper Best for Commutator Bars and Section Should Be Same as Adjacent One—Each Individual Unit Should Be Placed on a Surface Plate to Determine Its Trueness and Be Straightened if Bent

By *Jesse M. Zimmerman*

Renewal Parts Engineering, Westinghouse Electric & Manufacturing Company



Cleaning Bath in Which Individual Copper Bars Are Dipped to Remove All Dirt and Grease

**I**N THE course of development of commutating machinery, various metals have been tried for commutator bars. These different metals range from silver, pure copper, both hard and soft, through various alloys and brasses, cast copper of various purities, aluminum, wrought iron and even cast iron. Experience has shown that all of them can be used in commutators if one is willing to pay for the high price of maintenance and unsatisfactory operating characteristics plus a higher first cost. The use of any other metal than pure copper or silver will mean a larger

commutator. This in turn will mean an increased size of the machine.

Iron bars were at one time used in a commutator for an electric railway motor. The commutator soon developed high mica, and the commutating surface became blackened and blistered. Sparking gradually increased until commutation reached a state where it was impossible to operate the motor. High mica was not caused by the metal wearing faster than the mica. It was caused by the contact surfaces burning away, leaving high mica.



Aluminum was then tried. It worked better than iron, in that burning, blackening and high mica did not appear so quickly. However, like iron, it did not take a polish and soon had a dull appearance, gradually turned black and burned badly. This, no doubt, was due to the high contact resistance of the aluminum oxide which formed on the surface, due to sparking.

Bronze, brass, cast copper and copper alloy were tried for commutator work. While they gave better results than aluminum or iron, the commutator would develop high mica more quickly than ones made of copper hard-drawn from pure ingot metal. This burning action is a function of the contact resistance, current density, non-burning and non-blistering qualities of the metal used in the commutator. Anything which tends to increase the heat-conducting properties of a commutator will tend to decrease the burning action. This has been clearly demonstrated in an elaborate test of carbon brushes on a collector ring, where the question of commutation could not disturb the conclusion. Such tests were made on cast iron, wrought iron, bronze, various alloys, including cast copper alloy, and pure copper. With high current densities, the burning and blistering action appears to depend on the ability of the metal to conduct the heat from the contact surface. The fusion of the metal on good heat-conducting materials will be so small that the polishing action of the brush will keep the surface in a smooth, glossy condition.

The electric conductivities of the metals and their mixtures in alloys bear a fairly close relation to their heat conductivities. Through extensive tests, it has been found that very little impurity in copper will reduce the conductivity to possibly one-third. Most of the alloys of copper have a very low heat conductivity compared with pure copper. Wrought iron or aluminum have a lower heat conductivity than copper alloy. Ac-



Removing the Barrs from Both Sides of the Individual Copper Bars by Grinding

ording to this argument, silver should give the best commutation. It does, but is too expensive for this purpose.

The use of copper alloy, which costs almost as much as hard-drawn copper, does not warrant the increased cost of maintenance and interruption of service. Furthermore, if a motor working at its maximum rating with a commutator made of pure copper has this removed and has substituted a commutator having copper alloy whose conductivity ranges from 50 to 60 per cent, it certainly will be overloaded.

From the foregoing it is evident that bars to be used in renewing a commutator should be of the same material and workmanship as the original copper bars.

The bars should be made from pure hard-drawn copper whose conductivity is not less than 98 per cent, 100 per cent being based on copper having a resistance of 9.59 ohms per mil-foot at 0 deg. C.

The bars should be made of hard-drawn copper having a Brinell hardness number of not less than 75 to 80. They should be able to withstand a fiber strain of 25,000 lb. per square inch in order to overcome the stresses due to centrifugal force and stresses caused by alternate heating and cooling of the commutator while in service.

The Brinell hardness number for cast copper bars which are later "drop forged" or "bumped" is from 50 to 55. Soft copper has a Brinell hardness number of 38 to 40. From this it can be seen that the hard-drawing process will produce better commutator copper.

The die through which the copper is drawn is called a section. The opening in the die conforms with the cross-section of the bar, as shown in an illustration. During the drawing process, samples are taken for analysis which include quality, hardness and gaging of the section. Gaging to see that the size of the bar remains uniform is a frequent operation.

The copper bar must not vary from the specified section to either of the drawn edges by more than plus or minus 0.001 in. The algebraic difference at the two



Copper Bars Being Straightened Before Building into an Assembled Set of Commutator Segments

drawn edges must not exceed 1 mil. If this variation is not adhered to the distance from any bar to the corresponding bar under the next pole may vary more than plus or minus  $\frac{1}{32}$  in.

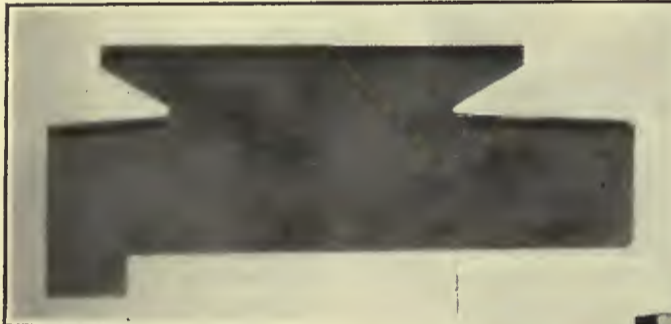
The concavity of each surface of a bar must not vary more than 1 mil from the computed thickness, i.e., the gaged thickness at any point must not be more than 0.002 in. less than the computed thickness and the convexity of the surface must not vary more than 0.0005 in.

All bars should have a drawn radius at the bottom chord. When a  $\frac{1}{32}$ -in. mica extension is allowed in the bore, the combination of the two gives a large creepage between bars. On some motors the space between the

The sale of a great many motors is so small that it is cheaper to machine the V's from the rectangular bars after they are assembled than to make a punching die. These bars are sawed into lengths corresponding to the unfinished over-all dimension. These are called rectangular bars. For repair purposes rectangular bars should have the V's rough-sawed, leaving  $\frac{1}{8}$ -in. material for finishing.

#### METHOD RECOMMENDED FOR REPLACING SPARE BARS

After removing the damaged bar, an undamaged adjacent bar can be used for a pattern and a new mica strip can be cut to the same size as the unfinished bar.



Hard Drawn Copper Bar as It Comes from the Die



Edges and the Sand Holes Remaining Cast Copper Bar, Showing the Rough

bore of the assembled segments and the commutator spider is so small that it is necessary to machine the bore of the assembled segments. In such cases the drawn radius is of no value.

All commutator bars should be chemically cleaned to remove all grease and dirt. They should be free from roughness, cracks and laminations. The surface of each bar should be ground to remove the burrs caused by punching and sawing, as well as all foreign particles adhering to the copper. Each individual commutator bar should be placed on a surface plate and straightened by light hammer blows if bent or untrue.

In the old days some of the motors had the commutator bars punched to size. It was thought the bars could be punched and then assembled. This did not work so well, due to the variation in the copper. If the copper ran heavy, the commutator gage diameter would be too large, causing an arch-bound commutator. Sometimes the gage diameter would be so large that the spider V's should not fit the copper V's at all. If the copper bars were thin, the commutator gage diameter would run small. When the commutator was assembled, open places between the bars could be found. After extensive tests, it was found necessary to machine the V's to an accurate gage diameter after the assembled segments were built up and held together by a clamping ring.

Bars for use in repairing commutators are supplied in two forms. They are, bars punched to an unfinished size and rectangular bars. Where a large number of bars are needed, a punching die is used to punch the bars to an unfinished size; that is, the V's are punched leaving  $\frac{1}{8}$  in. for finishing. All repair bars for these commutators are supplied in this manner.



Hard-Drawn Copper Bar After Years of Service

The mica strip can be fastened to the copper with a thin coat of heavy pure orange shellac. The unfinished bar should then be clamped in a vise with a pattern bar and trimmed to approximately the outline of the pattern. If the V's have been rough-sawed or punched, the amount of filing necessary may be reduced by taking an extra cut with a hack saw. The unfinished bar and the pattern should then be clamped in a vise with a mica strip between them and the V's of the new bar should be filed to the same size as the pattern bar. The radius in the V's can

be finished with a small rat-tail file. The bars are then ready to be placed in the commutator.

When reassembling the commutator, all the bars and the V-rings must be in their proper places, with the commutator nut fairly tight. The commutator should be heated to 125 deg. C. in an oven, and while still hot a pressure of from 20 to 30 tons should be applied to the detachable metal V-ring as the commutator nut is turned home.

A good method of testing for loose bars is to tap on the face of the bars at the front and rear. If a bar is loose it will vibrate. Leads should be soldered in the commutator slots, the face of commutator turned and the mica undercut. Tests should then be made for grounds and short circuits.

The value of having all commutator bars made accurately to size cannot be overemphasized. Investigation of causes for commutator troubles has shown many that result particularly from use of mica V-rings which are scant in thickness or oversized. These have been used to compensate for the inequalities of the bars themselves. Many of the loose bar troubles will be overcome if care is used in selecting bars needed for repairs.

## Remedying Radio Interference in San Diego

Low Pass Filters Are Being Used by the Railway to Eliminate Noises in Local Receiving Sets Caused by Motor Commutation—Exhaustive Series of Tests Was Conducted to Determine All Causes of the Disturbances

By G. W. SHAVER

Superintendent of Equipment San Diego Electric Railway

EIGHT months or more ago official complaints were made to the San Diego Electric Railway that it was producing severe radio interference. A committee composed of representatives of the Department of Commerce, the U. S. Navy Department, the Chamber of Commerce, the power company, the telephone company, the radio club and the railway made an investigation with portable radio receiving sets in an effort to prove whether the electric railway operation was actually causing this interference.

The interference under investigation was generally referred to as the "rock crusher." It is something like heavy static. The interference covers the entire broadcast frequency band, having a maximum at approximately 1,000 kilocycles (300 m.). The noise appears suddenly and lasts for intervals varying from a few seconds to several minutes, at the end of which time it might stop suddenly or die off slowly. It was much less severe after nightfall.

Investigation showed that the interference covered a very wide area. An increase in its intensity was noted as the portable set was moved under any wires, but was much more severe in the vicinity of the trolley wire. All efforts to connect the noise with the movement of individual cars was unsuccessful. It was decided that perhaps the interference noted at a given point was the result of disturbances set up by several cars which might be some distance away. To determine this, tests were made at night when there was only one car on the line.

At that time it was noted that the characteristic noise started and stopped in synchronism with the movement of the car with power on the motors. It was noted that the air compressor motor caused a continuous roar, although of but mild intensity, as long as it was in operation.

### COMMUTATION THE MAIN CAUSE

Our investigation leads us to believe that the two principal causes of this interference are the commutation of the motors and sparking at the trolley wheel. These sparks set up highly damped oscillations which are conveyed to the trolley wire, which acts as an antenna and distributing system. Power and telephone wires pick up this interference by induction and re-radiate it throughout the city. The reason there is such a reduction of this interference after nightfall is probably due to the increased absorbing effect of the comparatively large lighting load of all of the cars on the line, which forms a non-inductive path between trolley and ground.

Having determined the cause of the interference, the next step in the problem was to find and apply a remedy. Two solutions presented themselves; one, to improve commutation and reduce sparking at the trolley wheel and the other to prevent the disturbances set up by these causes from reaching the trolley wire. Since the com-

mutation was considered very satisfactory from an operating point of view, it was decided that the latter solution would be attempted.

A low pass filter was designed and installed on the roof of a car for test. It consisted of a 300-micro-henry inductor connected in series with the trolley lead and an 8-microfarad electrolytic condenser connected between the car side of the inductor and ground. The theory of its action is to provide a low-impedance path for the direct current between trolley and car and at the same time offer a high impedance to the high-frequency currents between car and trolley and shunt them off to ground through the condenser.

The tests, made on a section of the trolley line which could be isolated from the rest of the system, showed that the filters eliminated about 80 per cent of the interference. It was observed that when a car without a filter entered this section of the line it caused severe disturbance all the time it was operating, although the car was at times more than 1½ miles from the observing point.

In order to facilitate further investigation a car was jacked up in the carhouse so that one pair of motors could be operated. A single-wire antenna about 40 ft. long parallel to the trolley and about 3 ft. from it was connected to a six-tube Atwater-Kent radio receiving set. Operating one motor at a time, it was observed that No. 1 motor caused severe interference when rotating in one direction and practically none in the other. On the other hand, No. 2 motor caused practically no interference when rotated in either direction. On examining the wiring diagram it was noted that the main series field of motor No. 2 was permanently connected between the armature and trolley. The main series field of motor No. 1 was permanently connected between armature and ground, but it was found that the commutating field was connected between armature and trolley when the motor rotated in the direction which caused no interference. As an experiment, the main series field of motor No. 1 was connected between armature and trolley. Under these conditions motor No. 1, and in fact both motors simultaneously, could be rotated in either direction with practically no interference. It is concluded that either the main series field or commutating field will act as a filter which prevents the commutator disturbances from reaching the trolley. It is impossible so to connect motors 1 and 3 with their main series fields between armature and trolley without adding another unit switch because of the system of tapped field control employed.

In preparing for the tests in the carhouse a new filter had been designed and constructed and installed on the car. This new filter was of a type similar to that described except that it had three stages; i.e., three 100-micro-henry inductors in series with the trolley lead and three 2-microfarad condensers connected respectively between the car end of the inductors and ground. The filter was very efficient, eliminating practically all noise from the main motors and from the compressor motor.

In order to make the test more conclusive this filter was installed on another car which was tested under operating conditions when it was the only car on the line. The filter was so installed that its various units could be cut in or out separately, permitting a number of comparative tests in rapid succession. The tests indicated that the more stages employed the more perfect the elimination of the interference produced by the

motors. It was also found that a large radio-frequency choke (all three inductors in series) without any condensers was quite effective, but not as good as when the condensers were used.

It so happened that the car used on this test had one trolley wheel which produced much greater sparking than did the other. One caused but little interference, but the other, which sparked badly, caused quite a considerable amount. A filter such as that described had practically no effect on the disturbances from this cause. It is believed, however, that if the interference from the motors is eliminated the sparking wheel will cause little or no trouble.

There was one effect noted which has not as yet been clearly explained and that is that there seems to be a certain amount of interference produced when the power is shut off a moving car and the brakes are applied hard, causing rapid retardation. There is little or no interference while coasting. If the trolley pole is pulled down there is no interference, even though the car is rapidly slowed down.

The same type of car was used in all the tests. It is equipped with four Westinghouse 514-A-3 motors with tapped field control. We have a number of two-motor cars which are also producing a considerable amount of noise. An examination of the car wiring diagram shows that the main fields of these motors are permanently connected between armature and ground. Even though it were possible to reconnect all the motors so that the main series fields were connected between armature and trolley, it is believed that better results could be obtained at lower cost by a good filter.

With the proper use of filters it has been found possible to eliminate the major portion of the interference caused by electric street railways. Our trial test was made just a short while ago, consequently we have not as yet installed these filters on our cars. The results of all our tests are now in the hands of G. W. Cattell, radio engineer of the U. S. Navy Department, who has co-operated and assisted us to the fullest possible extent in the investigation and solution of this problem. He is now designing the final form of filter, which will be built and installed on a number of our cars which operate on one line. Careful observations will be made of the results obtained to determine what action will be taken in regard to equipping the rest of the cars.

### "Traveling Billboard"—Illinois Traction Advertising Medium

THE Illinois Traction System was well represented at the Greater St. Louis Exposition during the recent three weeks exhibit at Forest Park. Its booth was located on a prominent corner, and a background of an illuminated cyclorama showed the Illinois Traction System territory as well as a map indicating the advantage to automobilists of using the McKinley Bridge across the Mississippi River at St. Louis. The booth was in charge of representatives of the traffic department of the Illinois Traction System and of the St. Louis Electric Bridge Company. An odd method of advertising, this attraction was adopted by the Illinois Traction System, with the co-operation of the St. Louis Chamber of Commerce, in sending a special advertising car over the company's lines in Illinois. This car was covered with two 40-ft. signs and traveled more than 600 miles in Illinois. Upon arrival in a

city or town the car was heralded by a special type of siren whistle, and the newspapers were informed about the car and its purpose.

## Tractive Effort Increased with Three-Motor Truck

BY E. B. GUNN

DUE to several heavy grades on the lines of the Western Ohio Railway, running between Piqua and Findlay, Ohio, this railway required heavier equipment than the present four-motor freight cars that are being operated. A new departure in truck building resulted when the Cincinnati Car Company built a truck with three axles so that three motors could be mounted on each truck, or six motors per car. In May of this year the railway started a test with this type of truck by mounting six Westinghouse 56 motors under one of its



Freight Car of the Western Ohio Railway Equipped with Six Motors and Twelve Driving Wheels

cars. These particular motors were available from some of the company's heavy interurban passenger cars.

The use of this six-motor equipment necessitated the design of a new controller with groupings to take care of the six motors. The General Electric Company brought out improvements to its K-64 controller to take care of this condition. A line breaker was added to take care of the increased current and to provide for breaking the circuit outside of the platform controller. A commutating switch was also added to change the grouping from low to high speed.

These equipments were placed in service under one of the company's regular freight bodies and have been working very satisfactorily. Through their use the car can pull two extra trailers over the severe grades. The energy consumption is very low, considering the length of trains that are being hauled, and this type of equipment has been found particularly easy on substations. The truck has been able to operate around short radius curves in an entirely satisfactory manner, and the added tractive effort has proved of great advantage. Couplers are mounted directly on the truck and therefore the center of the coupler is practically in the center of the track at all times. Brakes have been installed on all twelve wheels of the car, which makes for very effective braking.

# Storage, Handling and Protection of Lubricants

Central Oil House Desirable Where Large Volume of Lubricants Is Handled—Proper Construction Makes Danger of Fire Almost Impossible—Location Near Railroad Siding or Street Reduces Handling

By Allen F. Brewer

Mechanical Engineer and Editor "Lubrication," the Texas Company, New York, N. Y.

**M**AINTENANCE of street cars and motor buses is far more of a problem than maintenance of steam turbines, engines, pumps, etc., in the power plant. With the latter, failure of bearings will, of course, be more costly from a replacement point of view, but attendant labor can be better supervised and more carefully trained to the importance of lubrication. The motorman or chauffeur, on the other hand, is left to himself on the road. If he profits by the teachings of the "chief," fine; if he is careless or negligent, the garage or carhouse mechanic will probably work overtime on bearing replacement, etc., which may send the cost of maintenance soaring, if enough of this occurs.

Effective lubrication starts with the methods and means of storage in the carhouse or garage. To direct our efforts toward the selection of the most suitable products, and then allow them to stand in open containers, exposed to perhaps the weather, and almost surely the dust, dirt and moisture conditions of the average shop, will be decidedly poor policy. For lubricants can only be dependable in proportion to their purity. As received from the refinery they are pure, if bought under a dependable trademark. It is, however, up to the consumer to keep them as nearly as possible in this condition, until used, and in certain conditions, during use. Proper storage equipment, well-defined oil-house rules, education of employees, and the use of certain oil purification equipment will be excellent insurance against the carelessness of operators or mechanics, and the possibility of the development of excessive maintenance costs.

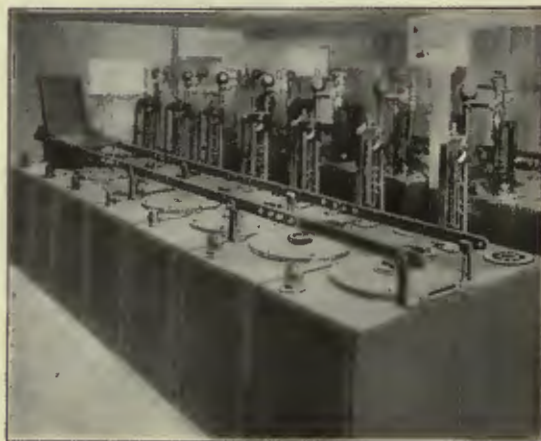
## FACTORS INVOLVED IN HANDLING LUBRICANTS

In general, the storage and handling of lubricants will involve a number of factors which must be given consideration, such as: (1) The construction of the oil house or oil room; (2) the storage tanks and their accessory equipment, such as heating coils, etc.; (3) the equipment installed for the handling of the products and shipping containers; (4) the provisions for measuring oils in order to enable a suitable record to be kept; (5) the manner in which the oils are distributed; (6) the extent to which semi-solid lubricants are to be used; (7) the manner in which the oil house is to be managed, and the kind of records kept.

The primary requisite for any electric railway using a considerable volume of lubricants is a central oil storage house, or at least a special room in some part of the garage or carhouse from which lubricating oils and greases can be issued as needed, and in suitable though not excessive quantities. In turn, all new supplies of such oils should be delivered there for storage until required. Whether or not the expense of constructing

an independent oil house is justified will depend largely upon the amount of rolling stock involved.

Of course, there will be considerable expense attached to such an installation. For this reason, therefore, many plants which are adjacent to oil supply depots frequently set aside a corner of the garage or carhouse for the storage of lubricants, and keep these latter in



A Battery of Lubricating Oil Storage Tanks with Barrel Truck Along Top and Measuring Pumps in the Rear

the shipping containers until they are empty, when they are forthwith returned to the oil dealer.

The natural objection to storage in this manner is that there will be considerable possibility of contamination of the lubricants. Such localities are often very carelessly hosed or cleaned out, with the result that dirt will be swept into the drip pans and measures. There will also be considerable chance for leakage and wasting of oils in such a room, unless an unusually careful employee has sole and complete charge and keeps it locked and inaccessible to others.

An oil house or oil room should, whenever possible, be of fireproof construction throughout, with brick, tile or concrete walls and floor and a tile, metal or slate roof or ceiling built on steel beams or rafters. The floor should be fitted with drains. The danger of fire in a modern oil storage house will usually be practically negligible; yet constructional features of fireproof nature are the best sort of insurance, and first cost, unless prohibitive, should not be dickered over.

In addition, cleanliness will be more easily maintained in such a building or room than in one where woodwork is used, which would soon become splashed and oil-soaked.

Doors and windows are another factor requiring consideration in oil-house construction. Best practice rec-

ommends as few of these as possible, and those that are necessary should be of steel frame or roller type, fitted with wireglass and automatic closing devices. Suitable fire-extinguishing equipment should also be installed.

#### LOCATION OF THE OIL HOUSE

Considerable thought should be given to the location of the oil house or the part of the store-house or garage, etc., which is to be set aside for conversion into an oil room. An appreciable amount of time will always be



This Type of Skid and Barrel Drainer Is of Great Assistance for Emptying Contents of Barrels

lost in the laborious handling of heavy oil containers. There is also considerable possibility that damage will result both to lubricants and containers if the latter are rolled or tumbled about unnecessarily. So our first thought should be to locate the oil room or house as close as possible to the railroad siding, dock or street. Thus the containers will not be subject to any more handling than absolutely necessary in their transference from cars, boat or auto truck to the point of storage.

Where handling of filled containers from one level to another is involved, hoisting is necessary. Hoisting is expensive; in addition, it entails a certain amount of severe handling of the containers which may easily lead to contamination of oils or greases through sprung seams, etc.

Wood barrels especially will suffer, and warped and cracked heads, or the jarring loose of particles of the glue lining, will often occur. Any damage to the container which may break the seal and lead to contamination of the contents through entry of water or foreign substances is a serious matter.

To overcome these objections "one level" handling is advisable. In other words, the platform of the oil house or storage room should, as nearly as possible, be on a level with the car floors or dock, or, where containers are to be delivered by auto truck, on a level with the floor of the average truck.

As a result of such construction, containers can be rolled, trundled on hand trucks, or handled by a portable conveyor, directly from the delivering medium to the filling hatch of the storage tanks, where this is located at the floor level, or to the hoisting device about the tanks if they extend above the floor.

In any system the type, number and size of storage tanks that may be necessary will depend upon the volume and nature of the lubricants that are to be stored. In general, where a new oil house is to be constructed it will usually be practicable to build it with a basement, and provide for location of bulk storage tanks therein; the main floor in such a house would thus serve as the receiving and delivering room, the tops of the tanks projecting above the floor or not, according to the type of house.

The number of tanks required will depend upon the number of different grades of lubricants used. In every case the rate of consumption involved should be considered. Where, for example, only small quantities of certain products are to be stored for any length of time, in the interest of economy of space and expense, it will be best to keep them in the shipping containers over the period of storage, rather than plan to transfer them to more permanent tanks.

There are two general methods by which fluid lubricants can be delivered, and which must be considered when planning for storage tanks. They are: (1) Bulk delivery by tank car, truck or boat, and (2) package delivery in steel drums, barrels or cans.

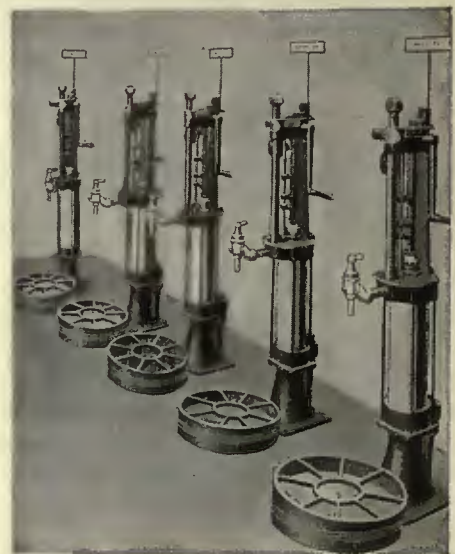
Where bulk delivery is involved, the location of the tanks with respect to the delivery level is naturally important. Usually in such plants the oil is transferred from the tank car or boat through a hose connection. To facilitate matters and reduce expense, gravity flow should be taken advantage of by locating the tank filling hatch below the level of the outlet valve of the tank car.

Care must be taken in the location and operation of valves, when pumping is necessary, inasmuch as where a number of tanks are involved there will be possibility of drawing some cheaper grade of oil into the suction line to contaminate a more highly refined product. Interconnecting valves should be tightly closed before pumping is begun.

Package delivery, as the shipment of lubricants in drums, barrels, or cans is usually termed, will also be facilitated if gravity is utilized to the fullest extent.

#### TEMPERATURE CONTROL DESIRABLE

Certain lubricants can be handled most effectively where absolute control of oil-house and tank temperatures is possible. Therefore, thermal conditions should



Ample Drains from Lubricating Oil Pumps Insure Cleanliness and Prevent Waste

be studied in planning storage-tank location in either an oil house or an oil room.

Wherever heavy, viscous products, such as greases or gear lubricants, are to be stored the oil house or oil room should be equipped with heating coils, especially where climatic temperatures may vary over a wide range. For this reason many storage tanks for lubricants are built similar to fuel oil tanks, with heating

coils within. In such installations the coils should always be composed of bent pipe, and no pipe junctions or fittings should be present within the tanks owing to the danger of water, or boiler compounds contaminating the lubricants in event of steam leaks at pipe joints, etc.

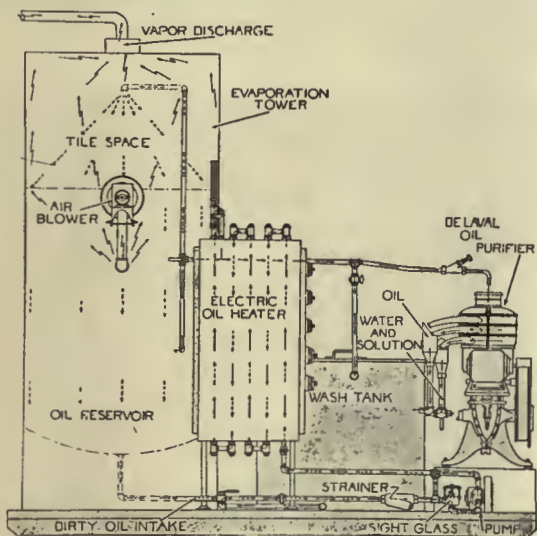
The better practice, however, is to install steam heating coils in the storage room itself or surrounding the tanks. Thus temperatures can be accurately regulated, overheating will not be so apt to cause damage to certain products, and heating can be economically carried out by the use of exhaust steam in many cases.

Horizontal location of all larger tanks will always be advisable. Thus the maximum distribution of load on the foundations will be obtained. The possibility of settling will thereby be decreased, and excessively heavy footings and foundations will not be as necessary to carry a load which is relatively widely distributed. This is assuming that the ground on which they are to be built is solid and not prone to settle.

To insure complete rigidity, the tanks should always be securely anchored to their foundations—never just rested upon the latter. This will be especially essential in localities where floods, earth movements or explosions, etc., are possibilities, the occurrence of which might disturb the location of tanks and cause broken pipe connections, damage to floors, and loss of oil through probable leakage.

In practically every storage room certain accessory equipment will be necessary for the handling of lubricant containers and the lubricants themselves. This will include pumps, meters or other measuring devices, portable elevators for hoisting or lowering drums, etc.

Measuring pumps will save considerable time and labor, will enable the oil-house or oil-room attendants to fill orders promptly, and will insure that the oils are kept free from contamination and in their original state



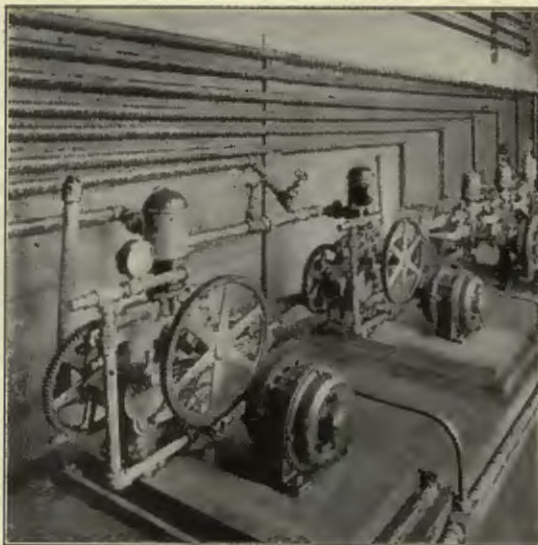
By Careful Heating, Washing, Evaporation and Centrifugal Action Oil Can Be Reconditioned for Reuse

of purity, until drawn into the distributing containers for use on equipment.

The value of orderly oil-house operation, and properly kept records of daily, weekly and monthly oil consumption cannot be underestimated. The effect on the morale of the personnel and the economies in consumption of lubricants that can be attained will be surprising where employees must follow a definite procedure in the

obtaining of their necessary oil supplies and where an accurate record is kept of their consumption.

The hoisting of barrels or drums above storage tanks, or to emptying racks for transference of their contents, will render it advisable to install a portable elevator for this purpose, to eliminate handling and probability of damage as much as possible. Modern practice is to



Battery of Power Pumps for Handling Oils in Bulk

extend a suitable track along the tops of all tanks that are to be filled from barrels or drums, at a sufficient height above them to facilitate location of the bungs directly over the filling hatches, and reduce the possibility of waste. Containers can then be hoisted to this track level, rolled into position above the respective tanks to be filled, and emptied of their contents rapidly, completely and with comparatively little labor.

The manner of distribution of lubricants from the oil house or oil room to various parts of the carhouse or garage is important in that it involves the element of lost time on the part of the employees who are to deliver the oils and greases. So this should essentially be studied as a labor-saving problem; although, on the other hand, prevention of contamination must never be overlooked.

Where auxiliary storage in individual departments is to be maintained the type of containers used is important. Preferably they should be of the cabinet or portable filling station type of storage tank, fitted, where advisable, with a suitable hinged cover to afford the utmost protection of the contents. Usually such tanks are equipped with measuring pumps, and so built that any drip from the pump discharge drains right back into the tank.

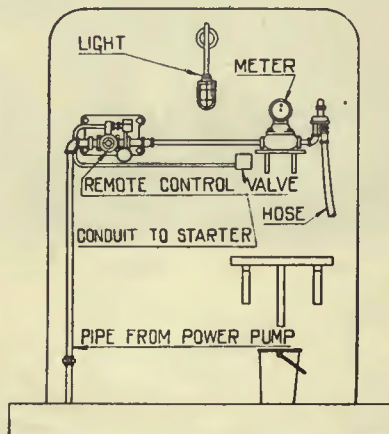
The extent to which greases and gear compounds are used will be another factor that must be considered in planning the oil-house layout. In electric railway service straight mineral, non-fluid gear compounds will predominate. For the motor bus, on the other hand, greases of varying melting points according to the service required will be in the majority.

In purchasing greases, it should be a rule never to attempt to store any greater amount than actually needed, and to observe every caution to avoid overheating. It must be remembered that oftentimes the oil and soap constituents of certain greases will tend to separate more or less permanently if subjected to

abnormal heat. Of course, this will cause a decided decrease in the subsequent lubricating value of the grease.

Such of these products as can be rendered fluid through reasonable heating can be handled like oils, their storage tanks being built with similar filling hatches, rolling tracks and elevator equipment. Thus, upon receipt of new deliveries in large amounts, steam heat where available can be turned on in the oil room and barrels promptly hoisted for draining of their contents with a minimum of loss into the respective tanks set aside for their storage.

Here again it is well to emphasize the importance of accurate regulation of steam flow and oil-room temperatures, especially at such a time. When such lubricants are to be transferred from shipping containers to storage tanks, whatever the atmospheric temperature, it will be necessary usually to raise their temperature (through



Convenient Arrangement for Lubricating Oil Draw-Off in Storage Room of Electric Railway

indirect heating) often quite considerably in order to enable them to flow readily from the containers.

Certain gear lubricants which may be too heavy to flow with any degree of rapidity under such heating as is available must be stored in the shipping containers. In general they can best be handled by a suitable pump or a clean paddle or spoon, removing only a sufficient amount each time to fill the gear cases or lubricators.

To protect the contents of the containers after the heads have been removed, and to prevent drying out of such products as greases a removable cover should always be kept tightly in place over the top. Sheet metal is considered the best material for such a cover and preferable to wood owing to its ability to insure a better seal, its resistance to warping and the ease with which it can be cleaned.

#### LUBRICATION SPECIALIST WILL PRODUCE MANY ECONOMIES

Greatest economy and efficiency in the storage, handling and usage of street railway and motor bus lubricants will be attained by placing the entire matter of lubrication under the supervision of a master mechanic or a capable lubrication engineer. Many larger roads have created the latter position in their mechanical engineering departments (though perhaps not in name), realizing that an able, technical petroleum specialist can save his salary many times over by reducing wastes of lubricants, loss of time, and cost of upkeep of rolling stock.

Such a job should include direct charge of the oil

house or oil room. When necessary, a capable corps of assistants should be available in order that prompt deliveries and accurate records can be maintained. All lubricants should be issued on requisition only, signed by the foreman in charge of each phase of operation and maintenance, and should never be issued in excessive quantities, since this has been found conducive to waste in application, through careless handling.

Monthly oil records are of decided value and should be prepared by the lubricating staff and submitted regularly to the executives. By showing inventory of stocks on hand, and records of the amount of each lubricant used throughout the system, abnormal usage can be checked up without delay and steps taken, if necessary, to bring about correction.

#### CARE AND HANDLING OF CONTAINERS

Unnecessary dropping of wood barrels will tend to promote leakage at the seams by springing staves or heads. Hence, it is best practice always to use some form of portable elevator onto which the container can be rolled and then raised to the level of either the storage rack or top of the storage tank.

Storage racks for barrels and drums, if used instead of main storage tanks, should be built of steel and in such a manner that individual containers may be removed independently as desired. Barrels of heavier compounds especially should always be stored in the oil house. Otherwise excessive cold may render emptying a difficult and tedious matter.

Both barrels and drums should be stored on the side or bilge with the bung down. It is usually inadvisable to use wood barrels for lengthy storage of high-grade lubricating oils, on account of the possibility of contamination or loss from leakage or evaporation.

In handling wood barrels it must be remembered that these latter have an appreciable salvage value, and in good condition they are returnable to the oil marketers or are in demand by cooperage firms. Care should therefore be taken to prevent damage while in the hands of the buyer.

Holes should never be bored in the heads for outlet of oil or inlet of air. A bung hole should never be reamed out since this will require the use of an odd-sized bung for the next shipment, thereby decreasing the value of the empty barrel. Likewise, a bung should never be driven entirely into a barrel as this may cause the bung stave to split, and entail the possibility of particles of glue or wood being jarred into the oil to contaminate it and cause serious trouble in subsequent lubrication.

Careful handling of wood barrels will not only result in the highest value from a resale point of view, but will insure that the lubricating oils will be in fit condition to meet requirements. Bungs should, therefore, be removed by a chisel or bung pick, after tapping the bung stave lightly with a wooden mallet or bung starter.

Empty barrels should be given the same consideration as filled barrels, to prevent damage and insure the receipt of the highest price when they are sold. Wood barrels, when empty, will always be subject to warping of the staves and heads if stored on end or if exposed to the weather. This will be prevalent especially if water is allowed to collect on the heads, or where the barrels are exposed alternately to the effects of the sun and excessive dampness. A wood barrel head will split and warp readily in such a case, causing the glue to loosen and necessitating complete reconditioning of the barrel before it can again be used.



# Washington Cars Embody New Color Scheme

Wisconsin Avenue Line Now Has Fifteen de Luxe Cars for One-Man Operation—No Expense Has Been Spared in Making These Units the Last Word in Modern Car Construction



Some Time Ago the Railway Officials Promised to Bring About an Improvement in Service. These New Cars Are Visible Evidence that Their Efforts Have Borne Fruit

**F**ULFILLING a pledge made by W. F. Ham, president of the Washington Railway & Electric Company, to render a "real street railway service" to the citizens in the area served by the Wisconsin Avenue line, fifteen new de luxe street cars have just been placed in service over that route. This has been done in spite of the fact that the Wisconsin Avenue line has never proved to be a profitable one. It is anticipated, however, that the high type of service which the new cars will render will attract increased patronage.

Many attractive features mark the new equipment, not the least of which is the new cream and blue color scheme which has been adopted in decorating the Wisconsin Avenue cars. It is doubtful if any citizen of Washington could be unaware of the passage of one of these new cars down the street, as their cream painting surmounted with an encircling band of royal blue on the exterior makes a very striking sight. In this respect the cars are similar to the Air Line coaches the company is now operating on Rhode Island Avenue.

Built by the J. G. Brill Company of Philadelphia, at a cost of \$15,366 each, the cars lack nothing in appearance or in comfort from the standpoint of the passengers. The interiors are finished in natural cherry, with white enamel and Quaker gray trim, and seem to radiate an air of cheery comfort. The broad, deep seats are of genuine leather equipped with cushion springs, providing

comfortable riding space for two persons, while the aisle of the car is wide and easy of passage. The floor is covered with attractive rubber tiles in soft browns and reds, presenting a safe and comfortable footing for passengers and of an attractive appearance. The rubber tiling serves the further purpose of deadening truck and body noises and may be cleaned easily.

The cars seat 49 passengers and are equipped with semi-rigid handholds with brown enamel grip, to accommodate additional standing passengers. Ventilation of the cars has had very careful attention by the company engineers. Eight automatic exhaust suction type ventilators furnished by the Railway Utility Company have been installed to insure a full passage of clean air at all times. In winter the cars are heated with individual automatic heaters placed under each seat, and the mean temperature of the interior is regulated by thermostatic control.

Practically every type of safety device has been incorporated in these cars with a view to demonstrating that one-man operation is fully as safe and feasible as two-man operation. In fact, the Washington Railway & Electric Company was confronted with a storm of criticism some time ago directed at its one-man cars which were then in operation in the capital, and at that time the company offered to substitute fifteen of these latest type one-man cars in place of a similar

number then in operation. Thoroughly to convince the public of the efficacy of the new equipment, a souvenir leaflet was issued to all persons riding on the cars. This booklet, entitled "The Cream and Blue," thoroughly describes the construction and enumerates the advantages of the new cars and further goes on to emphasize the proper manner to board and leave the cars. It is the belief of the management that antipathy toward one-man cars is largely due to ignorance concerning their advantages and characteristics, and this ignorance the

there being thirteen lamps placed in the interior and on the platforms, the latter providing a well-lighted space when entering and leaving the car, while an additional lamp is placed on the exterior of the cars at the doors to light up the step and additional roadway space when alighting at night. The latter feature is of considerable importance where vehicular traffic is heavy, since the light provides both a warning to passing motor cars and an aid to car riders.

The induction into service of the new cars is made coincident with the completion of the new trackwork on Wisconsin Avenue by the railway. This work covered the complete rehabilitation of the tracks on this avenue and entailed an expenditure totaling \$285,000. The new equipment, costing approximately \$231,000, added to the track rehabilitation costs represented a total outlay of \$516,000.

The principal specifications on the fifteen new cars are shown in the accompanying table.



No Lack of Attention to Detail Occurred in Designing the Interior Fittings

company has attempted to dispel by efficient publicity on the subject.

In addition to dead-man control, which is practically standard on modern one-man cars today, the new Wisconsin Avenue units are equipped with Westinghouse variable load brakes which automatically maintain an even braking effort regardless of the passenger load.

Wide, large doors permit of easy access at the front entrance of the car and provide an exit at the rear end through the operation of the automatic treadle which is used to operate the rear exit. Considerable emphasis has been placed upon the matter of front entrance and rear exit by the company, and it appears that the riding public is gradually becoming educated to this plan. The front doors are automatically controlled from the operator's valve handle.

The cars are provided with brilliant illumination,

### \$12,654,135 in St. Louis Savings & Loan Deposits

REPORTS of the Savings and Loan Association affiliated with the United Railways, St. Louis, Mo., indicate continued activity during the year 1925, encouraging thrift and promoting home owning among the employees of the railway.

Real estate loans to the number of 285 were made to members to buy or build homes, this being at the rate of a loan a day, 5½ days a week.

Cash receipts of the association for the year were \$2,476,646, or at the rate of \$8,659 a day.

During the eleven years since its organization the association has received and handled deposits from its members aggregating \$12,654,135.

It has financed the building or purchase of 1,017 homes by loans, aggregating \$5,297,730; 659 of these loans, aggregating \$1,664,048, or 31½ per cent of the total, have been paid off (notwithstanding employees are allowed 140 monthly installments or nearly twelve years to pay off, if they desire), leaving 1,258 loans, aggregating \$3,633,682, still in process of payment.

The membership is now 5,662 (a net increase of 233 over a year ago); the assets, \$3,660,575, with a contingent fund reserve of \$156,354.

Dividends of 6 per cent compounded semi-annually amounting to \$651,927 have been paid to members since organization, of which \$165,413 was paid during the year 1925.

The authorized capital stock of the association is \$10,000,000, represented by 50,000 shares at \$200 each, of which there were outstanding on Dec. 31, 1925, 48,199 shares of a par value of \$9,639,800.

#### PRINCIPAL SPECIFICATIONS OF WASHINGTON'S NEW CARS

Date order was placed.....	Feb. 17, 1926	Air brakes.....	Westinghouse Traction Brake Co.	Heater equipment.....	Railway Utility
Date of delivery.....	June 1 to 15, 1926	Axles.....	Hammered steel, annealed	Headlights.....	Crouse-Hinds WDF
Seating capacity.....	49	Bumpers.....	Anti-climber with pull socket	Lightning arresters.....	General Electric
Weights:		Car signal system.....	Faraday	Motors.....	GE 265-A, outside hung
Trucks.....	11,500 lb.	Car trimmings.....	Statuary bronze	Paint.....	Hildreth
Total.....	40,200 lb.	Center and side bearings.....	Brill	Registers.....	International
Bolster centers.....	19 ft. 0 in.	Conduits and junction boxes.....	Cable boxes	Sanders.....	Ohio Brass
Length over all.....	42 ft. 3 in.	Control.....	K-31	Sash fixtures.....	Curtain Supply Co.
Truck wheelbase.....	4 ft. 10 in.	Curtain fixtures.....	Curtain Supply No. 88	Seats.....	Brill 201-E
Width over all.....	8 ft. 8 in.	Curtain material.....	Pantastote, double faced	Seating material.....	Brown leather
Height, rail to trolley base.....	11 ft. 8½ in.	Destination signs.....	Keystone	Springs.....	Brill
Body.....	Semi-steel	Door mechanism.....	National Pneumatic	Step treads.....	Brill
Interior trim.....	Natural cherry	Fare boxes.....	Cleveland	Trucks.....	Brill 76-E-1
Headlining.....	Agasote	Fenders.....	Providence	Ventilators.....	Railway Utility
Roof.....	Monitor	Hand brakes.....	Peacock staffless	Wheels.....	Davis cast steel, 30 in.

# Stockholm-Göteborg Electrification Recently Completed

This Is the Most Important Railway in Sweden and Has Been Equipped with the 16½-Cycle, Single-Phase System—Power Is Taken from Existing 50-Cycle, Three-Phase Circuits and Transformed for Railway Use in Substations—Crankshaft Locomotives Are Used

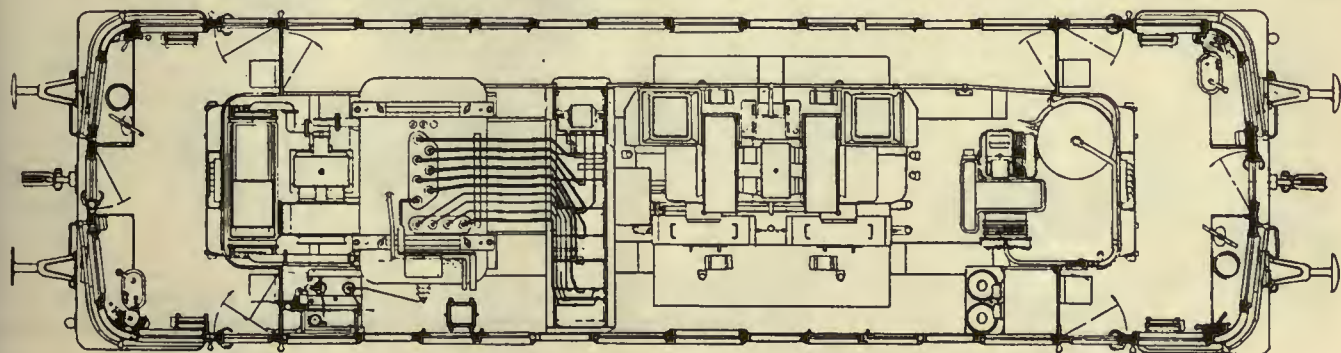
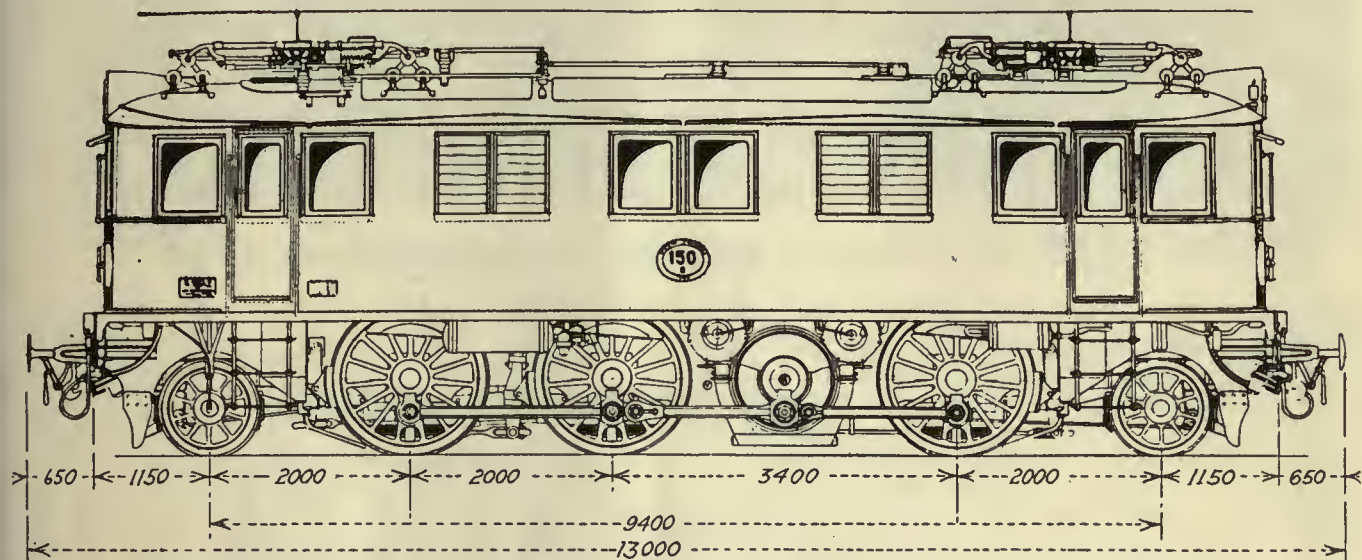
*By Dr. F. Neithammer*  
Prague, Czechoslovakia

**E**LECTRIFIED railway service between Stockholm and Göteborg, the two largest cities in Sweden, began operation the end of May, 1926, and I had an opportunity to study it thoroughly in June. This railway electrified a length of 458 km. (284 miles) with a ruling grade of only 1 per cent and a minimum curve radius of 500 meters (1,640 ft.).

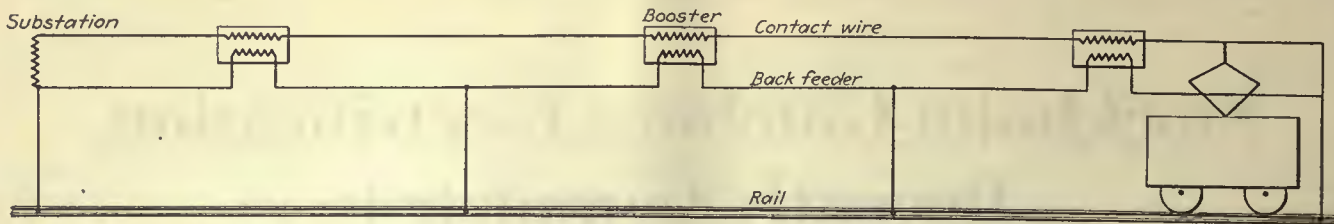
Power is obtained from hydro-electric stations at Trollhättan, Lilla Edet, Alvkarleby and Motala and from a steam station at Västerås. These are existing three-phase, 50-cycle stations distributing power for general commercial use over high-tension lines and are under the direction of the Royal Water Power Board. Energy from them is delivered at 50,000, 70,000 and

130,000 volts to railway substations, of which there are five between Stockholm and Göteborg. Here the electrical energy is converted by motor-generators to 3,000-volt, 16½-cycle, single-phase current which is stepped up for the trolley contact line to 15,000 volts. Two of these substations are equipped with three of these frequency changer sets, consisting of a motor rated 3,200 kw. at 70 per cent power factor, a single-phase generator of 2,400 kw. at 80 per cent power factor to stand heavy overloads and a static oil transformer of 2,400 kw. at 80 per cent power factor. The three other substations contain only two sets of the same size.

These sets, built by the ASEA-Västerås, have only



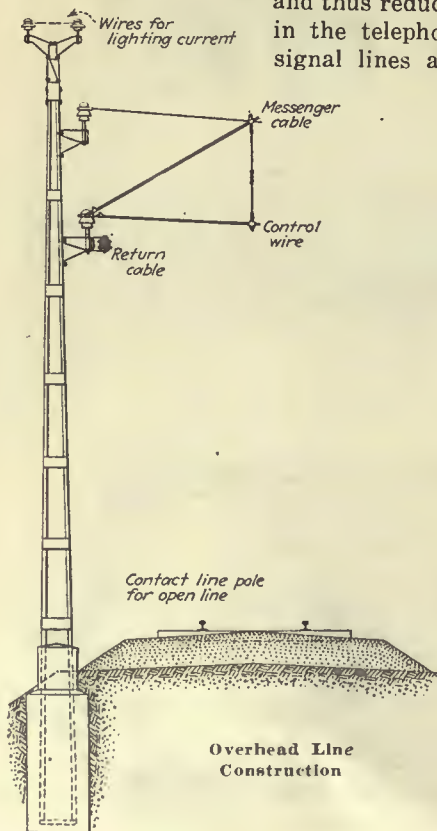
Standard 1,700-Hp., Single-Phase Locomotive, Göteborg-Stockholm Railway



Wiring Diagram Showing Use of Boosters for Equalizing Drop in Return Circuit

two bearings and possess a combined efficiency at full load as high as 87 per cent. The 50-cycle, three-phase machine has exactly the same outside dimensions as the single-phase, 16 $\frac{2}{3}$ -cycle machine, as shown in the substation plan, which gives the unit an excellent appearance. Possibly the single-armature Bergmann frequency changer with a single rotating field for 50 and 16 $\frac{2}{3}$  periods would be even more advantageous.

Catenary construction is used, with side brackets and hinged pull-offs for the contact wire, as shown in one of the illustrations. The catenary is fitted with counterweight adjustment. A lighting line is carried on the top of the pole, and further down is an insulated return wire which is connected to boosters or suction transformers and to the rails as shown in the wiring diagram. These connections to the rails are made alternately at distances of 1.4 or 2.8 km. to each rail and no rail bonds are used. These boosters equalize the voltage drop in the rails and thus reduce any disturbances in the telephone, telegraph and signal lines along the right-of-



Map Showing Electrified Line, Generating Station and Substations

way. As a further precaution, 25 pairs of telephone and telegraph wires have been combined in a cable which has been laid underground.

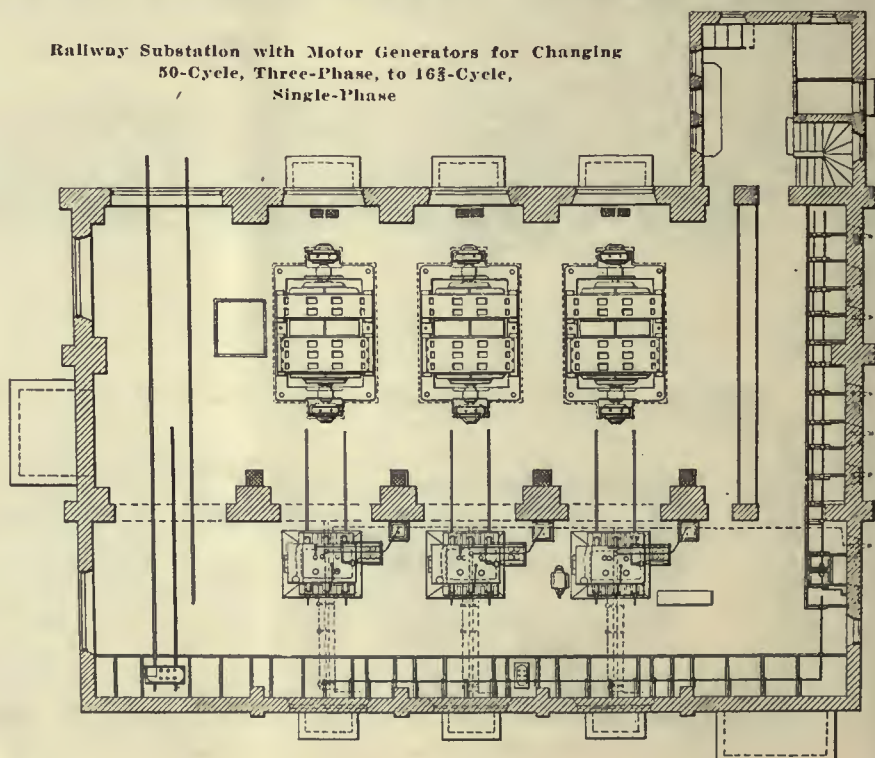
LOCOMOTIVE EQUIPMENT

The locomotive equipment for the new electrified line consists of 50 ASEA units of the 1-C-1 type. Each has a total weight of 79.5 metric tons with a weight of 51 tons on drivers, and a capacity of 1,700 hp. The maximum speed is 90 km. (56 miles) per hour. The motor equipment

consists of one pair of twin motors, geared to a jackshaft which drives the three axles by connecting rods as shown in the accompanying drawing. Tests with this simple method of drive show that a much greater train load is required to slip the wheels than with individual axle drive. The motors are of the straight series type with forced ventilation. The freight locomotives are identical in design with the passenger locomotives except that a different gear ratio is used.

The main transformer on the locomotive is of 1,490 kva. capacity. It is of the shell type with oil insulation and ventilated oil cooler, and reduces the voltage

Railway Substation with Motor Generators for Changing 50-Cycle, Three-Phase, to 16 $\frac{2}{3}$ -Cycle, Single-Phase



from 15,000 for the driving motors. Taps are provided giving from 168 volts to 840 volts for the main motors and 215, plus or minus 10 per cent, for the auxiliary motors. Multiple-unit control for the motors is obtained with electromagnetic contactors operated from a storage battery. I was informed while in Sweden that these single-phase locomotives cost no more than would have been charged for a corresponding number of 3,000-volt d.c. locomotives of the same capacity.

DEPARTURES FROM PRIOR SWEDISH PRACTICE

In taking electric energy for the operation of the line from existing stations the railway authorities have departed from the principle followed on the Riksgräns Railway in the north of Sweden, which has its own power station. While results from this railway have been good, a notable reduction in capital cost follows the use of existing stations, and there is no reason to expect anything but satisfactory results. The station load factor is much better when the power is taken from central stations, and the load variation from rail-

## Experimental Car at Glasgow Follows American Design

Single-Deck, Double-Truck Car Is Equipped with Four Motors to Give Increased Speed and Combat Bus Competition

INCREASING pressure of bus competition, begun about two years ago, has led the Glasgow Corporation Tramways management to make several experimental departures from its usual practices. For years the four-wheeled, double-deck, top-covered car has been standard with practically no modifications. Recently, however, a single-deck, double-truck car has been built and three of the ordinary four-wheeled, double-deck cars have been equipped with different types of trucks and motors.

In the early days of electric traction in Glasgow a few single-deck cars, of a type now quite obsolete, were tried, but failed to meet with much public favor. Moreover, the double-decker had the advantage of being able



Many Features Characteristic of American Electric Railway Practice Are Embodied in the Design of This New Single-Deck Car of the Glasgow Corporation Tramways. At Right, Arrangement of Equipment on the Platform Follows the Usual American Practice

way operation has no disturbing effect on the rest of the output. In fact, the use of the synchronous machines in the railway substations should have a very favorable influence on the power factor of the general distribution system and may bring it up to about 90 per cent. This alone produces an advantage that should have great appeal to central station companies.

A gain of this kind has been found to follow the use of motor-generators for commercial service in Stockholm and Göteborg, in which cities three-phase current is changed to direct current for general distribution.

The Swedish Railway electrification seems to represent the most economical plan to follow in such installations where the single-phase system of distribution has been selected. From observation it does not appear to be materially inferior to the best direct-current electrification. Of course, factors may develop through the maintenance angle that will take some years to determine and which may prove to be important considerations.

The Norwegian railways use the same electric system for the operation of the railways of that country as that in Sweden.

to seat more people, and thus came into general use. The advent of the bus, however, has somewhat changed public taste in this matter, as many of the buses running into and out of Glasgow are single-deckers, and it has been decided to make a new trial of the merits of the single-deck tram car.

Features characteristic of American practices are found in the new car. General dimensions are as follows:

	Ft.	In.
Length over bumpers .....	32	6
Body length .....	22	6
Body width over all .....	7	2
Body width inside .....	6	10½
Body height inside .....	6	10½
Platform length .....	4	9
Bogie centers .....	13	0
Bogie wheelbase .....	5	4
Wheel diameter .....	2	2

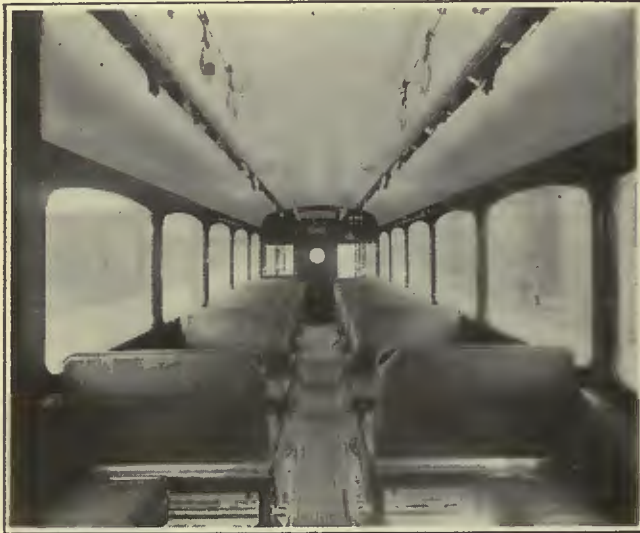
The car is equipped with Brill 77-E trucks and four G.E. motors of 25 hp. each. It is anticipated that more rapid acceleration and greater speed will be obtained than in the case of the ordinary single-truck car.

Besides the usual hand brakes, the car is equipped

with air brakes and one electro-magnetic brake. Power braking is rather a novelty for tram cars in Glasgow. Air brake equipment was supplied by the Westinghouse Brake & Saxby Signal Company, Ltd. In connection with the electro-magnetic brake, one pair of Metropolitan-Vickers 25-E magnets is fitted to each truck. There are four sand ejectors, two being operated by compressed air and two by pedal motion.

#### LUXURIOUSLY FINISHED INTERIORS ARE PROVIDED

Seats are provided for 36 passengers, of whom 24 are accommodated on cross-seats and the remainder on longitudinal seats at the ends. This arrangement allows standing room for about twelve passengers. In contrast to the bare wooden seats hitherto used, the new car has spring cushion seats upholstered in leather. The



Cross-Seats with Spring Cushions Upholstered in Leather Are an Innovation in the Design of Tram Cars in Glasgow

introduction of transverse seating is also new, as the longitudinal seat has hitherto been the rule in the lower saloon of double-deck cars, though cross-seats are employed on the upper decks.

Platforms are provided with double exits, the passengers entering at the rear and leaving by the front, or *vice versa*, whichever system is found to be the more efficient. This feature should give a much higher average speed. It is one of the great drawbacks of the ordinary double-deck British car that the passengers have both to enter and leave at the rear, thus greatly increasing the duration of stops. All exits of the experimental car are equipped with doors and folding steps. It will thus be seen that the designer has uppermost in his mind making the new equipment generally adaptable.

#### EXPERIMENTS WITH OLDER EQUIPMENT

In connection with the other experiments, three standard double-deck cars have been slightly altered and equipped with different types of trucks and motors. Car No. 15 has had its underframe lengthened in order to accommodate a pair of Brill maximum traction trucks, type 39E. The driving wheels are of 26-in. and the pony wheels of 21-in. diameter. The motors are Metropolitan-Vickers No. 101-BR, of the lightweight, ventilated type. The trucks are equipped with electro-magnetic track brakes and there is also a complete air brake installation. The car seats 61 passengers,

38 on the upper deck and 23 on the lower. Longitudinal seats in the lower saloon have been removed and cross-seats substituted. The standard bodies are not wide enough to accommodate two passengers abreast on each side and the central aisle, so single seats are fitted on one side. There is, however, only one seat less than with the former arrangement. All seats are upholstered with air cushions.

Car No. 16 has been reconstructed and is now mounted on E.M.R. pivotal trucks. B.T.H. 502 motors and electro-magnetic track brakes are included in the equipment. The heating arrangement is similar to that of Car 15. Car No. 17 is being mounted on Brill 70E1 swing link trucks, with a wheelbase of 8 ft. and a wheel diameter of 26 in. Metropolitan-Vickers 101-BR motors are being fitted, as also are air brakes. Upholstered cross-seats are used on both decks.

One general disadvantage of the single-deck car, in the opinion of the Glasgow management, is that it has not sufficient seating capacity. The number of seats is little more than half that of the ordinary double-decker. It seems probable, therefore, that the ultimate decision of the Tramway Committee will be to utilize the double-deck rolling stock with larger motors and either with longer single trucks or with double trucks.

#### Duralumin Tokens Prove Popular

FOR a number of years the Union Street Railway, New Bedford, Mass., has sold 21 metal tickets for \$1, the cash fare being 5 cents. At first paper tickets were used, but later, when Rooke automatic registers were introduced, these were replaced by metal tickets about the size of a 5-cent piece. In 1920 the unit of fare was set at 5 cents for a ride from either end of the city to the traffic center. There has been no fare increase since that date and metal tickets are still sold at the same rate. These metal tickets were replaced in 1922 by a light-weight, duralumin token. Front-page newspaper advertisements were used to promote the sale of tokens and in the spring of 1924 the company established selling agencies for these tickets at neighborhood drug stores. Previous to this, it was necessary for the purchaser to go to the ticket office in the center of the city. At no time have these reduced rate tickets been sold by the conductors on the cars.

Results attained under these various conditions are shown in the following table:

TOKEN USE ON UNION STREET RAILWAY			
Years	Number of Metal Tickets Sold	Ratio of Metal Tickets to Gross Receipts, Per Cent	Per Cent Increase in Sale of Metal Tickets Since 1920
1920.....	538,382	1.89	.....
1921.....	670,087	2.56	24.4
1922.....	1,187,299	4.37	120.5
1923.....	1,774,425	6.41	229.5
1924.....	1,783,587	7.16	231.2
1925.....	1,835,627	7.37	241.1

While the gross receipts have slightly decreased since 1923, due to local mill depressions, the use of metal tickets has steadily increased, although the amount of saving made by metal ticket users was only 5 per cent. Use of metal tickets as ready fares has speeded up fare collections and has supplied the company with advanced revenue prior to the time that the tickets are used as fares. The company believes, also, that one of the benefits of metal tickets is that a person in possession of these tickets, already paid for, will ride much more frequently than one who has to pay a cash fare.

# Maintenance Notes

## Undersize Armature Bearings Reclaimed

BY THE adoption of a method for building up the worn external surface of armature bearings the New York Railways has been able to

chemical composition as the bearings. They are turned to the standard outside diameter and the inside re-babbitted. The larger internal diameter is compensated by a thicker babbitt wall for the bearing surface. By use of this plan of salvage

trusses and gussets were used to aid in supporting the heavy 201-G motors. Two of these motors were mounted on each truck, each motor being rated at 5 hp. The trusses and gussets used were sufficient to strengthen the trucks for the heavier load.



New York Railways Rebuilds Its Worn Armature Bearings

Armature bearing on the left is one with a worn external surface. Next is a similar worn bearing which has been split, spread and is ready for welding.

Next is a bearing which has had the split welded. At the right is a welded bearing which has been turned and is ready for re-babbitting.

reclaim practically all worn bearings and, as a result, effected a very appreciable saving in armature bearing maintenance.

Bearings which show abnormal wear on the outer surface or are undersize are split longitudinally and spread such an amount as will permit of obtaining the proper outside diameter. The spreading is done cold by means of hard wood or steel wedges.

The opening left in the bearings after spreading is electrically welded with a bronze rod of about the same

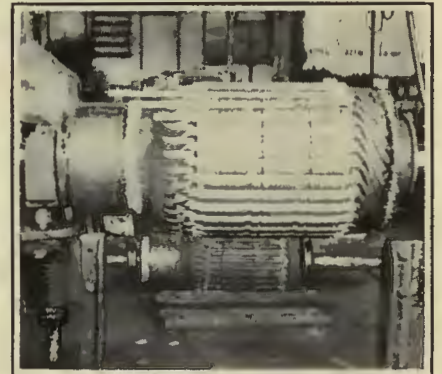
for worn bearings at least double life has been obtained.

## Reinforcing Trucks for Heavy Duty

DESIRING to prepare a number of motor cars for operation with trailers the Portland Railroad, Portland, Me., found it necessary to reinforce the old 27 E-1 trucks with which the cars were equipped so that they would stand up under the heavier duty. As indicated in the accompanying illustration, both

## Wood Strip Prevents Injury to Armature Coils

WHERE the insulation of armature coils is unprotected and exposed to foreign material after re-winding it is very often punctured or damaged in transportation or handling. To decrease this possibility the New York Railways is installing a hard wood strip on top of



Hard Wood Strips in Place and Partly in Place on Top of Coil in Armature Core Slots

each coil under the banding wire. This strip has not only practically eliminated mechanical injury to the coils during handling, shipment and installation in field frames but it has served as a protective shield to the coils in case the armature revolved on the pole faces or a banding wire becomes loosened. On account of the protective features of these strips the armature maintenance costs have been materially reduced.

## Bus Stop Signs from Trolley Poles

A PRACTICAL way of making use of old trolley poles has been hit upon by the Springfield Street Railway, Springfield, Mass. Needing a number of bus stop signs it was decided to trim several old poles to a



Gussets and Trusses Were Used in Reinforcing These Trucks



One of Springfield's New Bus Stop Signs

uniform length and then to weld oval sheets of metal to their upper extremities. Poles and signs were then given a coat of paint, after which the words "Bus Stop" were painted upon the metal background. The lettering is black upon a yellow background, thus making a striking appearance.



A Number of the Signs Which Were Made from Reclaimed Material

## Dick Prescott Stops a Makeshift Job

And Embitters an Enemy



**B**Y SOME of those peculiar combinations of chance which often bring about critical moments in men's lives, Dick Prescott, newly appointed assistant superintendent in the shops of the Consolidated Railway & Light Company, found himself frequently crossing the path of Pete Welcher, disaffected and envious shop inspector. Although Dick knew nothing of Pete's avowed determination to "show him up," there had on several occasions been something in the inspector's attitude and general demeanor that had raised a faint question in Dick's mind. He had, however, dismissed it without giving the subject much thought.

Pete was something of a mechanic. He loved to indulge a hobby of tinkering in the shop instead of attending to his work of checking up on repairs. Under the old shop management he had acquired some little reputation for inventiveness. This particularly pleased his vanity and gave him, he thought, a certain prestige in the eyes of the men. Though some of his products were crude substitutes for more efficient shop equipment sold by accredited manufacturers, they had been better than nothing and were used in various shop departments.

On one of his regular trips through the shop, Dick Prescott chanced to come on the inspector busily engaged in a corner of the machine shop.

"Hello, Pete," said Dick pleasantly, "what are you working on here?"

"Fixing up a commutator milling outfit," replied the inspector with an air of importance, pointing to an old lathe bed on which he had mounted some crude parts made in the blacksmith shop.

"Don't we have a commutator miller?" queried Dick, suddenly interested.

"Oh, yes, there's an old one in the armature room that I fixed up several years ago, but it ain't much good. This old lathe bed is just the thing we've needed right along."

"Well, if we need a new machine why don't we put in a requisition for one that's really designed for the job instead of wasting time and money trying to improvise one?" asked Dick.

"We're not wastin' money," exclaimed Steve sharply. "I can make one a whole lot cheaper than we can buy it and, besides, the only way we can get anything that we need around here is to make it."

"I can't quite see that," replied Dick. "In the first place you can't afford to be spending time away from your work doing this sort of thing. We're trying to get that pull-in record down, and the only way we're going to succeed is to have a check up on every job that goes through. It's far cheaper and better to buy a first-class machine than for you to putter around trying to make one. I'll see Bert Smith, the armature room foreman, and if we need a new miller, he can make out a requisition for one. The management understands that efficient tools are necessary to produce satisfactory work and keep down costs. You ought to be checking up on cars going through the shop instead of fooling with this."

Pete watched Dick as he walked toward the armature room. Then he slowly began to collect his tools, conscious that near-by workmen had overheard enough of the conversation to understand its import. With flushed face and averted eyes he finally left the machine shop, internally burning with rage and hatred.



## New Equipment Available

### Hall-Scott Motor Used in "a.c.f." Six-Cylinder Bus

MUCH wider springs than have heretofore been customary practice have been incorporated into the design of the "a.c.f." coach, which was recently announced by the American Car & Foundry Motors Company of New York. In addition to being wider the springs are built with a fewer number of leaves and are so designed as to be flat under load for the maximum of easy riding. This effect is heightened by the unusual length of the spring, the front spring being 49 in. x 4 in., and the rear spring 64 in. x 5 in. This extreme

230 in., over-all length 357 in., tread, front, 70 $\frac{3}{4}$  in., rear, 78 in., over-all width 96 in. The frame is of heat treated pressed steel, fish belly type, with a maximum depth of 11 in., tapering to 6 in. at the front and rear. It is stepped up over the front axle and arched over the rear axle, and has a 3-in. flange through the entire length.

The power plant is the standard six-cylinder Hall-Scott engine, with 4 $\frac{1}{2}$ -in. bore and 5-in. stroke. This engine is capable of developing more than 90 b.hp. at a governed speed of 1,750 r.p.m. The lubricating system of the engine is provided with a filter and a means of removing the con-



Easy Riding Qualities of This Six-Cylinder "a.c.f." Bus Are Enhanced by Long Springs

length gives a very slow period of vibration and the periods of the front and the rear are as far apart as possible, so that the vibrations of one set of springs will not build up in the other and cause a galloping effect.

Several models of the "a.c.f." coach are now on the market. Standard body designs are as follows: 29-passenger standard car type, 26-passenger parlor car, 29-passenger urban parlor car, 22-passenger intercity or sedan type and 56-passenger double-deck.

The bus is an entirely new one, although it has been developed along lines suggested by experience which the American Car & Foundry Motors Company's engineers have had in the manufacture of other buses, and after a careful study of bus operating requirements throughout the country. The general chassis dimensions are as follows: Wheelbase

densed moisture and fuel dilution so that the crankcase oil does not need to be changed until it begins to break down.

Particular care was exercised in the design of the axles. The front axle is a special "a.c.f." Timken design, reinforced to withstand the strain imposed by the front wheel brakes. It is of the I-beam drop center type, with straight thrust roller bearings in the steering spindles and opposed Timken tapering roller bearings in the wheel hubs. The springs are carried on top of the I-beam.

The rear axle was built by Timken Roller Bearing Company on a design which was developed by the American Car & Foundry engineers. It is of the underslung worm type with the worm mounted between Timken tapered roller bearings, with a Hyatt roller bearing on the shaft.

The springs are mounted beneath the rear axle.

Westinghouse steel shoe air brakes are standard equipment on all models. On the single-deck model these operate on the rear wheels only, with 16 $\frac{1}{2}$ -in. x 6-in. hardened steel drums. On the double-deck and gas-electric models Westinghouse air brakes are also provided on the front wheels, working in conjunction with the rear wheel brakes. The single-deck mechanically driven models are equipped with emergency brakes on the front wheels, these being of the Bendix three-shoe type operating in 16 $\frac{1}{2}$ -in. x 3-in. drums.

With the exception of the axle, the chassis is lubricated by the one-shot system with feed lines to all main lubricating points on the engine, clutch, drive line, spring ends and brake mechanism located on the frame. Lubricating points on the axles are equipped for the Zerk high pressure system.

Body framing consists of selected straight grain hard wood paneled with Plymetl. Upholstery is in genuine leather, the woodwork is mahogany, the trimmings nickel, and the exterior finish is Pyroxalin enamel. All models are lighted by means of a 12-volt electrical system, employing two three-cell batteries. Standard equipment includes ventilators and heaters, illuminated destination signs, bumpers, buzzer systems and emergency stop signals.

### Low Pressure Tires Are Standard on White Six-Cylinder Bus

SAID to be the first bus to be designed completely from the ground up for the application of ballon tires and four-wheel metal-to-metal air brakes, the six-cylinder model 54 chassis has been placed on the market by the White Company. The chassis is intended for 18 to 29-passenger bodies and deliveries will start early in April, it is expected. From now on the company will manufacture a line of four and six-cylinder chassis to meet all types of service demands.

As in the case of the other White bus models, the new six-cylinder unit is being built only as a single-deck bus.

The engine delivers 100 hp. at 1,900 r.p.m. The length over the various bodies, including bumpers, is just under 28 ft., the maximum allowed in several states. The width can be kept



This White Six Cylinder Model Was First Exhibited at the Cleveland Convention

the electrical indicating instruments for the two unit systems, consisting of a Leece-Neville 12-volt starting and lighting equipment with voltage regulator. The generator is rated at 30-amp. and the battery at 112 amp.-hr. at the 20-amp. rate.

Due to the use of low pressure tires as standard equipment a semi-center-point steering with inverted Ellicott type front axle has been adopted. The steering gear is of the Ross cam and lever type with a 16 to 1 reduction at the middle point. A device to prevent undue flexure or vibration at high speeds has been mounted on each end of both front springs. Front springs are 48 in. x 3 in., and the rear springs 64 in. x 4 in., the latter being of the two-stage type.

down within the 84-in. limit several of the southern states require, provided high pressure tires are used.

Efficiency and operating requirements have both been considered in working out the engine design. It is of 4 $\frac{3}{4}$ -in. bore and 5 $\frac{1}{4}$ -in. stroke, giving a total displacement of 519 cu.in. Cylinders are cast in a single block to get rigidity and quietness of operation. Two spark plugs are used in each cylinder. Valve construction is of the overhead type, the valves being operated by push rods from the camshaft along the right-hand side. It is, therefore, possible to remove the head and grind the valves without retiming.

A Stewart-Warner vacuum tank of large capacity is used to supply fuel and no difficulty is experienced in obtaining fuel even when operating over the steepest grades.

The exhaust valves of the engine are of the internally cooled type, the hollow stem being filled with a potassium nitrate which carries the heat from the head of the stem and guide. An ejector type exhaust manifold is used and has resulted in a decided increase in engine power. In this the passages from each cylinder head are arranged so that exhaust rushing from one cylinder helps that from the next. Cooling is by a centrifugal pump, with temperature control by thermostat placed in the water outlet between the engine and radiator. This consists of a cast aluminum shell with removable core.

Standardization on balloon tires for the model 54 has led to a slightly narrower frame, of high carbon steel, heat treated. The 46-gal. fuel tank is mounted in a cradle which is bolted to the outriggers so that the tank can be dropped down without disturbing the body. Another feature of help to the body builder is the location of clutch pedal and steering gear; both are outside the left-hand frame rail.

The clutch is of the two-plate dry disk type, air cooled, the central mem-

ber having impellers which give a positive circulation. From the clutch and four-speed transmission the drive is through a tubular shaft with three universal joints and S.K.F. center bearing to a spiral bevel rear axle. Normally this has a 4.5 to 1 reduction, although other ratios can be supplied to meet operating conditions. Transmission ratios are direct on high; 1.65 to 1 on third; 2.7 to 1 on second, and 5 to 1 on first, with a reverse ratio of 6.35 to 1.

Westinghouse air brakes of the metal-to-metal type are standard equipment and the chassis has been designed with their application in mind. The drums are high carbon steel and shoes of low carbon steel, the latter being of the one-piece type so that they can be thrown away when worn out. In addition to the automatic equalization of the air brakes, a slack adjustment is provided between the brake diaphragm and the cam. The compressor, which is of 6 cu.ft. per minute capacity, is directly lubricated from the engine and driven directly from the crankshaft.

The compact instrument board which was first developed for the model 53 bus chassis is a feature of the new unit. An air pressure gage for the brakes is included on the model 54 board. On the board are

## Mack "6" Has Made Its Debut

**M**ANY of the practices followed in the standard model AB Mack bus have been repeated in the new six-cylinder model AL unit, but it has been necessary to effect certain departures to allow for the additional power output of the six-cylinder engine. Among the mechanical features which come under this category are the engine, a single plate clutch and the relocation of the transmission to a point amidships, thereby effecting a better disposition of the weight and increasing the accessibility of both transmission and clutch.

In outward appearance the new model resembles the company's other parlor car type bus until the hood is reached. Here the physical aspect has been changed somewhat by a new windshield known as the "clear-vision" type and a new radiator. This latter unit, having individual fins and tubes, is built up from four castings; the top tank, the



Principles of Shock Insulation Have Been Further Applied In This Mack Six-Cylinder Bus

bottom tank and two side plates. Over these is placed the radiator shell of sheet metal.

The AL is being built in two models, the 29-passenger parlor car and the 29-passenger city type bus, the latter being also obtainable with gas-electric drive, the same as in the AB city type buses. The only dimensional difference between the parlor and city type models is an additional eight inches on the over-all length of the parlor car, making it 341 in.

The six-cylinder engine has a 4½-in. bore and a 5-in. stroke, which is identical with that of the AB model engine. It is rated at 97 hp. at 2,200 r.p.m. The cylinders are cast en bloc with the removable heads cast in pairs, insuring against distortion on the cylinder head. The pistons are of magnesium aluminum alloy of the constant clearance type, with wrist pins clamped in the connection rod and free to rock in bronze bushed piston bosses. Four main bearings having a diameter of 3½ in. are employed. Forced feed and splash lubrication is employed as in other Mack engines and a special oil filter is provided in connection therewith.

A single plate clutch has been used to obtain greater simplicity and to eliminate clutch rattle, a frequent fault with multiple disk clutches in heavy duty service. A cushioning effect between transmission and clutch is secured by a device known as a torque insulator. The purpose of this unit, which is made up of four rubber blocks, is partly to absorb the initial starting torque and reduce the resultant strain on the drive line.

It has for some time been standard Mack practice to use blocks of live rubber for insulating the various units from the frame. This method of mounting springs, radiator and steering column has been elaborated somewhat in the AL model so that the engine, transmission and gasoline tank are now also thus mounted. This practice of rubber mounting, or "shock insulating" as it is termed, is said to result in a vehicle which is remarkably free from road shocks, vibration and noises incident to propulsion.

The transmission, especially developed for this chassis, affords four speeds forward and the ratios are proportioned to harmonize with the characteristics of the engine on the one hand and those of the chassis on the other. The conventional three-rod arrangement ordinarily employed with admiship gear boxes is dispensed with in favor of a single

control rod. The reverse latch is released by depressing the control rod, no catches or buttons being used. The location of the transmission necessitates the use of one more universal joint than is employed in the AB model, consequently the drive line is equipped with five Spicer universals of the 500 series. Ball bearings are used throughout.

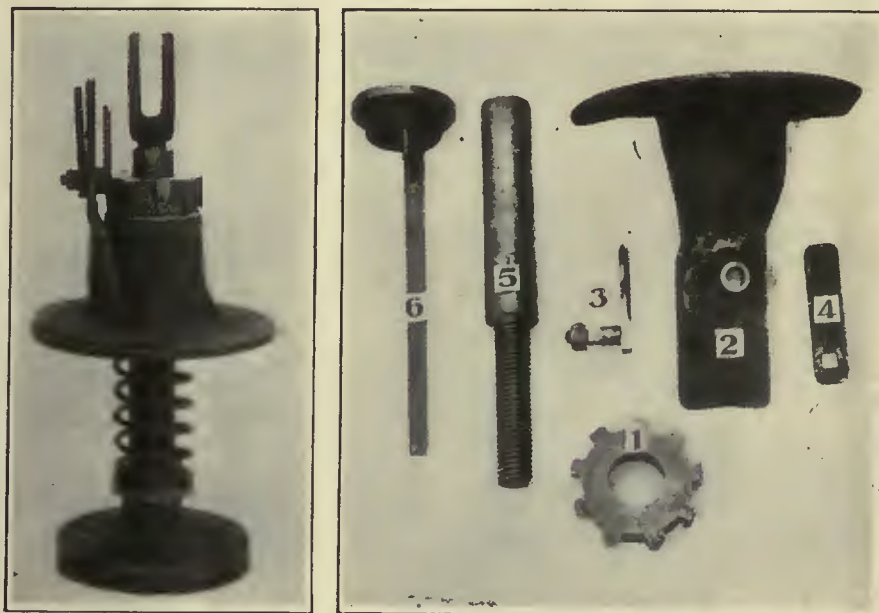
Springs are semi-elliptic throughout with 36½-in. x 2-in. auxiliary springs fitted to the rear springs to allow for variable loads. The frame is of pressed chrome-nickel steel, heat treated. The gasoline tank is mounted longitudinally along the left-hand side and has a capacity of 50 gal. Tires are 34 x 7 in. with duals on the rear wheels.

### Slack Adjuster Attached to Brake Cylinder

**F**OLLOWING a successful test extending over several months on a car of the Scioto Valley Traction Company, Columbus, Ohio, a type of

parts. In the details part No. 1 is a ratchet which is attached to the end of a hollow piston. The pawl for engaging this ratchet is supported by a bracket bolted to the non-pressure head of the brake cylinder. This is shown as No. 2 in the detailed parts. The pawl which engages the ratchet is No. 3, and in order to insure that the pawl will drop whenever the ratchet goes beyond it in application position a weight lever, No. 4, is provided. In release position the pawl engages the ratchet and turns the piston in the cylinder ¼ in., which makes the push rod ¼ in. longer.

A screw piston with an oblong hole for application to an oblong push rod is shown as detail No. 5. The push rod slides in this whenever the hand brakes are applied. The oblong portion fitting into an oblong hole holds the screw piston while the piston in the cylinder is turning ¼ in. in release position. A nut is bolted into the hollow piston to hold it when it is turned by the piston



At Left, Automatic Brake Slack Adjuster Assembled on Non-Pressure Head of Brake Cylinder. At Right, Detailed Parts—(1) Ratchet, (2) Supporting Bracket, (3) Pawl, (4) Weight Lever, (5) Screw Piston, (6) Washer with Key

brake slack adjuster invented by W. S. De Camp will be manufactured by the Deschler Machine Works, Chillicothe, Ohio. This slack adjuster is intended for fitting to the brake cylinder on the non-pressure head. Movement of the piston beyond a predetermined travel produces a turning movement through a ratchet and pawl to take up slack in the brake rigging.

Accompanying illustrations show the slack adjuster attached to the non-pressure head of the brake cylinder and also details of the various

parts. The screw piston has two double threads to an inch. A washer with a key is shown as detail No. 6. This washer and key boxes the release spring and keeps it from turning the piston back in the cylinder. The washer fits over the hollow piston and the key slides in a bushing in the non-pressure head. If the release spring bore firmly against the non-pressure head the desired turning would not result, but with the spring against the washer the necessary turning movement is provided.

# Association News & Discussions

## More Detailed Annual Reports Urged

**P**UBLICATION of more information upon property valuation, details of mortgages and franchises, etc., by utility companies and especially by holding companies in the utility field to secure a broader public market for their securities, is urged in the last report of the Public Service Securities Committee of the Investment Bankers Association of America. This report was presented at the annual convention of the association, held in Quebec, Oct. 11-15. The annual reports of some of the leading utilities are models, says the committee, and while lacking in some of the statistical operating figures which feature the railroad reports and while not yet standardized, they nevertheless give an excellent statement of the company's affairs in a form well suited for the general public. With the broadening market for utility securities, however, the report points out, there will arise, particularly from savings banks and other institutions accustomed to give closer and more detailed scrutiny to the selection of their investments than the average individual, an increasing demand for data on these securities.

In the present policy of the formation of large operating utility systems, based on geographic lines, the committee sees a condition corresponding to that of the formation of our large railroad systems many years ago. The continual increase in the distance over which electricity can be transmitted economically has made such grouping not only possible but profitable, and in such a period the public utility industry and its bankers are urged to avoid many of the mistakes made in the railroad history. The reward, in the opinion of the committee, will surely be sufficient if the utilities can avoid the burden of public antagonism under which the railroads have labored so long.

The committee sees in the plans of the state of Oregon to construct, acquire and operate a state-wide electric generation, transmission and distribution system a proposal contrary to the soundest economic and governmental principles. It will put the public utility business under the management of five board members, subject to political election and without the necessity of having any experience or qualification for running such a business enterprise and with a pledge of the credit of the state for all examinations.

The committee sees in the passage of laws by the states of Massachusetts, Connecticut and New Jersey admitting public utility bonds conforming to certain specified requirements as legal investments for savings banks a step of very considerable importance to the industry. Such legislation, it says, affords the banks a proper and wider field of selection for their investments

and makes available to a sound and essential industry large additional amounts of private capital. The committee points out, however, the practical difficulty of establishing any set rule by which to measure the safety or desirability of an investment security for any class of investors and urges that the restrictions be made not too narrow, but that the fullest extent possible be given to the institutions for the exercise of their own discretion and judgment. The committee declares the plan of the National Association of Railroad and Utilities Commissioners to secure the adoption of uniform state regulatory laws is desirable.

### West Virginians Hold Convention

**J.** D. WHITTEMORE, vice-president and general manager Monongahela West Penn Public Service Company, Fairmont, was elected president of the Public Utilities Association of West Virginia, which held its ninth annual convention at Charleston last week. Others elected as officers were: A. M. Hill, Charleston; C. S. Dawson, Charleston, and A. C. Spurr, Wheeling, vice-presidents; A. Bliss McCrum, Charleston, secretary; G. B. Moir, Charleston, treasurer, and J. W. Cummings, Charleston, assistant treasurer.

Instructive as well as educational addresses were presented at the closing session. Chief among the talks was that given by N. M. Argabrite of New York, vice-president of the Appalachian Electric Company.

Addresses given included the annual

talk by the president, W. R. Power of Huntington; Helen E. Steiner of Cleveland, chairman of the women's committee of the east central division, National Electric Light Association; George M. Chute, Jr., of Schenectady, N. Y.; A. M. Hill, vice-president and general manager of the Charleston Interurban Railroad and chairman of the bus division of the A.A.A., whose subject was "Transportation a Science"; D. L. Gaskill, Greenville, Ohio, secretary of the east central division of the National Electric Light Association, who spoke on "Public Relations, a Liability or an Asset," and former Governor E. F. Morgan, whose subject was "Citizenship."

At the annual banquet former Gov. W. A. MacCorkle was toastmaster and H. B. Flowers, president of the New Orleans Public Service, Inc., was the chief speaker.

"Advertising has been distinctly educational to the utilities as well as to their customers," delegates to the convention were told by Thomas D. Mays, president of the Mays-Williams Company, Inc., Charleston advertising agency.

A. M. Hill of Charleston spoke as follows, in part:

We are living today in a great transportation era, particularly in our own great country where our people seem to have an insatiable desire to be always going somewhere or returning and in a considerable hurry at that. The public wants frequent, complete, safe, comfortable and fast means of travel, and if it gets what it wants it will pay the price.

The story of the comeback staged by the electric railways is one in which fortitude, brains and nerve predominate, with fair-minded, open-handed salesmanship always in the foreground. A type of leadership was developed which tackled the problems confronting the industry according to new conceptions. They sold themselves on their jobs, then sold their employees, and finally went right to the people with their story and sold them too.

These men did not set their jaws and relentlessly fight the compelling advance of the motor bus. They were quick to recognize it as an ally if operated by them and a dangerous menace otherwise. Many companies have paid dearly for their early antagonism to the bus, but, I am glad to say, practically all of these have seen the error of their way and are turning their enemies into allies.

While the condition of the railways is improved, there is still much room for further improvement. Although operating economies have been introduced, there is the possibility of greater economy. Better employee co-operation and understanding have been brought about. We must continue to advertise frankly our story to the public. Above all else, we must constantly strive for better service to the public.

### COMING MEETINGS

OF

### *Electric Railway and Allied Associations*

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

**October 28**—New England Street Railway Club, regular meeting, Copley Plaza Hotel, Boston, Mass., 3:30 p.m.

**Nov. 5**—American Electric Railway Association, Metropolitan Section, Engineering Societies Building, New York City, 8 p. m.

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

**Nov. 17-18**—Iowa Electric Railway Association, operating and maintenance section, annual convention, Fontanelle Hotel, Omaha, Neb.

### New England Street Railway Club to Meet October 28

**E**LECTRIC welding as used in the Springfield and Worcester car shops will be discussed by W. L. Harwood, superintendent of equipment of these companies, at the next regular meeting of the New England Street Railway Club, Oct. 28. The afternoon session will convene at 3:30 p.m. at the Copley Plaza Hotel.

# The News of the Industry

## Chicago Council Acts

Committee Orders Ordinance Framed to Embody Features Proposed by Eastern Bankers—Local Traction Man Attacks Plan

Before Nov. 1 Chicago will have a new traction ordinance presented for its approval which embraces the plan affecting the city's street car system brought forward by F. J. Lisman, New York, and associates.

The City Council committee on local transportation on Oct. 15 voted its approval of the Lisman plan after many days of dramatic debate and ordered Corporation Counsel Francis X. Busch to start preparing the ordinance immediately. Up to this time conferences between the city and the New York bankers have been based on a skeleton draft of their proposal. When the new ordinance is completed it will be sent back to the main committee of the City Council without discussion.

Prior to the acceptance of the principal points of the Lisman plan by the sub-committee, Major R. F. Kelker, Jr., city engineer, presented an analysis showing that without an increase in fares it would be possible to amortize in 30 years the \$140,000,000 of first mortgage bonds proposed to be issued under the plan.

The enforced absence of several of the bankers and Surface Lines executives who are represented in the negotiations caused the postponement of the last scheduled conference of the Aldermen, the Surface Lines executives and local bankers. A report on the financial features upon which the new ordinance is to be based was to have been heard.

Perhaps the most pointed criticism against the Lisman plan was made by Leonard A. Busby, president of the Chicago City Railway, in a signed article recently appearing in the *Chicago Herald and Examiner*. Mr. Busby said in part:

The plan is expressly conditioned upon its acceptance by the present security holders. Unless they voluntarily accept the proposition, the plan fails. Yet the plan offers to the present first mortgage bondholders only 5 per cent interest, while the new money is to get 5½ per cent and be underwritten at 91.

Taking the bond interest into account, the proposition means that the car riders will pay on an average more than 6 per cent for the new money—an additional burden of \$500,000 for twenty years, as against financing on a plan whereby the money could be procured on a 5 per cent basis. The junior security holders are offered an average return of 3.6 per cent during the first five years, compared with the 5 per cent they are now receiving and a 5 per cent return thereafter.

The total amount to be paid the promoters under the Lisman plan is \$82,040,000, or an average of \$2,734,600 a year for 30 years. This will, of course, have to be paid by the car riders in addition to the \$7,500,000 a year required for sinking fund purposes in order to turn the property over to the city at the end of 30 years for \$1.

As Mr. Busby sees the Lisman plan, under it "the 20-year franchise is a bait to get control, if possible, of a sound business enterprise on a basis very profitable to the promoters."

## Further Data on St. Louis Transit Needs Revealed

Rapid transit needs of St. Louis, Mo., require an immediate expenditure of \$40,000,000 for the installation of five downtown subways, the erection of a three-story river-front structure to serve as a subway loop, storage grounds for street cars and a riverside driveway for automobiles, according to the final section of a report by C. E. Smith, consulting engineer for the city, and a special committee of the Board of Aldermen.

The second step in the development of rapid transit anticipates the extension of six radial subways from the downtown section half way to the city limits. The last step would carry the tubes or L lines to the city limits, or a total of 28 miles of rapid transit lines. Mr. Smith estimates that the complete rapid transit system can be built for \$100,000,000.

Three ways of financing the subways and other rapid transit improvements were suggested.

Pending construction of the subways the committee recommends that service be speeded up by the installation of express service by street car and local service by bus.

On the subject of buses the committee specifically criticized the unregulated operation of buses in St. Louis and deplored the hardship this works upon the street railway.

The committee also reported in favor of neutral zones for street cars on wide boulevards. It advised consideration of the skip-stop plan in vogue during the war period.

## Service to Argentine, Kan., Restored

Railway service over the Twelfth Street bridge into the Argentine district of Kansas City, Kan., was resumed on Oct. 14 by the Kansas City Public Service Company, pursuant to an order of Judge Kimbrough Stone in the federal court. The service was discontinued two years ago.

The line will be known as the Argentine-Twelfth Street line. The route is the same as that of the old Argentine line. Five-minute service is being given, beginning at 5:30 o'clock a.m.

Action of the new owners of the railway in restoring this service brought much favorable comment from the newspapers and citizens of the Argentine district and from the city commissioners of Kansas City, Kan.

## Boston "L" Insistent

Trustees Want New Subway Finance Plan—Company Unwilling to Operate Extensions if Fares Must Be Increased

Correspondence between the Mayor of Boston and the board of trustees of the Boston Elevated Railway, Boston, Mass., makes it appear that the city has reached its limit in subway and tunnel extensions under the plan of financing followed up to this point. If the position prevails which the trustees have taken in this new controversy the Elevated will not obligate itself to support alone the financing of any future extensions. The trustees suggest a plan to divide the burden among the taxpayers, real estate owners and car riders.

The issue between Mayor Nichols and the trustees was brought to a head over the continued failure of the Elevated to sign a lease for the use of a proposed subway under Governor Square, where traffic congestion has become very serious. The Elevated took the view that the congestion is caused by automobiles and that the cost of the remedy should not be placed upon those who ride in the Elevated cars; further, that the Elevated can no longer finance such extensions without increasing the car fares.

### CONCLUSIVE ANSWER CONTAINED IN COMPANY STATISTICS

Former Congressman Samuel L. Powers, chairman of the Elevated trustees, concluded a letter dated Oct. 14 to Mayor Nichols as follows:

In your letter you use the following language:

"Let me ask you a blunt question. Is it because your company is unwilling to undertake any further rapid transit extensions until the settlement of public control by the Legislature?"

I cannot but feel that the statistics I have given are a conclusive answer to your question. The question of extension of public control has nothing whatever to do with the attitude of the trustees relative to subway extensions.

We fully appreciate the effort you are making to improve transportation facilities in Metropolitan Boston, and it is the desire of the trustees to co-operate with you as far as they can consistent with their official duty as they see it. No one doubts that the extension of subways in certain localities would go a long way toward improving rapid transit facilities, and, as you say, such facilities are vital to the welfare of this community, but it is entirely evident that the extensions contemplated by you and by the Planning Board cannot be made as called for, at the expense of that part of our people who travel in elevated cars.

It is self-evident that subway construction already completed has added millions upon millions to the value of real estate in Boston—undoubtedly more than the amount that the subways have cost. It is apparent that the increase of vehicular use of the streets calls for the expenditure of further millions, but it is equally apparent that until there has been adopted a different method of meeting the cost of construction of subways, either through general taxation or by the assessment of betterments upon those directly benefited, there can be no substantial advance in subway extension.

## H. P. Savage Elected American Legion Commander

National commandship of the American Legion was conferred upon Howard P. Savage, superintendent of maintenance of way of the Chicago Rapid Transit Company, at the annual convention of that organization held in Philadelphia on Oct. 15. The election of Mr. Savage was made on the twenty-first ballot after the stiffest fight in the history of the Legion.

"High Power" Savage, as he is affectionately known to his fellows on the "L," was the first commander of the Chicago Elevated Post of the Legion. He is a past state commander of Illinois. Conspicuous among his achievements in Legion affairs have been his activities in securing the soldiers' bonus, his work in increasing Legion membership and his plans for a sound financial status of all posts.

He entered the service of the Metropolitan West Side Elevated Railroad, now part of the Chicago Rapid Transit system, as a track foreman. He was shortly promoted to track engineer, and later to his present position of general superintendent of maintenance of way of the elevated railroads.

During the war Mr. Savage served overseas as lieutenant in the 55th Engineers. On his return to Chicago he organized Chicago Elevated Post No. 184 of the American Legion.

When he stepped from the train in Chicago on his return from the Philadelphia convention, he was greeted by one of the largest crowds ever gathered in the vast Union station. Bernard J. Fallon, vice-president of the Chicago Rapid Transit Company and official spokesman of the occasion, proclaimed Savage a "credit to Chicago and a credit to the nation, the type of man Chicago needs."

## Indianapolis Inciter Sentenced

Harry Boggs, former president of the Indianapolis union, who pleaded guilty some time ago to a charge of contempt of federal court in connection with the recent strike of trainmen of the Indianapolis Street Railway, has been sentenced to serve 120 days in jail by Judge Robert C. Baltzell in United States court.

During the testimony it was disclosed that Boggs had been in the employ of the Indianapolis Street Railway up to the time he fled the city. The contempt charge against Boggs was based on information by the district attorney in which it was alleged that Boggs had incited acts of violence among the strikers in violation of Judge Baltzell's injunction. Boggs fled from the city at the time federal authorities began an investigation of the strike. He has been in jail 44 days pending disposition of his case.

Boggs said that officers of the railway did not know that he advised striking employees to "cut loose" with acts of violence to impede operation of cars.

"I'll say frankly," interrupted Judge Baltzell, "I don't like the looks of things. I want the government to look into this."

"Are you trying to shield the railway?" inquired the judge of Boggs.

"No, sir," said Boggs.

"Why don't you tell the truth?" asked the court.

"I didn't want to tell the court I was playing both sides."

"You double-crossed them both, didn't you?"

"No, sir, I didn't double-cross the car company."

"Didn't you double-cross the company when you told the strikers there were too many cars running?"

Boggs did not answer.

"This man looks like a pretty dangerous citizen," said the judge.

Boggs denied that Robert P. Armstrong and John M. Parker, vice-presidents of the national organization and organizers in Indianapolis, had any knowledge that he was on the payroll of the company. He said they wished him to take charge of the strike.

He said that he was employed by the railway to bring about an amicable settlement if possible and to try to keep the men from damaging cars. He told the court on one occasion he called the police and told them of a conversation he heard in which it was planned to dynamite a car in the downtown district. The court said there was no doubt in his mind that Boggs's acts largely were responsible for the violence committed by strikers.

Judge Robert C. Baltzell of the federal court ordered a further investigation when he sentenced Boggs for contempt of court.

## Electricity for Reading Suburban Lines

A survey of the system of the Reading Company, Philadelphia, to determine the feasibility of electrifying its suburban lines is now in progress. Charles H. Ewing, vice-president, in charge of operations, so announced on Oct. 21. He said a report from the engineers was expected within three months, but that then and only then could definite announcement be made of the plans for starting the work.

The same day E. B. Temple, assistant chief engineer of the Pennsylvania Railroad, declared that electrification of that road's line from Philadelphia to West Chester would be completed early in 1928.

## Utility Speakers to Inform Students

Ohio students will learn the elements of economic life through public utility speakers. To this end Vernon M. Riegel, state superintendent of public instruction, has sent a letter urging all superintendents of schools to arrange for public utility speakers to address student bodies. He said it is always helpful to be able to give students in the latter years of school authoritative information about forces and factors which affect economic life. He feels the public utilities can furnish the information needed to dispel the general ignorance about the structure under which modern industrial society functions.

## Service Restored in Pensacola

The railway lines of the Pensacola Electric Company, Pensacola, Fla., were forced to suspend while the storm raged on Sunday night, and there was a hurried order to return the cars to the carhouse. Practically all had been housed before the power plant went out of commission, and since the night of Sept. 19, or the early morning of Sept. 20, Pensacola has been without railway transportation. On Oct. 3 the statement was made that it probably would be a week or ten days before service could be restored.

Service on the line of the Miami Beach Railway, operating between Coral Gables and Miami, Fla., was restored on Oct. 3. All poles, wires and power facilities have been replaced, but several of the cars were damaged by water. Two cars are being operated every half hour between Ponce de Leon Boulevard at Coral Way and South Miami Avenue at First Street.

## Mr. Mitten on Industrial Peace

Thomas E. Mitten, chairman of the Philadelphia Rapid Transit Company, Philadelphia, told the Congress of American Industry, in session recently, that "humanizing the capitalistic system has been fully accomplished, so far as the P.R.T. is concerned, the basis of its success having been built on a foundation of trust and confidence." Mr. Mitten was responding to the request of the congress that he show in what way the plan of industrial peace in use in Philadelphia had contributed to the industrial success of the nation. The points he covered were the conception of the plan, what it had done, why it had succeeded and what it could be made to accomplish. In concluding his remarks Mr. Mitten said in part:

America's best way to overcome industrial autocracy is to harness labor and capital into an industrial democracy for greater production, with proper distribution of the resultant profits, since labor, capital and consumer are all benefited through added production, which makes for lessened cost of living. When a physical merger of capital and labor is thus effected, so that they have only one interest instead of two, then only will they pull together. There can be no strikes then, because a man does not destroy his own.

America endeavored in Kansas to, by law, require arbitration of disputes between capital and labor, but failed in the attempt. Harmony of these interests cannot be enforced by law, nor can co-operation be secured by coercion. Recent labor legislation can produce only temporary peace with the railroads, which, however, cannot last longer than the time required to increase wages beyond the power of the industry to pay. Capital must encourage labor to produce by permitting its participation in the resultant profits. Labor must produce more to get more and in so doing should get its fair share of the profits.

If the employees in the anthracite fields were offered an increase of wages in proportion to their future increased production, it is reasonably certain that a sufficient increase would be forthcoming, to compensate labor, capital, management and consumer. Even if this increase should justify only 10 per cent a year and this amount be invested in securities representing ownership, the men would in ten years control the mines.

A similar condition could be brought about in the bituminous coal industry in fifteen years, and it is safe to say that if the employee-ownership principle were applied to all industry, America would within one generation become a strike-proof nation, its democracy would be industrial as well as political, and the capitalistic system would not only have been humanized, but would have reached its maximum of usefulness in the advancement of human progress and civilization.

## Franchise Accepted in Louisville

Railway Agrees to Seven-Cent Fare with Transfer Privilege—Submits to Supervision of Board of Public Works—Initial Valuation Expense to Be Met by Company

THE Louisville Railway, Louisville, Ky., has formally accepted the provisions of the new franchise ordinance which was put through the City Council and signed by Mayor Will. Accepting the provisions of the ordinance was merely a formality as the company made a long struggle to get the ordinance through, agreeing to the few changes made just before its passage. The ordinance adopts general principles of regulation, fixes rates of fare and imposes certain duties upon the Board of Public Works.

Section 1 stipulates that the fare is to be continued at the present rate, namely, 7 cents for single-trip cash fare with general transfer privileges for two years or until appraisers report to the Board of Public Works and the Board of Public Works reports its findings to the General Council.

### SCHOOL CHILDREN TO RIDE AT HALF FARE

The company is ordered to establish a general transfer system under which the combined rides by street car and automotive units shall not exceed in price the fare charged for a ride upon automotive vehicles alone, and shall also afford transportation to school children at half fare, and to policemen, firemen and park guards, when in uniform, free, provided the fare charged for a ride upon automotive vehicle shall not exceed 10 cents during the two-year period.

The Mayor, with the approval of the General Council, will appoint a qualified appraiser whose duty it will be to value the property of the Louisville Railway. In addition an independent certified accountant will be employed to make a separate report. After the Board of Public Works has reviewed the valuation, the General Council will determine the value of the property used and useful by it in the public service and determine a rate of fare which will enable the company to earn a fair return on its property, this fare to be subject to readjustment from time to time.

The expense incurred by the city in making the initial valuation will be paid by the Louisville Railway, provided, however, that the company shall not be obligated to expend more than \$50,000, which sum shall be charged to operating expenses.

In the exercise of its power to fix just and reasonable rates the General Council shall, after the report of the appraisers, modify, establish, adjust or approve rates so that the railway will, under economical management, earn an aggregate annual net operating income equal, as nearly as may be, to a fair return upon the aggregate value of the railway property. The General Council from time to time will determine what percentage of such aggregate property value constitutes a fair return. In making such determination, it will give

due consideration, among other things, to the transportation needs of the city and the necessity of enlarging such facilities in order to provide the people of the community with adequate transportation.

Changes in rates initiated by the General Council will be made after reasonable notice to the company. The Board of Public Works will compile and keep all information up to date in respect to the value of the company's property and will report the findings to the Council for its full information and advice in fixing rates.

Should the company desire a change in rate it may file the proposed change with the General Council for its consideration and at the same time file a copy of the proposed change with the Board of Public Works. If within 60 days the petition has not been acted upon by the General Council the changes proposed shall take effect, but the Council shall have the right by resolution duly passed within such 60 days period to extend the time for any period fixed by it not exceeding 90 days. The General Council must neither disapprove nor modify the proposal of the company without according the company a full and fair hearing.

The company will report monthly to the Board of Public Works and on April 1 of every year file with the Board of Public Works and with the General Council a statement of the investment, revenues and expenses for the preceding calendar year.

The Board of Public Works will supervise the management of the railway. To enable it to do this, auditors, accountants and inspectors are to be employed as the General Council may, by ordinance, from time to time authorize. In order to defray the expenses of such supervision, the Louisville Railway, in lieu of any payments now provided for, will pay annually to the city of Louisville the sum of \$10,000.

Section 9 states that the Board of Public Works shall have access to all books, records, correspondence, files, data and all other recorded information of any kind or character kept by the railway. The accounts are to be kept according to the rules promulgated by the Interstate Commerce Commission.

### COMPANY TO PRESCRIBE RATE OF DEPRECIATION

Section 10 states that the company shall, as an expense of operation, accrue adequate sums for depreciation and amortization and set up the same in the form of reserves. Subject to revision by the Council, it will have power to prescribe the annual rate of depreciation and the class or property to which it shall be applied, but until the valuation shall have been made the gross sum for depreciation will be \$175,000 a year unless the Board of Public Works shall assent to a greater

sum. Property becoming obsolete, worn out in service or abandoned is to be amortized over a period of fifteen years, unless some other period is agreed upon by the Board of Public Works and the company.

The company will issue no new bonds or other securities representative of funded debt without the assent of the Board of Public Works as to amount, interest rate, maturity and sinking fund provisions.

To obtain new money for improvements, extensions or for betterments the company may from time to time issue and sell new securities in such amounts as may be necessary under certain conditions provided. New money for such purposes shall be obtained by the company at as low a rate as practicable, and should the price of such new money as secured be unreasonably high, then and in that event the return upon the property represented by the new money shall be allowed only at a reasonable rate without respect of the actual cost of such money to the company.

The new ordinance states that the surrender by the company of any and all franchise terms in excess of the present constitutional limit of twenty years from Aug. 25, 1922, by its formal acceptance of Ordinance No. 330 is confirmed and all franchise operating rights that the company may own, have or possess extending beyond Aug. 25, 1922, are included in said surrender and any and all its franchise rights shall expire and determine twenty years from Aug. 25, 1922, provided the said surrender by the company will be without prejudice to any or all rights of any and all holders of any bond or bonds heretofore issued by it or secured by any of three mortgages now outstanding on the property and franchises of the company. The surrender shall further be without prejudice to the right of said company, with the assent or approval of the Board of Public Works, to continue the sale of its general mortgage bonds, putting the holders of said hereafter sold general mortgage bonds upon an exact parity with the holders of said general mortgage bonds sold prior to Aug. 25, 1922.

The company is required to construct and maintain the supporting substructures of the streets to the extent that its track or tracks are laid above them, and adjacent to its rails, is to construct and maintain a stringer not less than 4 in. wide to keep the top surface of its rails flush with the surface of the street. Wherever the construction, maintenance or operation of the railway results in damage to the street surface, the company is to make repairs at its own expense.

Nothing in the ordinance "shall be deemed to barter away or to impair the police or rate-making powers of the city of Louisville, but, on the other hand, the city expressly retains those powers free and unimpaired."

In the event the Louisville Railway fails or refuses to abide by the terms of the ordinance, it shall be subject to a fine of not less than \$50 nor more than \$100 for each offense, and each day's failure or refusal shall constitute a separate offense.

## Resumption of Franchise Negotiations Planned in St. Louis

When negotiations are resumed on the terms of the franchise under which the reorganized lines at St. Louis, Mo., will operate, officials of the St. Louis Public Service Company, the successor to the United Railways, are prepared to advance further arguments in favor of a 7 per cent rate of return on their investment. Mayor Victor J. Miller has sought to limit the return to 6 per cent. Failure to agree on the rate of return for the company has delayed progress on the new franchise.

C. E. Smith, consulting engineer for the city, in an address before the Civitan Club, declared that under the franchise to be offered the company by the city the municipality will have the right to demand and direct the use by the company of any rapid transit facilities constructed by the city. Mr. Smith was explaining the recent report of a rapid transit committee of the Board of Aldermen recommending the construction of subways in St. Louis. He declared that the logical and economical arrangement would be to operate the subways in conjunction with the present surface lines, but said that should an impasse develop between the city and the railway a rapid transit system with a series of bus lines could be developed to furnish transportation.

## Approval Sought for Kansas City Traffic Artery Plan

The Grand Avenue Association of Kansas City, Missouri, an organization composed of property owners and leaseholders on Grand Avenue from Sixth Street Trafficway to Twenty-seventh Street, will ask the Kansas City Public Service Company to remove its tracks on Grand Avenue. It is the plan of the association to make a 99-ft. traffic artery of Grand Avenue, unimpeded by tracks, through the heart of the downtown business district. Notices have been mailed to all property interests, asking their opinion of the proposed change. Negotiations will not be opened with the railway unless most of the property owners favor the plan.

## "Chicago" in the Movies

The public is being told of the causes of delays and the efforts required to overcome them in a motion picture just released by the Chicago Surface Lines, Chicago, Ill. The picture is called "Carrying On." It shows typical blockades caused by broken-down vehicles on the tracks, flooded subways under viaducts, fires and snowstorms. The use of emergency equipment in overcoming these difficulties is graphically illustrated.

Another picture will be released by the Surface Lines shortly entitled "Arteries of City Life." It is directed against the parking evil and shows the congestion resulting from the parking of vehicles along main street car lines and too close to loading zones. It also shows how schedules are disrupted by blocked railroad grade crossings, and other interferences. A striking contrast between conditions as they usu-

ally exist in the Loop district, where parking is permitted, and as they were during the Eucharistic Congress, when parking was prohibited, is shown.

## Inclusive Educational Program at Boston

Because of the continual demand for intellectual advancement among all classes of its employees the Boston Elevated Railway, Boston, Mass., will again offer an educational program with topics for courses selected from those which proved most interesting and profitable last year. The committee this year is confining the program definitely to five months, Nov. 1 to March 31, with provision for one general meeting, five sets of departmental conferences and the holiday season. Among the courses will be a reading course, the purpose of which will be to lay out fifteen minutes or more for daily reading. There will be a course

## Georgia Railway Burns the 164th Car

An indication of the extent to which the Georgia Railway & Power Company, Atlanta, Ga., is keeping its equipment and its service up to date is seen in the funeral pyre of the 164th car to be scrapped during the past three years.

Car No. 164 was a double-truck, four-motor car, built in 1902, and had seen 24 years of almost continuous service. The length of the car over all was 38 ft. 6 in., its seating capacity 40 passengers and its total weight complete, when empty, 44,740 lb. It was the last of 34 cars dismantled and burned during September.

Of the 164 cars destroyed in the last three years 130 were single-truck cars, eight were double-truck two-motor cars and 26 were double-truck, four motor street-cars. All had been in service for more than twenty years. Their value new was \$597,000. The



Antiquated Cars Cast to Flames in Atlanta

in current events, public speaking, business English, interdepartmental accounts, automotive maintenance and electric railway law. The Boston Elevated Railway has issued an explanatory pamphlet on the educational program for the 1926-1927 season containing a valuable foreword by Edward Dana, general manager.

## Ticket Bootlegger Caught in Portland

The Portland Electric Power Company, Portland, Ore., through its attorney, caused the arrest of a man charged with forging car tickets. The man was employed until recently in a local print shop. In his possession when he was arrested was found one of the supposedly forged tickets and a witness told of buying three books for \$5 when the price of one is regularly \$3.65. Evidence also showed that he had sold more than 1,000 tickets at 3 cents each, when the price is 8 cents. The man under arrest has been held in jail in default of bail set at \$2,000.

cars have been replaced by new, modern low-floor safety cars, each with a seating capacity of 48 and a complete weight of 37,380 lb.

## Spreading the Story of "L" Service in Chicago

Employees of the Chicago Rapid Transit Company, Chicago, Ill., through the public speakers' organization, are doing good work in carrying the story of the company's service into public schools, clubs fraternal societies and similar organizations. Since the public speakers' organization was formed less than a year ago, 182 talks have been made to audiences aggregating more than 48,000. At the same time the first aid team has given 176 demonstrations before audiences totaling more than 83,000. Altogether the story of the "L" lines has been put before 358 separate audiences totaling more than 132,000 persons in the last ten months. These activities by the company have been the subject of comment before in the ELECTRIC RAILWAY JOURNAL.



### Commission Wants Albany Earnings Segregated

The United Traction Company, Albany, N. Y., in its arguments for a 10-cent fare, must segregate its accounts in every municipality. George R. Lunn, Public Service Commissioner, so ruled at a recent hearing. The question upon which the previous hearing had closed was the admission as evidence of the traction company's valuation of the lines covered by franchises in Rensselaer and Troy. Mr. Lunn said:

The commission will accept this evidence, but on the understanding that there must be segregation. The fact must be faced that the traction company must segregate its accounts in every municipality before the rates are fixed.

### Public Hearing on "L" Lease Scheduled

The Public Service Commission of Pennsylvania recently ordered a public hearing in Philadelphia on Nov. 4 on the joint application of the city of Philadelphia and Philadelphia Rapid Transit Company for approval of the Frankford "L" lease. The lease providing a 30-year extension of the agreement with the Philadelphia Rapid Transit Company was signed by Mayor Kendrick on Oct. 13 despite a considerable amount of criticism. At the Nov. 4 session opposition to the lease will be renewed. Following the Mayor's approval the United Business Men's Association filed a petition with the commission protesting against ratification of the lease.

### Future of Detroit's Business District Studied

J. R. Bibbins, consulting engineer, Washington, D. C., has been called to Detroit to undertake for the Detroit Edison Company a comprehensive economic survey of the future development of the rapidly growing business district and such other outside sub-centers as are already taking form for the purpose of securing a fairly definite picture of the growth and needs of the present and future districts for central station utility service, particularly district steam heating. The period comprehended by the survey will be five-year intervals up to the year 1950, and an attempt will be made to visualize the portable building development block by block in these areas, taking into account such controlling factors as transportation, traffic, zoning, city planning, land values, living conditions, local trends, industrial employment and output, business population, etc., and the particular economic relation of Detroit as an industrial center to other contiguous or competing centers of the Middle West.

Detroit is rapidly developing its municipal railway and bus transportation system and its interurban facilities. It has ambitious plans for port development, has already developed a major highway plan for its rapidly enlarging suburbs and is entering upon active rapid transit development and facilities for transportation by air. Its municipal area now covers 139 square miles, as

compared with 28 square miles in 1900, and its population has grown from 286,000 in 1900 to more than 1,300,000 in 1925, not including tributary suburban population outside of the city limits.

### World's Series News Told by Grand Rapids Cars

PATRONS of the Grand Rapids Railway, Grand Rapids, Mich., were served with inning-by-inning bulletins during the world series baseball games. Plays were received by radio and the results by innings, including chief features, such as Ruth's home runs, placed on the bulletin boards of the new electric rail coaches as they passed through Campau Square. Many compliments were received by the company from patrons who enjoyed the games while they rode home.

### Railway Proclaims World's Champions

"Rajah" Hornsby, the manager of the Cardinals, and the other members of the St. Louis team certainly received the plaudits of the populace of the metropolis on the Mississippi. It was a grand welcome that city accorded its world champions. Whistles blew, auto horns honked, and if the use of any other noise-making device were overlooked, history as written in the daily papers failed to record it. Many of the people of St. Louis remained up all night to celebrate. The expediency of this may be debatable, but it is a fact that they did it. Joy was unconfined. And when joy is unconfined in St. Louis it apparently knows no limit.

The ELECTRIC RAILWAY JOURNAL has already told how the United Railways did its part in transporting the fans to the baseball park. The company might well have remained content with this contribution to the affair, but it did not. Nothing like that for it. Of course, its men individually took cognizance of the fact that the world's championship pennant will swish in the breeze—when there is a breeze in St. Louis next summer—from the flagpole

at Sportsman's park, but the company took official notice of the event in which Alexander the Great, Rog, Bell, Bottomley and others covered themselves with glory. Its most conspicuous contribution to the event was a car proclaiming the world's champions. This car, with its cardinal decorations, was operated over the system at night. It made a big hit. Incidentally the car and the signs it carried on either side conveyed to the public the fact that "corporations have a soul."

### Prompt Decision Expected on New York Fare Referendum

The Court of Appeals of New York decided on Oct. 15 in Albany to hear arguments on Oct. 19 on the appeal in the taxpayer's action for an injunction to prevent the submission of the so-called 5-cent fare referendum in New York City. All other matters before the court will wait until after this issue and the one on the prohibition vote have been heard. It is expected that a decision in each case will be rendered before the date fixed for a recess of the court until after election.

### Advertisements to Be Carried in Honolulu Cars

The Honolulu Rapid Transit Company, Honolulu, Hawaii, has voted to carry advertisements in its cars if an attractive bid is received. This reverses a policy of 25 years standing. The situation in Honolulu, with its hotels located 3 to 4 miles out of the city proper and its many tourists, is regarded as unusual. The city frowns on billboards, of which there are very few.

In 1925 the company carried 17,085,088 passengers in 71 cars. It is asking for bids and preliminary specifications for twelve additional cars. Advertising bids will also include the use of buses. The proposed contract is to run from March 1, 1927, for a period of five years. The advertising privilege is to include the use of the lower portion of the ceiling along either side of the car for card advertising. No other space in or out of the car will be included in this privilege. Bids are to be received by the company up to Dec 15.



Crowing About the Cardinals a la Railway

## New Providence Plan Contemplates No Subways Now

Robert Whitten, city plan consultant, reported to the City Council of Providence, R. I., on Oct. 12. He advances plans involving an expenditure of \$40,000,000 for the relief of traffic congestion in the city and calling for the construction of four 140-ft. boulevard highways across the city, the widening of more than 25 streets and the elimination of several grade street crossings by underpasses. In addition to providing additional street capacity, the plan proposes to create thoroughfares upon which a speed of 30 m.p.h. will be as safe as 15 m.p.h. is on the ordinary city street today. It is also designed to carry through travel around the congested down-town district instead of through streets already crowded.

Mr. Whitten put aside for the present a plan submitted last summer by William W. Lewis for a subway system of two tubes to carry street cars through the congested area as a means of easing the traffic situation. Mr. Whitten said that purchase of land for the widening of highways can be made much more economically now than will be possible 25 years from now, but subways, if needed then, probably can be built in 1950 as cheaply as now.

## Dallas-Irving Franchise Extended

The Dallas Southwestern Traction Company was granted an extension of time until Dec. 31, 1927, for the construction of its line from Dallas to Irving by a recent action of the County Commissioners' Court. E. P. Turner, chairman of the board of the company, made the request. This line, it is proposed, will be an electric line connecting Dallas and the Irving territory. The promoters organized a company about fifteen years ago and several extensions of time under the franchise have been granted. E. P. Hopkins is president of the company.

## News Notes

**Fare Lowered to Stimulate Travel.**—A reduction in fare between Harrisburg and Mechanicsburg has been put into effect by the Valley Railways, Lemoyne, Pa. Instead of three 8-cent fares only two will be charged. The new rate will be tried out until Dec. 31, and if increased revenues result the plan will be continued after that date.

**Towns Celebrate New Electric Branch.**—The first electric train passed through the newly electrified West Hempstead branch of the Long Island Railroad on Oct. 19. The train left the Pennsylvania Station at 2 p.m. and passed through Jamaica, Malverne, Lake View, Hempstead Gardens and West Hempstead to Mineola amid much celebration and cheers. Since 1893 the West Hempstead branch has had shuttle service by steam or storage battery cars between Mineola and Valley Stream connecting at either end

with main line trains. The new electrification will mean through service to New York and Brooklyn. One year ago last May the electrification of the Montauk Division to Babylon was completed.

**"Stars" Awarded in Atlanta.**—Officials of the Georgia Railway & Power Company, Atlanta, Ga., have given out recently more than 600 "service stars," representing a total of 3,000 years of service by the 600 employees. Among the trainmen who received seven stars, having served more than 35 years with the company, are S. B. Lyon and W. B. Kirk. These men are also the oldest trainmen in the company from the standpoint of continuous service. A set of stars, one to be worn on each side of the uniform collar, is issued for each five years.

**Fare Hearing Scheduled.**—The matter of a 10-cent fare in Syracuse, N. Y., is up again. The Public Service Commission will hear the city's side of the case against the application of the New York State Railways at the New York City offices on Oct. 26. The company is seeking permission to charge a 10-cent cash fare and a 7½-cent ticket fare. The original petition was submitted nearly a year ago. Several hearings have already been held.

**Council Blocks New Car Line.**—The Common Council of Madison, Wis., passed an ordinance on Oct. 8, signed later by the Mayor, prohibiting the use of Regent Street from Breese Terrace to Prospect Avenue by the Madison Railways for a new car line. The action of the Common Council blocks the plan of the company to abandon its Harrison Street line in favor of the new line on Regent Street from Breese Terrace to Prospect Avenue. The Railroad Commission had approved the company's plan to lay new rails on Regent Street and counsel for the company had contended that under the franchise granted the company in 1892 it had the right to use any city street without first obtaining permission from the city. An appeal by the city from the order of the commission authorizing the abandonment of Harrison Street is now pending in Circuit Court.

**Pittsburgh Officials Attend Utility School.**—Officials of the Philadelphia Company and its subsidiaries, owners of public utilities in Pittsburgh, Pa., are going to "night school" at the University of Pittsburgh. Ninety men of the Philadelphia Company, including four vice-presidents, registered for the course in public utility administration. Classes are held each Thursday evening under the direction of Dr. Charles Reittel and will be continued throughout the school year. The faculty includes Dr. Reittel, Dr. John G. Bowman, chancellor of the university, and A. W. Robertson, president of the Philadelphia Company.

**Railway in Laurel to Continue.**—According to Barney E. Eaton, president of the Mississippi Power Company, plans for the rehabilitation of the railway at Laurel, Miss., are being completed. An unofficial announcement made some time ago was to the effect that the railway service of the Laurel Light & Railway Company would be abandoned in favor of buses.

**Free Rides in Charleston.**—The Charleston Consolidated Railway & Lighting Company, Charleston, S. C., was temporarily "bought" by Kerrison's Department Store on Sept. 25, for one hour and turned over to the public for free rides. This idea was conceived by the officials of one of the city's oldest firms in appreciation of the patronage the shoppers had given in connection with the 95th anniversary sale held in the store during that week. The watchword of the hour on Sept. 25 was "the rides are on Kerrison's, jump aboard."

**Tickets in Atlanta Have New Color.**—The Georgia Railway & Power Company, Atlanta, Ga., is discarding the green tickets and substituting pink ones. Fifteen pink tickets will be given upon submission of \$1, just the same as fifteen green ones heretofore. Any green tickets which have been purchased will be honored upon presentation.

**School Fare Ruling on Interurban.** The Public Service Commission has approved a new tariff of the Schenectady Railway, Schenectady, N. Y., fixing regulations heretofore applicable on the Troy division only, which provide for the sale of 50-trip one-zone interurban school tickets at a price of \$2 a ticket, applicable within zones 2, 3 and 4 on the Saratoga division.

**More One-Man Cars in Service.**—The number of one-man car lines operated in Milwaukee, Wis., was increased to six on Oct. 3 when the Milwaukee Electric Railway & Light Company placed one-man cars in operation on its Wells-Downer line. Twenty reconstructed cars newly equipped and refurnished were added to the line.

**Resident Buyer in Birmingham for Illinois Traction.**—The Illinois Traction System, Springfield, Ill., will open a branch office in Birmingham, Ala., according to O. L. Bunn, general manager of the Chamber of Commerce. Leander Poole will represent the company in Birmingham. The Illinois Light & Power Corporation, the principal holding company for the Illinois Traction System, buys heavily in the Birmingham district.

**Dallas Railway Takes Interurban Rails in City.**—Rails of the Texas Interurban Railway on St. Paul Street and Fairmount Avenue, Dallas, used for the last two years by the Dallas Railway & Terminal Company, are to be purchased by the latter company for a consideration of \$46,620. Denton Interurban cars will continue to use the rails, which had been under a lease to the purchasing company that expired Sept. 30.

**Coal Carrying Improves Business.**—The Evansville, Suburban & Newburgh Railway and the Evansville & Ohio Valley Railway, Evansville, Ind., are hauling considerable coal at the present time, which will prove a good source of revenue for several months to come. Many of the coal mines in Warrick and Spencer Counties along these traction lines are resuming operation and a good many men are employed in mining. The transportation of the products of the mines furnishes one of the best sources of revenue that these lines have from year to year.

## Recent Bus Developments

### Pinchot Raps Commission

Pennsylvania's Chief Executive Sees Red at Steam Railroads' Proposals to Run Buses

Governor Pinchot of Pennsylvania announced recently that he refused the grant of charters to the Pennsylvania General Transit Company and the Reading Transportation Company, formed by officers of the Pennsylvania Railroad and the Reading Company, respectively, to operate bus and truck lines.

The Pennsylvania company asked for a charter covering 55 of the 57 counties of the state, the Reading for charter rights in 24 counties. The Reading's application was for a \$1,000,000 corporation, while the capital stock of the proposed Pennsylvania Bus Company was half that amount.

The Governor said in part:

I decline to approve the charter applications of the Philadelphia & Reading and the Pennsylvania Railroads to operate bus and truck lines over the highways of the state, as recommended by the Public Service Commission, for the reason that these applications are the first steps toward securing a monopoly of bus transportation over the highways of this Commonwealth.

These charters appear merely to grant the right to run buses and trucks over the highways and stipulate that lines cannot be run over any definite route or routes until after the Public Service Commission has granted the right to operate in each individual case. In fact, they are the opening wedge in handing the highways of Pennsylvania over to the railroads.

Such blanket grants as these have never been made before. They can have but one purpose. It is no answer to say that other bus and truck lines might be permitted to operate. The history of similar cases demonstrates beyond question that competing lines would be crushed out or bought out (with increased charges to the public), that the railroads would absorb them as they did canals, and that the formation of a railroad bus and truck line monopoly would scarcely even be retarded.

If the present majority of the Public Service Commission could be trusted to protect the rights of the citizens of Pennsylvania against encroachment or extortion by railroads, street railroads, electric and other public utility corporations, the apparent safeguarding of public rights in those charters might have some meaning. Under the actual circumstances it has none. If I were to sign those charters, the commission could complete the railroad monopoly by granting certificates of public convenience without anybody being able to stop it. For this reason alone, even if these charter applications did not involve a fundamental public policy, which they do, they ought not to be approved.

The time to stop the intended control of our highways by the railroads is before it starts. These charter applications on behalf of the Pennsylvania and the Reading Railroads will be followed by similar applications from other railroads. Since the rights of our citizens are not otherwise protected, the Governor must protect them and so long as I am in office the Governor will, to the full extent of his power.

The commission's letter, stating the facts in the case, and signed by Chairman W. D. B. Ainey, was in part as follows:

The commission's approval of these applications merely clothes these companies with lawful authority to furnish service of this character if and when by subsequent order, the commission shall have determined that the public necessities require the furnishing of bus service as auxiliary or supplemental to service presently being furnished, whether by rail carrier or otherwise.

The commission's approval of these incorporations will in no wise relieve them, in seeking authority to operate over specific

routes, of the burden imposed by law of affirmatively establishing by proper testimony that the particular service which they propose to furnish in any given case is necessary for the service, accommodation, convenience and safety of the public.

When such applications are presented the commission will require, as it does in all similar cases, that copies of the petitions be served upon all existing carriers engaged in furnishing a similar type of service in the territory, and these carriers will be afforded full opportunity to protest and be heard in public hearings.

At the present writing seven applications for operation over specific routes have been filed in the interest of the Pennsylvania General Transit Company and four in the interest of the Reading Transportation Company. Of the former, three have been approved, one refused and three are pending. Of the latter, all four cases are pending. The commission's refusal, above noted, was in the application for the carriage of persons between Waynesburg and Washington, and its reason therefor was that reasonably adequate service of this character is presently being there furnished by an existing certificate holder.

The proceeding is of interest because of the point of view taken by the Governor, because the electric railways appeared in opposition to the plans of some of the applications, which appeared to threaten the entrance by the railroads' bus lines of territory in which trolleys were operating, and because of the pronouncement of the commission of its intention to protect the rights of existing carriers.

### Would Operate Buses Only

The Omaha & Lincoln Railway & Light Company, Ralston, Neb., has asked the State Railway Commission for authority to tear up the last of its trackage, that between Omaha and Ralston. The company formerly operated cars to Papillion, but a year ago was allowed to abandon the track and service and substitute buses. A little later it was authorized to abandon railway service between Omaha and Ralston, save two cars a day, buses having been used for supplemental service for two years. Now the public authorities propose the reconstruction of a viaduct in Omaha over which the company's tracks run, and as this will call for an expenditure that the railway regards as prohibitive its officers desire to abandon railway operation and furnish transportation entirely with buses.

### Doylestown Bus Project Argued

The application of the Philadelphia Rapid Transit Company, Philadelphia, Pa., for certificates of public convenience to operate bus lines from Philadelphia to Doylestown and to Cypress Avenue and Cadwallader Avenue, Montgomery County, was heard by the Public Service Commission on Oct. 19. The Bucks County application is new, but the Montgomery County application is for an extension of service already existing. The company in this has asked for approval of additional rights to permit the operation of its buses from Broad Street and Olney Avenue, operating over route V to Montgomery County. A. B. Millar, of the Philadelphia Rapid Transit Company, declared

there was need for the additional line. The Bucks County line was opposed by the Reading Transit Company.

### Agreement Reached on White Plains-Tarrytown Service

The Third Avenue Railway, New York, and the city authorities of White Plains have reached an agreement whereby buses will be run for five years on all routes now covered by trolleys. Buses will reestablish service to Mamaroneck from White Plains on a 20-cent fare, but trolleys will be retained to Tarrytown with fare increased to 10 cents.

### Clang of the Gong Replaces Honk of the Horn in Alliance

The honk of the horn of the bus has been replaced by the clang of the trolley gong on local lines of the Stark Electric Railroad at Alliance, Ohio, for after nearly a year of operation the Stark Electric has abandoned its city bus lines.

When six new gray buses fresh from the factory were received in Alliance a year ago wheels were lifted from the ground and the high-pressure tires were replaced with balloons. Thus equipped, buses began operating. For making this experiment with balloon tires, the Stark Electric had a tire proposition from the manufacturers which was considered by company officials to be very reasonable.

It is true that the four buses which replaced the three street cars at Alliance took in more in gross than did the local trolleys, but the cost of operating the buses more than offset their added earning power. Not only that, but the Stark Electric had operated its local street cars over the route used by its interurban cars, so that there was an important element of economy here which worked to their benefit.

With two branches of car tracks in the city, it has now been established that street cars can be operated at a cost much less than that for buses. By rearranging schedules it was necessary to secure only three trolley cars to give local service over two lines. For this service one-man cars were leased. These cars do not represent the best of their type, but they are proving fairly popular with patrons. If the railway service as restored with one-man cars proves profitable Stark Electric officials plan to purchase new cars for the city service. Routes over which the buses operated ran the mileage for each bus up to about 40,000 miles in less than a year, a severe drain upon the physical equipment.

Buses Serve Davenport.—The Tri-City Railway of Iowa put into regular service on Oct. 3 the new buses recently purchased as an added improvement to the street transportation service of Davenport. Six Yellow coaches seating 21 passengers and two 25-passenger Mack gas-electric coaches are now being used. The fifteen drivers who are now operating the buses were put through a rigid period of training before the buses were put into public service.

## Financial and Corporate

### Receivership Ended in Kansas City

Deeds that passed on Oct. 14, terminated the receivership of the Kansas City Railways, Kansas City, Mo., and turned the property over to the new Kansas City Public Service Company.

To afford time for certain court orders to be drawn Judge Stone had fixed 2 o'clock Thursday afternoon as the hour for the delivery of the deeds. This ceremony marked the end of a receivership, in which adherence to a policy of public service rebuilt a property virtually bankrupt.

The document was executed by John T. Harding, special master commissioner, acting for the federal court, and by Powell C. Groner, Mr. Groner having acted as bidder at the foreclosure sale by the Kansas City Railways through the signature of Frank C. Niles, vice-president, and the Kansas City Public Service Company, which received title. Copies of the deeds were filed immediately in Kansas City, Mo.; Kansas City, Kan., and Independence.

The revenue stamps required reached the unusual total of \$22,000.

The receivership having extended a month and a half beyond the date estimated when salary allowances were made, Judge Stone authorized payment to the receivers, Fred W. Fleming and Francis M. Wilson, and their counsel, James E. Goodrich, for the extra period. The receivers were paid at the rate of approximately \$31,000 a year. Counsel received 20 per cent less.

To the Kansas City Public Service

Company passed full possession of the property, subject to the supervision of the State Public Service Commission and to franchise conditions, such as provide for the board of control.

### \$300,000 Theoretical Deficit on Municipal Line

San Francisco Civic Body Recapitulates Figures of Local Railway on the Basis of Private Operation

An analysis of the monthly operating statements of the San Francisco Municipal Railway for the fiscal year 1925-26, contained in the *City*, issued by the San Francisco Bureau of Governmental Research, shows a book profit of \$21,395. This is an increase of \$15,009 over the preceding year's profit, for which reduced debt charges are largely responsible. The figures are contained in the accompanying table.

The total operating revenue was approximately \$3,400,000. This is \$132,000 more than for 1924-25. This was practically absorbed, however, by an increase of \$125,000 in operating costs, \$94,000 of which was for conducting transportation.

The bureau explains:

A change in the method of setting up reserve funds for depreciation and for accident and damage claims, effective during the last two months of the year, resulted in reducing by about \$1,000 the amount which would have been set aside for these purposes under the old method.

Comparison charges, shown in the accompanying table, are taxes which the road would bear if privately owned but which the publicly owned road does not pay. The

charter requires, however, that account shall be taken of these for comparative purposes. These charges are partly offset by bond redemption payments which a privately owned road would not ordinarily be called upon to make.

The table showing the operations of the system in detail is subject to adjustment after the accounts are audited which may make minor changes in the totals.

### Valuable Stock Rights for Montreal Holders

The long-anticipated issue of new stock by the Montreal Tramways, Montreal, Que., has at last materialized. For every four shares now held the shareholders will have the right to subscribe for one new share at \$125. The present common share capitalization of the company is \$4,000,000; thus the new financing will increase the common stock outstanding to \$5,000,000.

Payment for the new issue will be made in three installments: 25 per cent on Dec. 1, 1926, 25 per cent on Dec. 31, 1926, and the remainder on March 31, 1927. The new shares will carry dividends for the quarter ended March 31, 1927.

This operation marks the first financing by means of a stock issue in more than ten years. The last stock issue made was in the fiscal year ended June 30, 1916, when 10,000 shares were issued and allotted to shareholders at par, thereby increasing the issued capital to \$4,000,000, at which it has remained up to the present time.

Last year the funded debt structure of the company was simplified by the authorization of \$100,000,000 of general and refunding bonds. An issue of \$17,826,500 series A, carrying 5 per cent interest, was made to redeem \$17,650,000 outstanding debenture stock at 101, and an issue of series B to the amount of \$2,500,000 was also made, the proceeds of which were used partly for capital expenditures and partly to replace \$1,750,000 of first mortgage bonds. These issues and the issue of first mortgage bonds gave the company a total mortgage debt of \$41,823,343 at the close of the last fiscal year.

The new financing will net the company \$1,250,000 to be used in various extensions and other capital expenditures. Since 1920 the stock has been on an annual dividend basis of 10 per cent. The stock has been quoted recently around 170.

### Rockford Properties Ordered Sold

A court order for the sale within 30 days of all properties of the Rockford City Traction Company, Rockford & Interurban Railway and Rockford, Beloit & Janesville Railway, all of Rockford, Ill., has been entered by Judge E. D. Shurtleff in the Winnebago County Circuit Court.

The petition for the order for sale was presented by the Continental & Commercial Trust Company, Chicago, trustees for first mortgage bond holders, and the order was issued without objection. Charles W. Ferguson, master in chancery, will be in charge of the sale of the properties. Milton Ellis, Beloit, Wis., railway banker, is expected to bid in the road, controlling as he does the majority of outstanding

#### SAN FRANCISCO MUNICIPAL RAILWAY

Last two fiscal years ended June 30, 1925-June 30, 1926.

(Compiled by Bureau of Governmental Research from Official Monthly Reports.)

	1924-25	1925-26	Increase or Decrease
Passenger revenue.....	\$3,268,383	\$3,395,186	\$126,803
Miscellaneous revenue.....	13,115	18,671	5,556
Operating revenue.....	\$3,281,498	\$3,413,857	\$132,359
Operating Expenses:			
Ways and structures.....	115,074	136,604	21,530
Equipment.....	197,619	204,046	6,427
Power.....	464,990	488,812	23,822
Conducting transportation.....	1,600,499	1,694,960	94,461
Workmen's compensation.....	45,656	41,324	4,332
Other general and miscellaneous.....	149,417	152,006	2,589
* Accident and damage claims.....	121,247	102,010	19,237
Total operating expense.....	\$2,694,502	\$2,819,762	\$125,260
Net operating revenue.....	586,996	594,095	7,099
* Reserve for depreciation.....	266,062	260,403	5,659
Reserve for accident and damage claims.....		4,609	4,609
Total charges to reserve.....	\$266,062	\$265,012	\$1,050
Operating income.....	320,934	329,083	8,149
Interest received on securities owned.....	44,495	43,718	777
† Compensation fund dividend.....	28,535	22,727	5,808
Total non-operating income.....	73,130	66,445	6,685
Gross income.....	\$394,064	\$395,528	\$1,464
Interest on funded debt.....	186,678	177,133	(a) 9,545
Surplus.....	\$207,386	\$218,395	\$11,009
* Redemption of debt.....	201,000	197,000	4,000
Surplus.....	\$6,386	\$21,395	\$15,009
† Comparison charges—taxes unpaid.....	311,548	324,910	13,362
Theoretical deficit.....	\$305,162	\$303,515	\$1,647

\* B. P. W. accounts included in "Depreciation Reserve."

† Difference between reserve charges as operating expense and actual expenditures.

‡ Estimate by bureau.

(a) Approximately \$17,500 of this amount was expended from 1910 and 1913 bond funds.

bonds, for which he paid about 23 cents on the dollar for \$1,300,000 of obligations. Simultaneous with the action in the Rockford courts, H. C. Van Oven, receiver for the Rockford, Beloit & Janesville lines, filed a petition for the sale of the northern interurban line. This plea was granted. That sale will take place at the same time as the other railway properties.

### Foreclosure Sale for Norwich Property Set

Judge Jennings at a recent hearing in the Superior Court at Norwich, Conn., authorized foreclosure proceedings in connection with a mortgage against the Groton & Stonington Traction Company of that city. The sale under foreclosure has been set for Nov. 22 at New London to dispose of the property.

The sale is the outcome of proceedings started in December, 1924, by Ernest E. Rogers, state treasurer, as trustee for the owners and bondholders of the Groton & Stonington Traction Company, on bonds secured by a mortgage made on July 1, 1904.

### Coral Gables May Purchase Its Railway

Plans are under way by the developers of Coral Gables, Fla., a Miami suburb, to divest themselves of certain properties there so as to secure funds for further new work on their part. The developers offer taxpayers the two street railway lines for \$1,782,730; the golf clubs and courses for \$1,750,000 and the Venetian Casino and pools for \$300,000. In order to put through this program it is proposed by the city commissioners to hold an election to authorize an issue of bonds to the amount of \$4,500,000, about \$4,000,000 of the proceeds of the sale to go to the Coral Gables Corporation, developers of the resort, and \$500,000 to be used for public improvements. George M. Merrick, president of the corporation, declared it to be his intention to use the money realized from the sale in carrying on a program of development. According to the Coral Gables Chamber of Commerce the City Commission favors the purchase of the utilities from the private owners and will meet during the week ended Oct 30 to take final action for the consummation of the deal.

### California Beach Sale Under Way

Negotiations are under way for the sale by the Pacific Electric Railway, Los Angeles, Cal., of its resort properties at Redondo Beach. The impending sale was confirmed by D. W. Pontius, vice-president and general manager of the railway. He stated that the Charles G. Andrews Realty Company was handling the deal. It is reported that the deal, if consummated, will involve approximately \$2,000,000.

The property is known as the railway's amusement holdings. It consists of a bathhouse, dancing pavilion, restaurant, and other buildings, as well as the land on which they stand.

The property passed to the railway

from Henry E. Huntington about fifteen years ago when it purchased the Los Angeles & Redondo Railway. A portion of the property is under lease, but the company has been operating the pavilion and the bathhouse.

### Improvement Noted in Evanston Operation

For the year ended Dec. 31, 1925, the Evanston Railway, Evanston, Ill., reports a balance of \$70,458, against \$59,095 for 1924. The accompanying table shows revenue and expenses for last year compared with the year previous. The Evanston Railway operates 10 miles of line, controls and operates the North Shore & Western Railway and connects with the Chicago Surface Lines.

#### EARNINGS STATEMENT OF EVANSTON RAILWAY

	1925	1924
Gross operating revenue.....	\$306,178	\$290,607
Other sources.....	8,152	4,137
Total revenue.....	\$314,331	\$294,745
Operating expenses.....	184,132	181,005
Taxes.....	28,423	24,363
Total expenses.....	\$212,555	\$205,368
Gross income.....	\$101,775	89,376
Interest on funded debt.....	30,355	28,252
Interest on floating debt.....	540	1,669
Miscellaneous.....	422	360
	\$31,317	\$30,281
Balance.....	\$70,458	\$59,095

### Changes in Penn-Ohio System Being Worked Out

Revamping of the corporate structure of the Penn-Ohio system, announced in the last annual report of the Republic Railway & Light Company, New York, is proceeding rapidly. Upon completion of these plans there will be only one holding company for the system, instead of three as at present. This holding company will control four main operating groups: Pennsylvania Power for the electric properties in Pennsylvania; Pennsylvania - Ohio Power & Light for the Ohio electric properties; Ohio River Edison, operating the most important power-producing units of the system, and a fourth company to have charge of the railway properties formerly owned by the several holding companies.

According to the *Wall Street Journal* much progress has been made on consolidation and simplification of the subholding companies and of operating companies looking toward the ultimate goal of four main operating companies. Pennsylvania-Ohio Power & Light has eliminated properties operating in Pennsylvania and now has only electric properties in Ohio. The newly formed Pennsylvania Power Company now operates the electric properties in Pennsylvania. These two companies, comprising the Penn-Ohio system, receive the majority of their power from Ohio River Edison.

The majority of the electric railways are now controlled by one company, Pennsylvania-Ohio Electric Company. Possibly in the distant future these traction securities will be distributed to Penn-Ohio Edison stockholders, thus

eliminating all but electric power companies from the system.

Benefits from this consolidation program have already manifested themselves through ability of the operating companies to finance on favorable terms. Last summer Ohio River Edison was able to place an issue of \$4,000,000 5 per cent bonds to yield 5.50 per cent, and Pennsylvania Power placed \$3,800,000 30-year 5 per cent first mortgage bonds to yield 5.13 per cent.

### Quarterly Earnings Reports Likely from Insull Railroads

Quarterly earnings reports to stockholders may soon become a fixed policy of the managements of the Chicago Rapid Transit Company; Chicago, North Shore & Milwaukee; Chicago, South Shore & South Bend and Chicago, Aurora & Elgin Railroads—the four electric railroads in the Chicago district controlled by Samuel Insull and associates.

The policy of all these companies heretofore has been to issue only annual reports, but the issuance on Oct. 18 of a quarterly statement with the dividend checks of the Peoples Gas & Coke Company is regarded in financial circles of Chicago as significant of a new program presently to be adopted with regard to the corporate publicity of the Commonwealth Edison, Public Service of Northern Illinois, Middle West Utilities and Midland Utilities companies as well as that of the electric railways.

**Change Effected in Capital Structure.**—The Danbury Power & Transportation Company, Danbury, Conn., formerly the Danbury & Bethel Traction Company, has been authorized to change its capital from \$500,000 to 5,000 shares of stock of no stated par value.

**Authorizes Sale of Land.**—Robert W. Perkins, receiver of the Shore Line Electric Railway, New London, Conn., has been authorized to sell six tracts of land owned by the company in Essex, Preston and Norwich. The sale is the result of action brought by the United States Trust Company, New York, and the Old Colony Trust Company, Boston, Mass.

**Revenues Show Gain.**—Revenues of the Community Traction Company, Toledo, Ohio, in September showed a gain of more than \$3,400 over those for the corresponding month last year. Total revenue in September was \$258,919 compared with \$255,550 for a similar month last year. The gain was made in spite of "open weather." Mr. Johnson said the improvement was due, he thought, to continual improvements in service and the chartered bus service which has proved popular since its installation on Sept. 1.

**Net Income Increases.**—For the three months period ended Sept. 30, 1926, the total operating revenues of the Brooklyn-Manhattan Transit System, Brooklyn, N. Y., was \$11,673,905, against \$11,228,732 for a similar period ended Sept. 30, 1925. Total operating expenses increased from \$7,338,227 to \$7,442,816 for a similar period this year. The net

income after the consideration of income deductions amounted to \$1,732,554 for the three months period ended Sept. 30 this year, against \$1,490,688 for the similar three months period of 1925.

**Seattle Not Liable to Tax Portion.**—Contending that the city of Seattle, Wash., is not liable to any portion of the 1919 street railway taxes and cannot legally pay such taxes from either the general fund or any special fund, Corporation Counsel T. J. L. Kennedy and his first assistant, Ray Dummet, recently argued the city's appeal in the tax case before the United States Circuit Court of Appeals. James B. Howe, counsel for the Puget Sound Power & Light Company, which won a decision in the District Court to the effect that the city is obligated to pay three-quarters of the 1919 tax, approximately \$543,000, argued that the city had agreed by ordinance, held valid by the State Supreme Court, to pay its portion of the taxes. Taxes and interest on the street railway for the year 1919, totalling approximately \$650,000, were paid by the company under protest. The company is seeking to have the city pay three-quarters of this amount, or the taxes for the nine months of 1919 that the city had possession of the carlines.

**Short Massachusetts Line Suspends.**—The Templeton-Gardner Street Railway operated its last car on Oct. 9. The service was replaced by buses on Oct. 10. The railway has been in existence since 1900. The road was finally acquired by the Northern Massachusetts Street Railway and thence passed into the hands of the present company to include only the East Templeton to Baldwinville and Gardner to Riley's Switch routes. The East Templeton to Baldwinville line was abandoned last summer.

**Surplus Lower.**—For the period from Jan. 1 to July 31, 1926, the gross earnings of the Lake Shore Electric Railway, Sandusky, Ohio, were \$1,873,262, against \$1,852,849 for a similar period in 1925. Operating expenses and taxes increased from \$1,512,120 in 1925 to \$1,606,916 in 1926. After the consideration of interest, the surplus for the period from January to July, inclusive, was \$13,244, against \$84,959 for a similar period last year.

**Seeks Permission to Sell Bonds.**—Authority to issue and sell \$56,000 of first and refunding 5 per cent bonds has been asked of the Indiana Public Service Commission by the Evansville & Ohio Railway, operating railway lines from Evansville, Ind., to Mount Vernon, and Henderson, Ky. G. R. Millican, vice-president and general manager of the company, said the money will be used to pay for general improvements and for six new interurban cars which were bought some time ago.

**Service Discontinued.**—The Huntingdon, Lewiston & Juniata Valley Traction Company discontinued service on Oct. 7 in the borough of Huntingdon, Pa., on its line, which is 1.7 miles long. The service ended with F. Blair Isenberg, general manager, announcing plans to tear up and scrap the track, property and all holdings.

## Personnel of New Kansas City Company Announced

When Judge Stone had approved the transfer of the Kansas City Railways, Kansas City, Mo., to the Kansas City Public Service Company on Oct. 14, W. C. Woolfolk, president of the new company, announced the following operating staff, with various advances in title and increased authority:

F. G. Buffe, vice-president in charge of operations.

J. A. Harder, secretary and treasurer.

L. M. Boschert, assistant secretary.

Neal S. Doran, comptroller and assistant treasurer.

Charles L. Carr, general solicitor in charge of legal and claim department.

D. L. Fennell, general superintendent of transportation.

R. W. Bailey, general superintendent of maintenance.

E. E. Stigall, purchasing agent.

E. B. Sanders, manager commercial department.

A. T. Bagley, superintendent department of personnel.

J. D. Cornell, freight traffic manager.

D. E. Druen, superintendent of power.

H. W. Smith, superintendent of way and structures.

C. A. Kincaid, superintendent of distribution.

R. S. Neal, superintendent of equipment.

F. C. Lynch, superintendent of bus maintenance.

I. R. Carson, assistant superintendent of transportation.

H. M. Smith, assistant superintendent of transportation.

H. H. Cloyd, assistant to Mr. Buffe.

A separate construction department is being organized, with A. E. Harvey as superintendent of construction.

Senator Francis M. Wilson and Col. Fred W. Fleming, co-receivers, have, of course, relinquished their duties. Colonel Fleming will assume management of the Central Surety & Insurance Corporation, of which he is president. He is also vice-president and treasurer of the Willock Realty & Loan Company and president of the Golden Rule Baking Company.

Senator Wilson plans a hunting trip in Platte County, the first real vacation he has had for thirteen years. During the period of the receivership, Senator Wilson was away from the office only 60 days, 30 of which were spent in pursuit of bus knowledge. After Jan. 1 he expects to open a law office in Kansas City, "a modest sort of an office where if any client should come, he would be courteously received."

## W. J. Wright a Public Service Corporation Counsel

Wendell J. Wright has been appointed assistant general counsel of the Public Service Corporation of New Jersey and its subsidiary companies.

Mr. Wright in 1898 became associated

in his New Jersey and New York law practise with Edmund W. Wakelee, now vice-president of Public Service in charge of law. Later he founded the firm of Wright, Vander Burgh & McCarthy, with offices in Hackensack.

In 1905 Mr. Wright was appointed counsel to the Bergen County Board of Freeholders and in 1909 was appointed by Governor Fort first judge of the First District Court of Bergen County. Later he became prosecutor.

Mr. Wright was one of the organizers of the Closter National Bank, of which he was a director. He also is a director of the North Jersey Title Insurance Company and its general counsel.

## John S. Bleecker—Public Utility Consultant

John S. Bleecker is leaving Day & Zimmermann, Philadelphia, Pa., to establish offices at 910 Finance Building, that city, as industrial and public utility consultant, but will retain certain connections with the industrial management department of Day & Zimmermann. Mr. Bleecker has been connected with Day & Zimmermann for the last two years, but was associated before that with the Indianapolis, Columbus & Eastern and the Columbus, Newark & Zanesville lines, operated jointly for the bondholders by the Day & Zimmermann organization. Of these roads he was general manager. Mr. Bleecker was formerly manager of the New Orleans Railway & Light Company. New Orleans, La.: the Columbus Electric Company, Columbus, Ga., and the Columbus Railroad. In addition to serving Stone & Webster on the Columbus properties he was affiliated with that concern in its home office in Boston and at Seattle, Paducah and Houghton.

## Elmer Ambrose Sperry, Electric Railway Pioneer, Honored

Elmer Ambrose Sperry, New York, inventor and early builder of electric railways, has been awarded the John Fritz Gold Medal for 1927 for the development of the gyro-compass and the application of the gyroscope to the stabilization of ships and airplanes. The award was made unanimously on Oct. 15 by the board of sixteen representatives of the American Societies of Civil, Mining and Metallurgical, Mechanical and Electrical Engineers. The presentation of the medal will take place on Dec. 7, in New York, at the annual meeting of the American Society of Mechanical Engineers.

Shortly after Mr. Sperry's early successes in mining machinery he founded the Sperry Electric Railway, Cleveland, Ohio, built electric railway motors and controllers and installed several of the early electric railways put in operation in the later '80s. Subsequently he sold his electric railway patents to companies now represented by the General Electric Company.

Mr. Sperry is a charter member and one of the founders of the American Institute of Electrical Engineers and the American Electrochemical Society. He is also a member of the American

Society of Mechanical Engineers, American Chemical Society, Society of Naval Architects and Marine Engineers, Society of Automotive Engineers, and many others.

## Cleveland Officials Advanced

Col. J. H. Alexander, the New President, and P. E. Wilson and R. W. Emerson, New Vice-Presidents, All Men of Long Experience Schooled Under Late Mr. Stanley—Their Careers Reviewed Briefly

**C**OL. JOSEPH H. ALEXANDER, newly elected president of the Cleveland Railway, Cleveland, Ohio, succeeding the late John J. Stanley, takes at the age of 42 one of the most important public utility posts in the country. At 35 years of age he was advanced to the position of vice-president of the company, similarly one of

he became assistant to the general manager of the Pittsburgh Railways. Two years later, in 1912, he was back in Cleveland as chief engineer in the office of Peter Witt, then the city's traction commissioner.

Mr. Alexander proved an invaluable aid in the commissioner's office and in so doing attracted the attention of Mr.

ditions, interpreted labor agreements, conferred with the war labor policies board, co-operated with the United States employment service in the procuring and distributing of workmen on the various projects and imported approximately 13,000 Porto Ricans and 2,600 Nassauans on ships which were assigned to and operated by the construction division.

He conferred in an advisory capacity for many months with the cantonment adjustment commission (later known as the emergency construction wage commission), and thereafter was made the army representative on the emergency construction wage commission and on the general committee of war labor adjustment.

At the time of the signing of the armistice he had been nominated by representatives of labor and by representatives of employers as chairman of the national committee on standardization of wages for building trades employers. He made approximately 300 speeches on 100 total jobs to approximately 200,000 workmen.

In substance, he established and supervised the carrying out of the fundamental standards and policies for the general administrative work of the construction division of the army.

The foregoing leaves no doubt as to the splendid war record made by Colonel



R. W. Emerson



J. H. Alexander



P. E. Wilson

the youngest ranking officials in such work. Responsibility is nothing new to Colonel Alexander. The very year of his graduation from the Case School of Applied Science at Cleveland he took a job with Tom L. Johnson's Municipal Traction Company at Cleveland as chief engineer, a sizable job for a youth of 22 years.

The following four years witnessed in Cleveland a bitter struggle for supremacy between rival railway systems, several in number, and in that conflict Mr. Alexander first came into prominence. Standing loyally beside Johnson and his chief aid, the late Fred Goff, young Alexander fought courageously. That historic fight terminated in 1910 with the adoption of the Tayler grant, a document of great merit, the provisions of which still govern railway operation in Cleveland.

At various times during the railway fight Mr. Alexander prepared for Johnson numerous surveys of the various competing car systems and made many tests of their facilities and equipment. Shortly after the franchise settlement in Cleveland the young engineer went to Pittsburgh. There, at the age of 26,

Stanley. So in 1916 Mr. Stanley made him assistant to the president. His progress was rapid in this new position and it wasn't at all surprising when in April, 1919, there was another promotion. At that time he was elected to the office of vice-president.

Less than a year after going with the railway in 1916 the Colonel responded to the nation's call to arms, receiving an appointment of major in the administrative section of the construction division of the United States army. He entered service on Nov. 1, 1917, and continued in the army until November, 1918. Early in 1918 he was promoted to the rank of colonel.

A page from war records might serve best to describe Colonel Alexander's work as a member of Uncle Sam's fighting forces. Here it is:

He established and approved all labor rates and supervised all labor matters and conditions on all army construction projects in the United States and Porto Rico, on which as many as 400,000 laborers were engaged at one time and which in the construction division alone numbered approximately 500 and aggregated \$1,400,000,000 in value.

He conferred with labor delegations, determined prevailing union rates and con-

Alexander. He returned to Cleveland shortly after the war and was back at his job of assistant to Mr. Stanley for only a short time before he was elevated to the vice-presidency. As stated previously, he was 35 years old when he ascended to the office of vice-president, and now at 42 years becomes president.

In 1925, when buses were added to the service of the Cleveland Railway, Mr. Stanley assigned to Colonel Alexander the job of directing their operations. Today the bus is one of the chief cogs in the system of the Cleveland Railway.

As a boy Colonel Alexander was sent to a preparatory school in Canada. Some few years later he went to the University of Minnesota. After three years of study there he enrolled in the Case School of Applied Science, Cleveland, to complete his technical education. That was in 1901. In 1905 he was graduated with a degree of B.S. in mechanical and electrical engineering, and the following year the same institution conferred a fellowship upon him.

He is president of the Ohio Safety Council and likewise president of the Cleveland Safety Council. It might be

well to point out that largely through his efforts the annual International Safety Congress, with its 10,000 delegates, met in Cleveland last year. He is an ex-president of the Cleveland Engineering Society and long has been prominent in civic movements here.

#### PAUL E. WILSON

Other important changes in the organization were the advancement of Paul E. Wilson to the post of vice-president and of Ralph W. Emerson to a similar office. Mr. Wilson previously was secretary of the company and Mr. Emerson general manager. Each of these officials retains his former title in addition to the new one. Mr. Wilson has been secretary of the company since 1921. In that post he succeeded the late Henry J. Davies. Before that he had been assistant secretary of the company for two years and previous to that, from 1910, had been secretary to Mr. Stanley. While he was still attending high school Mr. Wilson worked for the railway as office boy and clerk for two summers. Upon his graduation he was for three years clerk to the superintendent at the operating headquarters of the company. He attended law school at Western Reserve University for two years and did newspaper work for the *Cleveland Leader* and the *Cleveland Press* for two years before becoming secretary to Mr. Stanley. Mr. Wilson has long been the point of contact between the company and the public through the press, although the other officers of the company were always accessible to the newspapers. Mr. Wilson is not yet 40 years old.

#### RALPH W. EMERSON

Mr. Emerson has been general manager of the company since 1922. In that year he succeeded in that post the late George L. Radcliffe, who had been vice-president and general manager. Before that, from 1915 on, he had been assistant superintendent of the company. Mr. Emerson's experience in the railway field has been varied and rather unusual. He was graduated in 1906 from the Case School of Applied Science as a mechanical and electrical engineer. Immediately thereafter he joined the engineering forces of the Cleveland Railway. In 1910 he resigned from the service of the company to install and operate the power plant of the New York & North Shore Traction Company at Roslyn, L. I. When this Long Island road was placed in service Mr. Emerson was made general superintendent. He continued in that capacity until 1915, when he rejoined the forces of the Cleveland Railway. He is 41 years old.

The promotions by the Cleveland Railway advance to the principal operating and executive posts of the company men all of whom are young, but officials well versed in the affairs of the company who in addition have the confidence and the respect of the public of Cleveland gained through years of operation under the late Mr. Stanley and fostered by each of the operating officials that served with him in directing the property.

A. C. Mellette, investigator for the claim department prior to his resignation early this year, has returned to the

Los Angeles Railway, Los Angeles, Cal., and will once more act as an outside investigator. Since leaving the company Mr. Mellette has been with the claim department of the St. Louis & San Francisco Railroad at Memphis, Tenn.

#### New Claims Attorney for All Insull Railroads

G. T. Hellmuth, for many years chief counsel for the Chicago, North Shore & Milwaukee Railroad and more recently of the Chicago Rapid Transit Company, has been appointed general claims attorney for the entire group of Insull transportation companies in and around Chicago. He will have complete supervision over the claims departments of the Chicago, North Shore & Milwaukee, Chicago Rapid Transit, Chicago, South Shore & South Bend and Chicago, Aurora & Elgin Railroads. His office will be located in the general executive headquarters of the four companies at 72 West Adams Street, Chicago. Mr. Hellmuth is a graduate of the John Marshall School of Law in Chicago and the greater part of his business career has been spent with the North Shore and Rapid Transit lines in various legal capacities.

#### Officials of Cleveland-Southwestern Advanced

Frank E. Hull, superintendent of the northern division of the Cleveland, Southwestern Railway & Light Company, Cleveland, Ohio, has been named superintendent of the southern division of the system. John Nester, general superintendent, will take over the superintendency of the northern division. H. A. Humphrey, train dispatcher of Elyria, also has been promoted to trainmaster.

Paul A. Beique has been appointed a member of the Montreal Tramways Commission, Montreal, Que. In this capacity he succeeds the late Paul E. Mercier, who had occupied the position for only about four months. Mr. Beique is a civil engineer.

Howard Wright, formerly of the claims department of the Puget Sound Power & Light Company, Seattle, Wash., has been appointed safety engineer for the Southwestern District to succeed the late Capt. David J. Kinzie.

J. D. Whittemore, vice-president and general manager of the Monongahela West Penn Public Service Company, Fairmont, W. Va., was elected president of the Public Utilities Association of West Virginia at the ninth annual meeting of that body, held recently at the Hotel Kanawha, Charleston, W. Va.

E. B. Gunn, superintendent of transportation and equipment of the Western Ohio Railway, Lima, Ohio, is resigning his position after a service of eight and one-half years with that property. His office was located at Wapakoneta. In the past few years the Western Ohio Railway introduced many economies in the mechanical department, reducing the cost of maintenance, increased its freight business and strived with success for a

clear record in the matter of accidents. In all of this work Mr. Gunn took an important part.

## Obituary

#### R. E. Breed

Richard Edwards Breed, well known in public utilities circles, died on Oct. 14 in Roosevelt Hospital, New York City. Mr. Breed, who was born in Pittsburgh, came to New York twenty years ago at the age of 40. Although a prominent figure in the entire utility field he was affiliated more particularly with the light and power industry. He was a director of the American Light & Power Company, the Electric Light & Power Corporation, the Carolina Power & Light Company, the Wheeling Bank & Trust Company and many other concerns.

Adolphe Alfred Dion, president of the Moose Jaw Electric Railway, Moose Jaw, Sask., died recently in Ottawa. He was one of Canada's most prominent electrical engineers and was recognized as an authority on electrical development. Mr. Dion was 67 years old.

Paul E. Mercier, a member of the Montreal Tramways Commission, Montreal, Que., since April, 1926, died recently when making a survey for the St. Regis Paper Company. In 1895 he was engaged as chairman on the Montreal Park & Island Railway and in 1896 and 1897 was identified with the Canadian Pacific Railway in the Quebec district. He served in many other engineering capacities in Montreal and Quebec. Mr. Mercier was born 49 years ago in St. Hyacinthe, Que. He was educated in engineering at the Polytechnique School, Montreal.

Frank W. Remick, member of the banking house of Kidder, Peabody & Company, Boston, Mass., died on Oct. 16 at the Massachusetts General Hospital. Mr. Remick's business connections were extensive and diversified. In the street railway industry he was well represented, being a director of the Boston Elevated Railway, the Middlesex & Boston Street Railway, the Puget Sound Electric Railway and the Puget Sound Power & Light Company. Mr. Remick was born in Boston in 1861. He received his education in the Boston public schools. In 1879 he entered the employ of Kidder, Peabody & Company, and had been connected with the concern continuously since that date. He became a member of the firm in 1905.

Capt. David J. Kinzie, for the past several years safety engineer for the southwestern district of the Puget Sound Power & Light Company, Seattle, Wash., is dead. The captain was noted for carrying on in the Tacoma public schools the safety educational work sponsored by the Safety Council. Captain Kinzie was born in Boston. His early business career was spent in Alaska, where he had charge of personnel and safety work in several large mines. During the war he was located at Camp Lewis, where he was chief personnel adjutant. At the close of the war he joined the forces of the company, where he served until his death.



## 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

### Baltimore to Have Interesting Tests on Pneumatic Car Wheels

A test set of pneumatic street car wheels has been prepared for the United Railways & Electric Company of Baltimore, Md., by the Hatfield Resilient Wheel Company, the J. G. Brill Company, the United States Rubber Company and the SKF Industries. One of these wheels was on exhibit in the J. G. Brill Company's space at the Cleveland convention. The theory of the wheel as worked out for application to railway usage is an adaptation of the Hatfield resilient wheel previously developed for truck and bus operation. Two pneumatic tubes are inserted into the circumference of the wheel to absorb all shocks and vibration before they reach the axle. These rubber pneumatic cushions are protected from all dirt, oil and heat by steel cover plates, the latter, however, allowing complete freedom of movement in a vertical direction.

The pneumatic tubes are bolted around their inner rim to the center steel section of the wheel and around their outer rim to the steel bearing surface which is applied to the rails. It is upon these bolted sections that the greatest strain will come in actual operation, due to braking, rapid acceleration, etc. If the pneumatic cushions are capable of withstanding the severe torque which will be applied to their rims the numerous advantages of the wheel will recommend it to widespread attention in the railway field. The test to be conducted in Baltimore will, therefore, be watched with considerable interest.

The air pressure in both tubes is equalized by dual connections from an air locking valve stem. The two tubes are placed side by side and are of equal cross-sections. The only metallic connection between the outside wheel surface and the inner wheel section is a ground connection of flexible wire.

### Templeton, Kenly Company Stages a Prize Letter Contest

An opportunity to gain a little extra Christmas money has been offered to roadmasters, supervisors of track, their assistants and track foremen by the manufacturers of the Simplex jacks, in the way of a prize contest for letters telling about the use of Simplex tie-spacing shoes.

For ten letters that best describe and explain the different kinds of work done with the tie spacers, and which also tell how they were used and the results obtained, cash prizes from \$100 to \$10 will be awarded.

There are no special conditions to be followed. Letters may be written in pencil, ink or on a typewriter, and one contestant may write and submit as many letters as he wishes.

The contest closes Dec. 1 and the judges, who will be three maintenance of way engineers, will select the winners before Christmas. Details of the contest may be obtained from Templeton, Kenly & Company, Ltd., Chicago, Ill.

### Widespread Use of Timken Bearings in Buses

An interesting point was brought out by the Timken Roller Bearing Company of Canton, Ohio, when a check-up by that company's representative indicated that of the 85 buses of 21 different makes displayed at the Cleveland convention of the American Electric Railway Association Timken bearings were included as regular equipment in every bus. The company states that this has also been true at other recent shows where buses have been exhibited. Efforts are now being made to bring about a widespread adoption of Timken bearings in electric railway cars, for both passenger and freight service.

### F. H. Shepard Comments on Pennsylvania Railroad Order

Announcement was made in the issue of *ELECTRIC RAILWAY JOURNAL* for Oct. 9 of the large equipment order just placed with the Westinghouse Electric & Manufacturing Company by the Pennsylvania Railroad. It is considered to be of outstanding interest by railway and electrical equipment men because of its value in indicating the trend toward heavy traction electrification by the major railroad systems.

Commenting on this recent order, F. H. Shepard, director of heavy traction operation of the Westinghouse company, said:

This commitment and the announcement of the plans for this important work by the Pennsylvania Railroad presages one of its most important activities since the war and indicates the time when New York will be linked to Philadelphia and Washington by electric service. The railroads have been making great strides in efficiency since their return from government operation, and traffic handling within the past month exceeded all previous records in America. And this with a freedom of movement and efficiency undreamed of during the dark days of the war and subsequent thereto.

It is confidently believed that railroad conditions, as well as business generally, are reaching their normal stride and that the increment of growth may now be expected to follow year after year just as obtained before the war. This means provisions for increased capacity for traffic movement, and in many cases electrification to enable the increased service to be undertaken where physical restrictions make increased tracks and facilities impossible.

It is well known that electrification will double the capacity over steam operation, and the last evidence of this is the example of the Virginian Railway, which completed the extension of its electrification to Roanoke, Va., last week. Here train operation under mountain grade conditions and for fast freight train service are demonstrating the maximum realized in the world today, 9,000-ton trains being hauled by a single locomotive at 28 miles an hour and mountain grade operation accomplished with 2,000 hp. per single train, more than double any performance accomplished by steam.

### Chromium Corporation of America Has Been Formed

A company known as the Chromium Corporation of America has been organized to take over the patents of the chromium plating process developed by the Chemical Treatment Company and the Chromium Products Corporation, the latter a subsidiary of the Metal & Thermit Corporation. This new company will have plants and branch offices in most of the leading industrial centers.

John T. Pratt, president of the Chemical Treatment Company, will continue in that office and also be chairman of the board of the new corporation, of which Dr. F. H. Hirschland will be president. The latter is also president of the Metal & Thermit Corporation. Vice-presidents in charge of operations will be Louis C. Owens, Jr., Dr. Erich A. Beck, and Richard Loengard. In addition to the above officers, the directors will consist of a prominent and financially strong group of men.

In announcing the formation of the new corporation, Mr. Pratt made the following statement:

Manufacturers of metal products have followed with the greatest interest the rapid development of chromium plating during the past few years. Knowing the properties of chromium, particularly its extreme hardness and ability to resist acids, high temperatures and all sources of tarnish, corrosion or discoloration, they have felt that it would only be a matter of time before chromium plate would become a standard finish for many types of metal products.

The new corporation will take over and operate the Chromium Products plant in Jersey City and the Chemical Treatment plants in New York and Waterbury. Plans are also being formulated for the opening of new plants at Carteret, N. J.; East Chicago, Ind., and South San Francisco, Cal., in each of which the Metal & Thermit Corporation now has plants, as well as in Chicago, Detroit, Cincinnati, Akron, Philadelphia, Pittsburgh and Cleveland. The company's expansion program contemplates a national service within two to three years.

Having taken over from the Chemical Treatment Company its trade name, "Crodon," which will hereafter stand for chrome plate as applied by the Chromium Corporation of America or its licensees, the company will inaugurate immediately an intensified selling, merchandising and engineering campaign which will cover manufacturers of certain types of metal products throughout the country. The Chemical Treatment Company policy of limiting the use of Crodon to manufacturers of quality products will be rigidly adhered to. At the same time, the educational advertising, designed to inform manufacturers, the trade and the public of the many advantages of Crodon will be intensified.

### Credit Where Credit Is Due

The Cutter Company, Philadelphia, Pa., appreciates its employees. Furthermore, it does not hesitate to express that appreciation in some tangible way. Recently the company published a handsome little volume entitled "Experience Is Master." In this book are pages and pages of pictures and interesting little sketches of the many members of the Cutter organization who have helped to build up the company's prestige as a manufacturer of circuit breakers and other electrical protective devices since 1888.

Only men who have served the Cutter organization for ten years or more are introduced to the readers of the book. But there are many of these, and in looking over the various sketches it is possible to obtain a very good idea of the spirit which imbues all of the members of the Cutter organization.

### Comfort Features Are Provided in New Ruggles Bus

Service on long interurban runs and special tours has been particularly considered by the Ruggles Motor Truck Company of Saginaw, Mich., in designing its new 26-passenger touring coach, which has just been placed on the market. Heretofore one of the drawbacks in using motor buses for long-distance runs has been the lack of comfort facilities for the passengers. The Ruggles company has attacked this problem by installing complete lavatory and toilet facilities in its bus.

The body is mounted on the standard Ruggles model 70 coach chassis, with a 236-in. wheelbase, powered with a 105-hp., six-cylinder motor, with double reduction drive. The bus is equipped with 34x36-in. pneumatic cord tires, with dual rear tires on Budd steel disk wheels. Gruss transport type air springs are used on the front.

Sufficient headroom has been provided in the interior arrangement of the bus to allow the average person to walk through the aisle without stooping. Pullman seats with arms and special backs have been installed. These are covered with a high grade of striped mohair. The window sashes are of brass construction, Pullman type, with maximum openings. The floor is covered with battleship linoleum and over this covering, in the aisle, is Wilton carpet. Pillar mirrors are installed between the windows, together with double coat hooks and combination ticket holders. All dome lights are protected with non-glare shields. Over the rear wheel housings are built side seats with ample space between the seats for a portable lunch or card table. An electric buzzer system, electric clock and adjustable driver's seat are other standard equipment featured.

Running the entire length of each side of the interior and above the seats of this bus are individual luggage racks. They are nickel-plated and placed high enough to be out of the passenger's way, yet easily accessible for handling small baggage parcels and heavy wraps



Comfort Is Carried to the Point of Luxury in the Interior Fittings

and small grips. Space is provided on the roof for taking care of large luggage requirements.

The lavatory is situated in the right rear side of the bus and is finished in mahogany paneling. It is economical in the space it consumes and is built under strictly sanitary conditions. The lavatory includes toilet, ice water tank, large mirror or heavy plate glass and a porcelain wash bowl with running water. The installation of this lavatory relieves the necessity of providing the necessary long rest period which has heretofore been given in long distance operation.

The new bus was on display at the American Electric Railway Association convention which was held in Cleveland, Ohio, Oct. 4 to 8. Visitors at the convention were given an opportunity to inspect every new detail of its construction.

### Fifth National Power Show to Be Held

The Grand Central Palace in New York City will be the scene of the Fifth National Exposition of Power and Mechanical Engineering, to be held from Monday, Dec. 6, through Saturday,

Dec. 11. On exhibition there will be heat and power generating apparatus, hoisting and conveying equipment, power transmission equipment, machine tools, refrigerating machinery and heating and ventilating machinery.

In addition an elaborate program of the latest films showing engineering and industrial progress will be displayed.

The fifth exposition will include exhibits of 500 manufacturers and will occupy four floors in the Grand Central Palace, the largest exposition of its kind ever held in this country. The American Society of Mechanical Engineers will hold its annual meeting in the Engineering Societies Building on dates included by those of the Power Show, as will also the American Society of Refrigerating Engineers.

### Electric Locomotives for Rack Railroads

Several electric locomotives of a new type, intended for use on rack railroads, are at present in course of construction at the works of the Brown-Boveri Company in Mannheim, Germany. A number of these are intended for service on a section of the Andes railroad, operated by the Chilean Transandine Railway. The engines for this line weigh 85 tons and are fitted with six motors, each capable of developing 235 kw. for one hour, with a continuous output of 195 kw. These units will operate on 3,000 volts d.c. With a total hourly capacity of about 1,400 kw., these locomotives are claimed to be the most powerful of their kind so far constructed.

The remainder of the locomotives now being built are intended for service on the Asui Pass in Japan. The section includes a ramp about 600 yd. in length with a gradient of 6.7 per cent. Direct current at 600 volts is supplied by means of a third rail system. The engines are equipped with three motors having a one hour capacity of 200 kw. and a continuous capacity of 160 kw.

Work is being rapidly pushed on all of these units with a view to delivery in the near future.

### Electric Railway Orders for Haskelite and Plymetl

In the recent issue of "The Lightweight Champions' Record," published by the Haskelite Manufacturing Corporation, Chicago, Ill., the following orders for Haskelite and Plymetl received from electric railway companies were listed:

Rochester & Syracuse Railroad—Plymetl to replace steel on a 45-ton interurban car.

Indianapolis Street Railway—Haskelite for headlinings of twelve cars.

Houston Electric Company—Plymetl for side panels.

West Penn Railroad—Plymetl for side panels in rebuilt cars.

Chicago, Milwaukee & St. Paul Railroad—Haskelite for interior trim in five gas-electric cars.

Twin City Motor Bus Company—Plymetl for side panels.

Peoples Motor Bus Company—Haskelite for roofs and headlinings in 25 double-deck buses.



New Ruggles Coach Which Was on Display at the American Electric Railway Association Convention in Cleveland

## Every One Has a Good Word for Cleveland Exhibit

**Manufacturers Were Not Loath to Demonstrate Their Faith in the Industry by Making Possible the Largest Display Ever Staged—Total Registration 8,623; Total Indoor Space Sold 119,007 Sq.Ft.**

AND still the figures go up. This year there were 119,007 sq.ft. of exhibit space sold at the Cleveland convention of the American Electric Railway Association. Oddly enough, the total amount of space available for exhibits came to the same total of 119,007 sq.ft. Nor was there any lack of manufacturers, who, like the famed virgins of Hebraic times, had failed to safeguard themselves by making advance preparations, and found at the last moment that the doors were shut to them. As a result of this year's work the crown of Fred Dell, director of exhibits, might be said to bear many jewels. Brightest of these is the sparkling record of 41 street cars and other rolling stock which was placed on exhibit. Twenty-six were for passenger service and the remainder consisted of freight and service equipment.

The best that had ever been mustered in previous exhibits was 11 cars. And yet in the first half of this year the purchases of rolling stock had reached a low ebb. It seems that the manufacturers have set up against this a high tide of enthusiasm, for no cost was spared in preparing the exhibits at Cleveland.

### REGISTRATION SETS NEW RECORD

This year the total registration at the convention was 8,623 and the total number of manufacturer members listed was 423. Both of these figures surpass by large margins any records which have been set up in the past. A

comparison of these various totals for the past six years might be interesting:

Year	Where Held	Registration	Sq.Ft. of Space Sold	No. of Mfg. Co.
1921	Atlantic City	1,189	No exhibit	225
1922	Chicago	4,200	61,895	244
1923	Atlantic City	4,404	75,681	274
1924	Atlantic City	5,804	86,349	330
1925	Atlantic City	7,147	100,030	371
1926	Cleveland	8,623	119,007	423

Naturally it was impossible, with the tremendous amount of material on display, to consolidate all of the exhibits on one floor, or even in a single building. But the co-operation of the city authorities in Cleveland made it possible to have available a supplementary building, known as the West Wing, by the time the exhibits began to arrive. Most of the bus and bus equipment manufacturers were assigned space in this wing but there were also many trackwork, steel castings, and similar displays there. Then there was the regular exhibit hall downstairs in the auditorium building, which housed most of the balance of the indoor exhibits. There were a few large booths on the arena floor proper.

Much to the satisfaction of the exhibitors the crowds circulated very well during the several days of the convention and the fears which had been expressed by some that they would be overlooked due to their locations in the west wing or in the downstairs exhibit proved ill founded. Mr. Dell sent out a questionnaire to the various exhibitors recently to get the

reaction of each company to the convention as a whole and to the general arrangements and handling of the exhibit. Replies from these sources have been most enthusiastic. Exhibitors were particularly impressed with the excellent facilities which Cleveland had available for handling shipments of display material and for setting up and generally facilitating the progress of the show.

It has been said before that one of the most outstanding features of the whole exhibit was the generous display of rolling stock, both passenger cars and freight and service equipment. It does no harm to emphasize this point by occasional repetition. The cars were not only conspicuous by their numbers; they indicated such strides forward in appearance, comfort, reduction in weight, and in general operating efficiency that they could not but prove of monumental inspiration to the railway men there assembled.

### MANY UNEXPECTED LINES REPRESENTED

But the many other features of the exhibit were not without their own significance. When one stepped into the west wing he was literally dazzled by the display of buses—bodies, chassis and complete units. Certainly the last word in the artistic as well as in sturdy dependability was very much in evidence there.

Almost every conceivable line of railway supplies was represented in the Cleveland show. And there was a surprising array of materials which would not, at first glance, strike one as being subject to great demand in this industry. All of which goes to prove that the electric railway field is being looked upon with increasing favor by manufacturers in general as one worthy of thorough exploitation and development as a major channel for marketing goods.



Even the Rain Could Not Keep the Crowds from Inspecting the Car Exhibits

## Rolling Stock

Boston Elevated Railway, Boston, Mass., has purchased eight 29-passenger city type Mack buses. Two of these units will be used between Allston and Cambridge and the remaining six are classed as "extras."

Honolulu Rapid Transit Company, Honolulu, Hawaii, is asking for tentative bids and preliminary specifications for twelve additional cars. This will bring the total of cars owned up to 83.

Los Angeles Railway, Los Angeles, Cal., received six new buses from the Fageol Motor Company of Oakland, Cal. during the month of August. Among these were included one four-cylinder street car type bus, four six-cylinder street car type buses and one double-deck bus. All but the four-cylinder unit were equipped with air brakes.

Hamilton Street Railway Company, Hamilton, Ont., Canada, is preparing to order 24 new double-truck street cars, according to an announcement recently made by the Dominion Power & Transmission Company.

Chicago & Northwestern Railroad, Chicago, Ill., has placed an order for five 72-ft. gas-electric rail cars with the Electro-Motive Company. These units will be practically identical with the three cars which were delivered to the railroad in May. They will have seats for 42 passengers, and in addition each will have a 15-ft. railway post office and a 16-ft. 8-in. baggage compartment.

Maryland & Pennsylvania Railroad, Baltimore, Md., has ordered one 72-ft.

gas-electric rail car for all-passenger service from the Electro-Motive Car Company. This car will be equipped with a model No. 120 power plant.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has purchased one six-cylinder parlor-car type Fageol bus equipped with Westinghouse air brakes for use in suburban service out of Milwaukee.

## Track and Line

Virginia Electric & Power Company, Richmond, Va., is making rapid progress on the extension of its Norfolk trolley line to Port Norfolk and Pinners Point and expects to have the improved service in operation early in October. A part of the old line is being double-tracked and a single-track extension for some distance is being laid. Total new trackage is around 15,000 ft. The company will improve its High Street lines, laying 12,200 ft. of new trackage.

Los Angeles Railway Corporation, Los Angeles, Cal., has applied to the Railroad Commission for permission to construct a double track in Leonis Boulevard between Pacific Boulevard and Downey Road in the city of Vernon.

Pacific Railway, San Jose, Costa Rica, will be electrified, according to a recently approved contract between the government of Costa Rica and the Allgemeine Elektrizitäts-Gesellschaft of Berlin. The electrified portion of the railway will extend from San Jose to Punta Arenas, the Pacific port.

Honolulu Rapid Transit Company, Honolulu, Hawaii, was given authority by the Public Utilities Commission to

spend \$31,124 in double-tracking Puna-hou Street from Wilder Avenue to below Dominis Street.

Gary Railways, Gary, Ind., has started laying a second track on its Hammond line in Eleventh Avenue, Gary, for a distance of  $\frac{1}{2}$  mile between the Pennsylvania Railroad crossing and Rutledge Road. The work will be completed in about two weeks. At the request of residents along Eleventh Avenue the company has willingly agreed to remove its poles from the center of the street and to erect poles near the curb line from which the trolley wires will be suspended. The cost of the entire undertaking, including the realignment of poles, is estimated at \$25,000.

## Trade Notes

American Brown Boveri Electric Corporation, Camden, N. J., announces that four district offices of the company have now been established. These are located at 165 Broadway, New York City; 842 Summer Street, Boston, Mass.; 922 Witherspoon Building, Philadelphia, Pa., and 230 S. Clark Street, Chicago, Ill.

American Steel & Wire Company, Chicago, Ill., has announced that the scope of its Birmingham, Ala., office will be enlarged to cover all of the products manufactured by the company. J. J. Gilmore has been promoted to be manager of sales in the Birmingham district, covering Alabama, Mississippi and Louisiana.

J. H. Bunnell & Company, Inc., New York, N. Y., announced the removal of its factory location to new and larger quarters at Pearl and Prospect Streets, Brooklyn, N. Y. The main office and warehouse will continue to be located at 32 Park Place, New York City.

## ELECTRIC RAILWAY MATERIAL PRICES—Oct. 19, 1926

### Metals—New York

Copper, electrolytic, cents per lb.	14.15
Lead, cents per lb.	8.35
Nickel, cents per lb.	35.00
Zinc, cents per lb.	7.68
Tin, Straits, cents per lb.	70.50
Aluminum, 98 to 99 per cent, cents per lb.	27.00
Babbitt metal, warehouse, cents per lb.	
Commercial grade.	63.00
General service.	32.50

### Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads.	\$6.50
Somerset mine run, Boston.	2.20
Pittsburgh mine run, Pittsburgh.	2.225
Franklin, Ill., screenings, Chicago.	1.525
Central, Ill., screenings, Chicago.	1.45
Kansas screenings, Kansas City.	2.35

### Track Materials—Pittsburgh

Standard steel rails, gross ton.	\$43.00
Railroad spikes, drive, Pittsburgh base, cents per lb.	2.90
Tie plates (flat type), cents per lb.	2.30
Angle bars, cents per lb.	2.75
Rail bolts and nuts, Pittsburgh base, cents, lb.	4.20
Steel bars, cents per lb.	2.00
Tie, white oak, Chicago, 6 in. x 8 in. x 8 ft.	\$1.45

### Hardware—Pittsburgh

Wire nails, base per keg.	2.65
Sheet iron (24 gage), cents per lb.	3.00
Sheet iron, galvanized (24 gage), cents per lb.	3.85
Galvanized barbed wire, cents per lb.	3.35
Galvanized wire, ordinary, cents per lb.	2.50

### Waste—New York

Waste, wool, cents per lb.	12-18
Waste, cotton (100 lb. bale), cents per lb.	
White.	13-17.50
Colored.	10-14

### Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	11.2
Whitelead in oil (100 lb. keg), cents per lb.	15.25
Turpentine (bbl. lots), per gal.	\$0.90
Car window glass, (single strength), first three brackets, A quality, discount*.	84.0%
Car window glass, (single strength), first three brackets, B quality, discount*.	86.0%
Car window glass, (double strength) all sizes, A quality, discount*.	85.0%
Putty, 100 lb. tins, cents per lb.	5.25-5.50

\* Prices f.o.b. works, boxing charges extra.

### Wire—New York

Copper wire, cents per lb.	16.25
Rubber-covered wire, No. 14, per 1,000 ft.	\$5.75
Weatherproof wire base, cents per lb.	17.75

### Paving Materials

Paving stone, granite, 5 in. New York—Grade 1, per thousand.	\$147
Wood block paving 3 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4, 16 lb. treatment, N. Y., per sq. yd.	\$2.70
Paving brick 3 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4, N. Y., per 1,000 in carload lots.	51.00
Paving brick 3 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4 N. Y., per 1,000 in carload lots.	45.00
Crushed stone, 1-in., carload lots, N. Y., per cu. yd.	1.94
Cement, Chicago consumers' net prices, without bags.	2.10
Gravel, 1-in., cu. yd., f.o.b. N. Y.	1.75
Sand, cu. yd.; f.o.b. N. Y.	1.00

### Old Metals—New York and Chicago

Heavy copper, cents per lb.	11.50
Light copper, cents per lb.	9.75
Heavy brass, cents per lb.	7.25
Zinc, old scrap, cents per lb.	4.25
Lead, cents per lb. (heavy).	\$6.875
Steel car axles, Chicago, net ton.	\$17.25
Cast iron car wheels, Chicago, gross ton.	14.75
Rails (short), Chicago, gross ton.	16.75
Rails, (relaying), Chicago, gross ton.	28.50
Machine turnings, Chicago, gross ton.	6.50

## New Advertising Literature

Martindale Electric Company, Cleveland, Ohio, has issued its most recent catalog on commutator, slotting and grinding equipment and various motor maintenance specialties. This is catalog No. 7.

J. G. Brill Company, Philadelphia, Pa., has issued a leaflet describing the Brill 177-E truck for light-weight cars. Detailed information on the various component parts of the truck is given. Dimensions for the Brill 177-EX, 177-E1X and 177-E1 trucks are included.

Wright Manufacturing Company, Lisbon, Ohio, has published a new catalog, No. 11, which is said to be one of the most comprehensive handbooks on chain hoists, trolleys, hand cranes and allied equipment ever prepared. It contains not only cuts and general descriptive matter but also line drawings giving all dimensions and clearances of the various products.

American Brown Boveri Electric Corporation, New York, N. Y., has published descriptive circular No. 200 on turbo-compressors and blowers. Compressors and blowers for various industrial applications are listed.

# PEACOCK STAFFLESS BRAKES



### *Make this trial:*

*Let us send you a Peacock Staffless Brake to test. Try it out in fair competition with any other brakes. Slack off the brake until full piston travel is required to set brake; release air brakes; then try to set hand brake. Will it hold?*

## *Are Dependable Brakes*

With a braking power three times that of the ordinary hand-brake, and almost unlimited chain-winding capacity, Peacock Staffless Brakes are a guarantee of safety when emergency stops are necessary.

No matter what condition of brake rigging exists, any length of brake-chain can be handled by Peacock Brakes. Even up to 12 feet if necessary.

Will your hand brakes do this? Or will they jam after taking a few turns on the brake drum. Peacock Staffless Brakes wind chain over the drum, and drop it in the capacious housing below.

Modern cars are equipped with Peacock Staffless Brakes because of minimum platform space occupation, simplicity of operation and low installation and maintenance costs.

## National Brake Company

890 Ellicott Square

Buffalo, N. Y.

*Canadian Representative*

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



# Real Power Brakes

What they are and what they will do for you.

True power brakes—air brakes of the correct design—are complete braking units in themselves and are not simply conventional mechanical brakes operated by power.

Only by completely eliminating from the service brake the elements which are the *cause* of their unreliability and troublesome habits can they be made reliable in operation and, by present standards, more nearly trouble-free than any other operating part of the vehicle. To the operator this holds forth the promise of important reductions in the cost-per-mile of operation, and there is nothing, unless it be traffic, that is more vital to profits than cost-per-mile.

Christensen Air Brakes are Real Power Brakes. They are not a compromise or an accessory. They must be built into the chassis, but once installed are without equal for effective control and low cost of maintenance.

Power is applied to the brake shoes by pistons operating in cylinders inside the brake drums. The thrust of these pistons is transmitted directly to the ends of the brake shoes by powerful

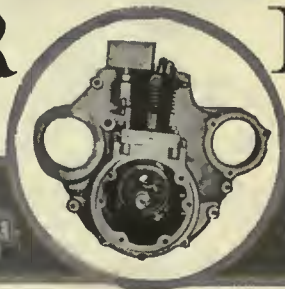
levers interposed between the piston stems and the ends of the shoes. Seal-tite all-metal pistons are used in the brake cylinders—impervious to oil and brake heat—and the piston travel is sufficient to wear out the liners. In addition, Christensen Brakes are, by the very nature of their design, inherently self-equalizing. Hence, no adjustments are required from the time the brakes are originally set up until the liners are completely worn out. All outside service brake rigging—cams, pull-rods, cables, levers, and mechanical equalizers—is eliminated.

Real Power Brakes—Christensen Air Brakes—will reduce your brake maintenance cost, increase the life of your brake liners, reduce your accident hazard, enable you to make faster schedules with safety, make your drivers better and more alert by reducing braking fatigue, and promote public confidence. Figure it out yourself. It is expensive to be without them.

*When you buy buses specify definitely "Christensen Air Brakes"—the Real Power Brake.*

# Christensen AIR BRAKES

CHRISTENSEN  
6513 Cedar Ave.



AIR BRAKE CO.,  
Cleveland, Ohio





# *The Most Modern Motor Coach*

Because of their unusual record for satisfactory and profitable operation, the Fageol Safety Coach and the Hall-Scott Engine were chosen by the American Car and Foundry Company as the automotive units with which it placed itself in position to supply equipment in the highway transportation field.

As a further step in this same direction, we introduced at the American Electric Railway Association Convention this month, an entirely new coach—the A. C. F. This coach is designed for heavy duty service, has stronger frame and structure, four-wheel brakes, and ample springs, making it adaptable to the severest conditions of overload and speed imposed by mass transportation requirements.



American Car and Foundry Motors Company  
30 Church St., New York

# Budd-Michelin Dual Wheels

## . . . first aid to better buses

## and better profits

**E**ARLY venturers in the bus industry saw that if buses were faster, more comfortable to ride in, more people would ride in them.

They realized that this meant putting their heavy buses on pneumatics—that was the problem.

There was one wheel that could solve it. A wheel that had proved its stamina on the war-torn roads of France—that had triumphed under tests where other wheels had perished—the Budd-Michelin Dual Wheel.

Bus owners adopted it. It brought

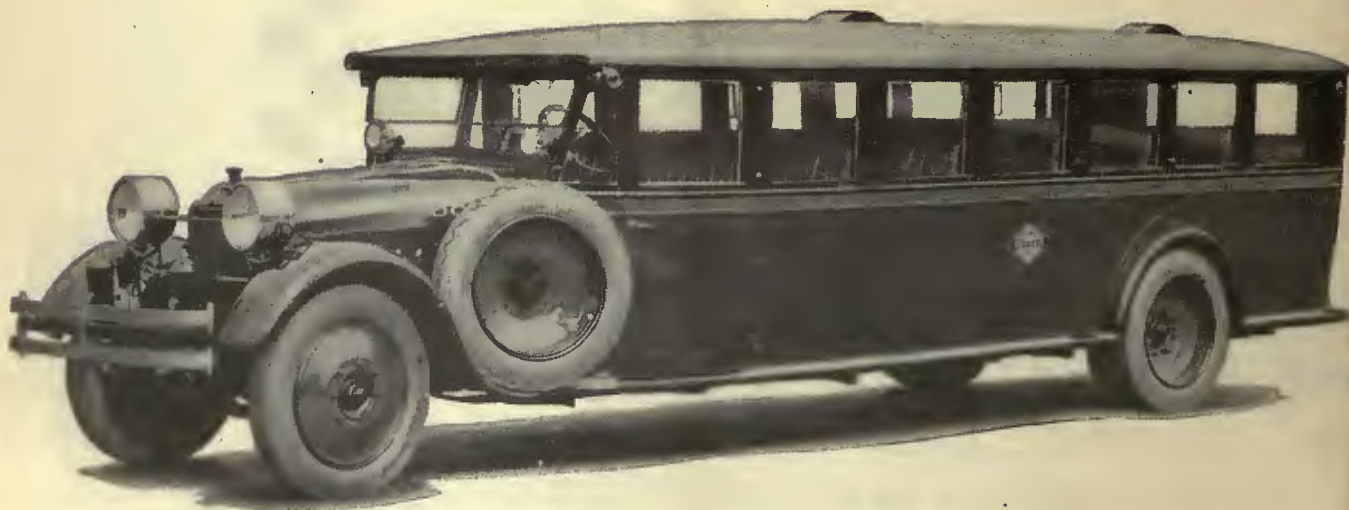
speed, passenger comfort—and more. It gave the heavy bus low body suspension with greater seating capacity. It cut servicing costs by making one-size wheels and tires standard throughout the fleet. And it boosted tire-mileage—made it possible for heavy buses to get from 15,000 to 20,000 miles from a set of pneumatics.

Veteran bus owners have never been wooed away from Budd-Michelin Duals. Over 40,000 buses are equipped with them—and this fact alone is a safe guide to follow.

# BUDD

## WHEEL COMPANY

*Detroit*



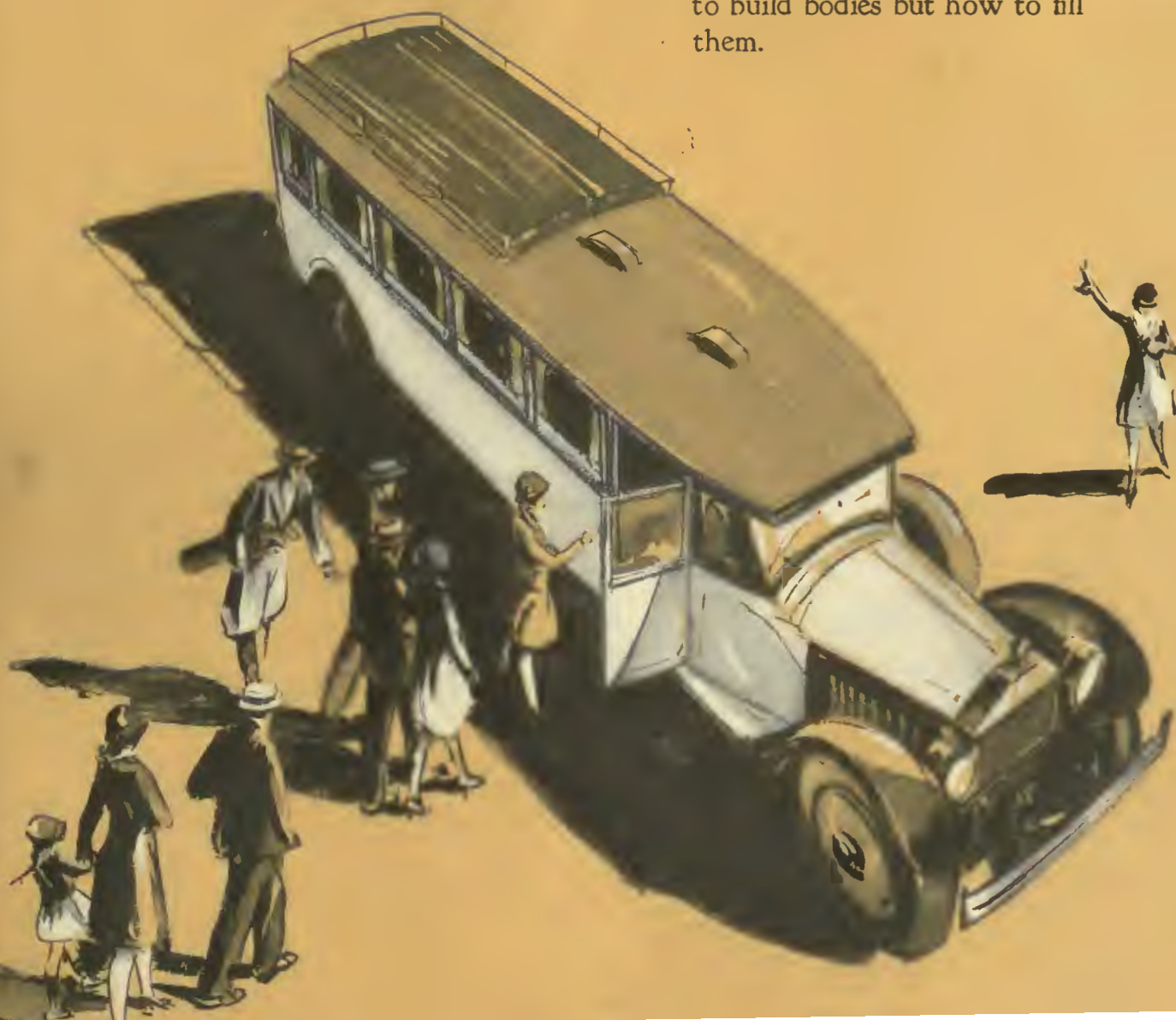
*The Budd-Michelin equipment—two Budd-Michelin single wheels in front, two Budd-Michelin Dual Wheels in the rear (pairs of single wheels acting together as units). All wheels completely interchangeable either as units or as halves of Duals. One spare.*



# *The Attractive Body draws everybody*

Into every detail of a Lang Body is built an invitation to ride, a carefully studied program for attracting passengers that draws them off the curb—

For Lang not only knows how to build bodies but how to fill them.



# LANG BODIES

*create new passengers*



There is a personal touch of luxury about Lang Bodies that wins the passenger, indicating a characteristic of Lang body-building that dates back to the days when Lang built fine carriages and coaches for private use.

THE LANG BODY COMPANY  
CLEVELAND, OHIO

*"After all—  
it's the Setting  
that counts!"*





## Are You Going to "Carry On" from Cleveland?

EVERYONE agreed at Cleveland that electric railway service can and should be vigorously *sold*. Public relations work was an outstanding topic of discussion and many operators made up their minds to see what could be done for their own properties in this connection.

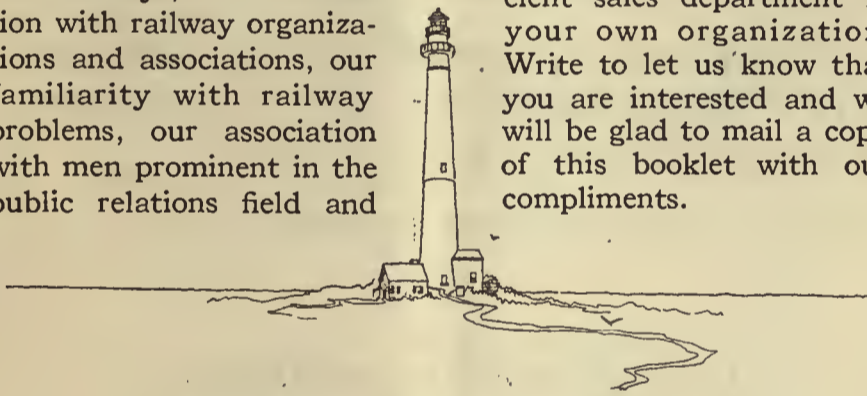
Convention enthusiasm, however, is apt to wane when once we are back in harness. Are you one of those who are really going to "carry on" from Cleveland?

We announced, at this convention, our readiness to undertake productive public relations work for the electric railways. We discussed our experience in advertising to the railways, our connection with railway organizations and associations, our familiarity with railway problems, our association with men prominent in the public relations field and

the clearing house we have established for exchange of public relations experience.

A number of well-known properties are now consulting us in this respect and, if you too are interested in the active selling of your service, we hope you will not hesitate to get in touch with us.

As a first step—if you did not pick one up in Cleveland—we suggest that you obtain a copy of our booklet "Selling Transportation." This booklet outlines our ideas upon the subject and explains just how we work. We do not, for instance, handle merely the advertising end of these activities, but enter into every phase of public relations work, including the training and establishment of an efficient sales department in your own organization. Write to let us know that you are interested and we will be glad to mail a copy of this booklet with our compliments.



Doyle, Kitchen & McCormick, Inc.  
2 WEST 45<sup>th</sup> STREET, NEW YORK,



## Does Your Grocer Use Scales?

**H**E DOES!—Because you expect him to weigh your orders of bulk goods. If he didn't you would assuredly change your trading place.

The same thing is true with circulation. During the last few years Advertisers have not been satisfied to *suppose* they were getting a certain circulation for their money; they don't want to be merely *told*, they want to *know*.

They want the circulation measured by a standardized and unquestionable measurement.

The *Audit Bureau of Circulations* is the recognized authority for proving circulation. It is maintained as a co-operative organization by the advertisers, advertising agencies and publishers who realize the necessity for businesslike methods in advertising.

A. B. C. reports place in the hands of advertisers, essential facts that have been secured and verified by a searching examination of the publisher's records.

You don't need to buy Space by Guess!

*You can get the full circulation facts on  
Electric Railway Journal by referring  
to the last A. B. C. report which will be  
gladly furnished on request.*

*Street Railway History  
Repeats Itself With*

# GRAHAM BROTHERS MOTOR COACHES

Excessive costs, a few years ago, checked the tendency towards larger and heavier street cars. Engineers strove for less weight, better distribution of it. Then figures confirmed the efficiency of the lighter, smaller street car.

History repeats. The tendency in motor coaches has gone through the same stages—but much more rapidly.

More and more street railways are putting into service Graham Brothers 21-Passenger Street Car Type Motor Coaches.

They best fit the all-day-load requirements. Their initial cost is low. Operating and maintenance costs are low. The coach is so attractive in appearance it invites patronage—so comfortable and dependable it wins preference over private automobiles.

Your Dodge Brothers dealer will give you any information about Graham Brothers Motor Coaches.

Street Car Type

\$ **3815**

*f. o. b. Detroit*

Complete With Body  
to Seat 21 Passengers

Parlor Coach

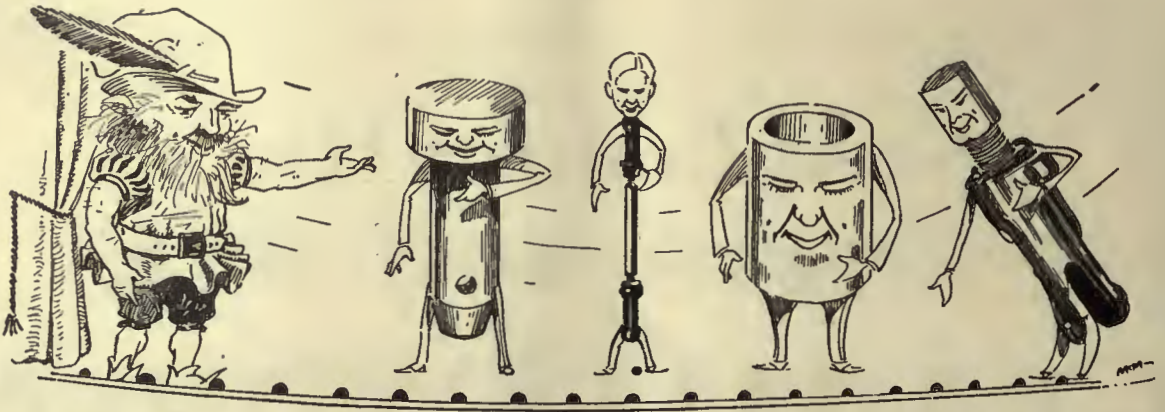
\$ **3750**

*f. o. b. Detroit*

Complete With Body  
to Seat 12 Passengers

**GRAHAM BROTHERS**

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



## Judge them by the encores—

Encores to the actor are what repeat orders are to a car part. For this is the tangible means of judging their popularity and ability.

Judged on the basis of repeat orders Boyerized Parts are popular products in the electric railway industry. Such success can be easily traced to the fact that the Boyerized Process enables Boyerized Parts to outlast ordinary steel parts three to four times.

Pick out the parts you need—then send for quotations.



The  
McArthur  
Turnbuckle

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

**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.

100 · YEARS · OF · MANUFACTURING · EXPERIENCE ·



Cane  
Webbing  
for Car Seats

No. 327-M—Special

## Greater Comfort in This H-W Interurban Seat

Closer placement in cars and greater passenger comfort with increased leg room are outstanding features of this Heywood-Wakefield interurban car seat model. Mechanism rails are set in. The deep double spring cushions have chamfered edges. Individual backs are specially shaped and pitched to meet the best ideas of comfort without sacrifice of car room.

It is one of a series of new H-W Electric Car seat models equally suitable for either new cars or replacements.

Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W Sales Office.

*Heywood-Wakefield*  
REG. U.S. PAT. OFF.

### HEYWOOD-WAKEFIELD SALES OFFICES

Heywood-Wakefield Company, Wakefield, Mass.

Heywood-Wakefield Company,  
516 West 34th St., New York, N. Y.

Herbert G. Cook,  
Hobart Bldg., San Francisco, Cal.

The G. F. Cotter Supply Co.,  
Houston, Texas

Heywood-Wakefield Company,  
439 Railway Exchange Bldg., Chicago, Ill.

Frank N. Grigg,  
630 Louisiana Ave., Washington, D. C.

Railway & Power Engineering Corporation,  
133 Eastern Ave., Toronto;  
Montreal; Winnipeg, Canada



## Knowledge of Industry

In the heart of the industrial centers of America, the McGraw-Hill Publishing Company has placed its district offices—that manufacturers may have available quickly and conveniently the McGraw-Hill service, data and knowledge of industry.

Every manufacturer who would sell industry more efficiently is now almost in the shadow of a McGraw-Hill office. Right at his elbow is the identical knowledge of industry and industrial marketing which has proved of such value to manufacturers who have availed themselves of it.

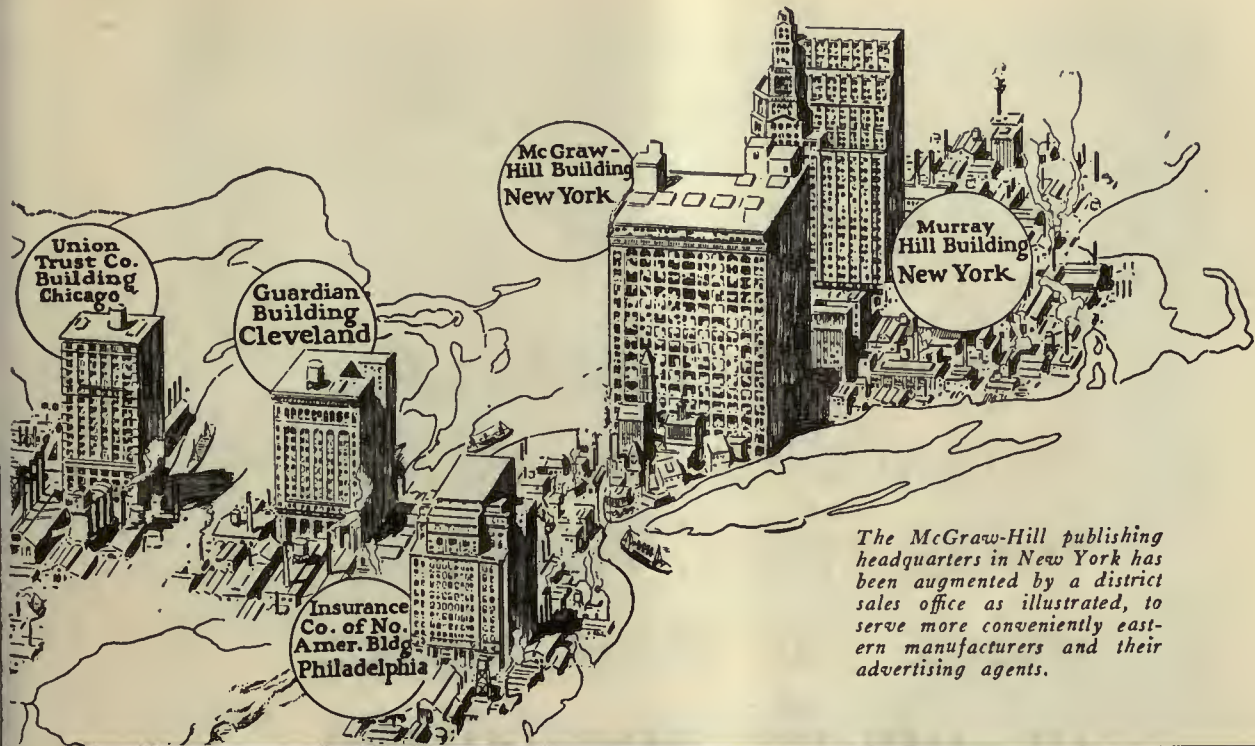
Each office is in charge of a district manager, who, through previous experience in industry or long service with McGraw-Hill, is well qualified to counsel with manufacturers on methods of selling to industry. His staff includes Marketing and Advertising men who have been drawn from industry, and whose contacts with industry are kept fresh by constant work on industrial selling problems.

Back of these men, as a reserve force of the district office, are the entire McGraw-Hill editorial, circulation, marketing and advertising staffs. Manufacturers consulting these district offices are thus assured all of the McGraw-Hill resources in applying the McGraw-Hill Four Principles of Industrial Marketing to their own selling.

These Four Principles are fundamental to waste-free selling. Briefly stated they are: (1) Determination of Markets; (2) Their Buying Habits; (3) Their Channels of Approach; (4) Appeals that Influence.

While each manufacturer is best able to apply these Four Principles for himself, the McGraw-Hill Publishing Company can be of material assistance in counseling with manufacturers and in either supplying data or suggesting how it may be obtained. This service is gladly furnished and we welcome the opportunity to serve manufacturers and their advertising agents in the interest of more effective marketing. A conference may be arranged, either in your office or a McGraw-Hill office.





The McGraw-Hill publishing headquarters in New York has been augmented by a district sales office as illustrated, to serve more conveniently eastern manufacturers and their advertising agents.

# Brought to Industry's Door

## McGraw-Hill's District Office Facilities—

105 advertising salesmen, whose first function is to advise on marketing problems, serve industry and trade through McGraw-Hill district offices.

36 seasoned advertising planners and writers and 20 artists, all trained in the appeals and mechanics of industrial advertising, supplement the district offices' marketing staffs.

These men and 108 McGraw-Hill editors have a background of practical experience in selling or production in 58 broad classifications of industry.

All data relating to production, marketing and buying practices developed by any district office will be made available by any other district office.

McGraw-Hill has its own telegraphic facilities in New York headquarters for expediting contact with district offices and industry.

This district office set-up is in conformity with the McGraw-Hill Four Principles of Industrial Marketing which stipulate "selling in terms of the prospect's problems."

McGraw-Hill Publishing Company, Inc., New York, Chicago, Philadelphia, Cleveland, St. Louis, San Francisco, London

# McGraw-Hill Publications

45,000 Advertising Pages used Annually by 3,000 manufacturers to help Industry buy more effectively.

### CONSTRUCTION & CIVIL ENGINEERING

ENGINEERING NEWS-RECORD  
SUCCESSFUL METHODS

### ELECTRICAL

ELECTRICAL WORLD JOURNAL OF ELECTRICITY  
ELECTRICAL MERCHANDISING

### INDUSTRIAL

AMERICAN MACHINIST INDUSTRIAL ENGINEER  
CHEMICAL & METALLURGICAL ENGINEERING  
POWER

### MINING

ENGINEERING & MINING JOURNAL  
COAL AGE

### TRANSPORTATION

ELECTRIC RAILWAY JOURNAL  
BUS TRANSPORTATION

### OVERSEAS

INGENIERIA INTERNACIONAL  
AMERICAN MACHINIST  
(European Edition)

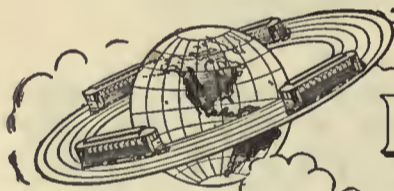
### RADIO

RADIO RETAILING

### CATALOGS & DIRECTORIES

ELECTRICAL TRADE CATALOG  
ELECTRICAL ENGINEERING CATALOG  
RADIO TRADE CATALOG  
KEYSTONE CATALOG KEYSTONE CATALOG  
(Coal Edition) (Metal-Quarry Edition)  
COAL CATALOG CENTRAL STATION DIRECTORY  
ELECTRIC RAILWAY DIRECTORY  
COAL FIELD DIRECTORY  
ANALYSIS OF METALLIC AND NON-METALLIC  
MINING, QUARRYING AND CEMENT INDUSTRIES

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

*Chicago & Alton Waukesha Engined Versare-Westinghouse  
Bus and Chicago & Alton R. R. Deluxe Lincoln Limited*



# **An Epoch Arrives**

The Covered Wagon, the Iron Horse and the Electric Locomotive each have had their day. With the development of a suitable gasoline engine that can handle this 72-passenger, 30,000 pound (when loaded), eight wheel bus at fifty miles an hour, there comes a new era in transportation. Waukesha "Ricardo Head" six cylinders are the only standard production engines suitable for a high speed gas-electric bus of this speed and weight.

*Write for information regarding these heavy duty vibrationless six cylinder engines, made in sizes varying from 70 H. P. for a high speed light bus or speed truck up to the 125 H. P. model used in the above C. & A. R. R. Versare-Westinghouse bus.*

AUTOMOTIVE EQUIPMENT DIVISION

**WAUKESHA MOTOR COMPANY**  
**Waukesha Wisconsin**

*Eastern Sales Office*

*Aeolian Building, 33 W. 42nd Street*

*New York City*

*Builders of Heavy Duty Engines for Over Twenty Years*

# Texas Operator Buys 5



This photograph shows four of Mr. Nunnelee's fleet of 19 Studebakers. It is impossible to assemble the entire fleet as they are constantly on the road, earning dividends for the owner.

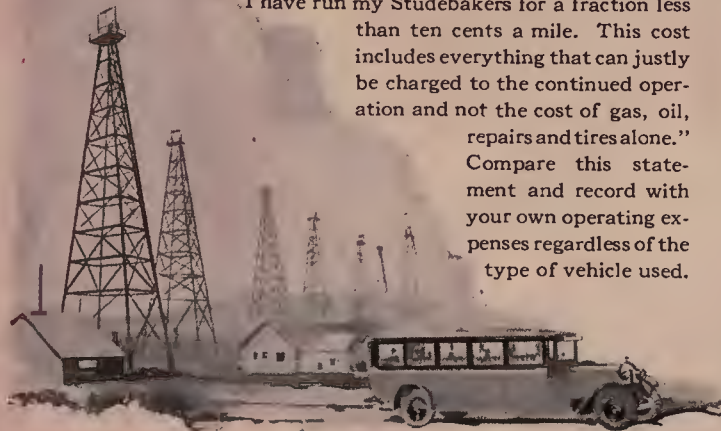
## Cost Records of W. E. Nunnelee, Tyler, Texas, show marked saving in Studebaker operating cost—so he buys five additional Studebaker busses, bringing his Studebaker fleet to 19 units

**W**HEN W. E. Nunnelee, who has been in the bus business since 1921, needed more equipment to meet the growing demand for better transportation in the vicinity of Tyler, Texas, he had a certain definite method of selecting new equipment. At various times he had tried out many other types of equipment. So his cost records were complete. Therefore he referred to his own ledger which pointed out the logical choice—STUDEBAKER! Accordingly on July 24th he placed an order for five new Studebaker busses, bringing his fleet to a total of 19 Studebaker units.

It is not the offhand statement of an owner or his mere opinion that proves the relative value of a motor bus. It is what the cost record has to say that really counts.

### Complete Cost Less Than Ten Cents a Mile

Convincing evidence of Studebaker economy is given in Mr. Nunnelee's statement: "An auditor's check on my business shows that I have run my Studebakers for a fraction less than ten cents a mile. This cost includes everything that can justly be charged to the continued operation and not the cost of gas, oil, repairs and tires alone." Compare this statement and record with your own operating expenses regardless of the type of vehicle used.



It would be difficult to find a more strenuous test for any automotive unit. Here severe climate conditions and the punishment of road some good, others bad, conspire to make overland travel difficult.

But Mr. Nunnelee's experience, which is typical of hundreds of others, indicates Studebaker stamina and economy—for he also says: "One of the main reasons to which I attribute my success is the fact that I have standardized on Studebakers."

"On September 8, 1922, we made our first run to Marshall, Texas, and since that time have never missed our schedule. At present we are operating six passenger lines out of Tyler, embracing a territory of nearly 300 square miles. On an average we cover over 2,300 miles daily. Several of our Studebaker busses have from 100,000 to 200,000 miles to their credit and are yet in excellent condition. After my experience with several other cars, I find that I can run a Studebaker from one to five cents a mile cheaper than any of the other makes."

The real basic reasons why Studebaker busses lead the field in automotive transportation are found in the ledgers of owners everywhere. Over 2,000 Studebaker busses, in constant daily service in every section of the United States and in 37 foreign countries, have delivered over one hundred million miles of dependable and profitable transportation. Studebaker is the choice of men who know automotive value and appreciate the importance of uninterrupted service as a business-building asset.

### Two Studebaker Busses Can be Bought for the Price of One Truck-Type Bus

Studebaker cars are operated for less as proved in the case of Mr. Nunnelee and 1,200 other Studebaker bus operators. The low purchase price enables the operator to buy two Studebaker units for the price of one truck-type bus. Maintenance costs are considerably lower because of the rugged construction and quality of materials employed and the simplicity of design.

Lower depreciation is experienced on account of the lesser initial investment and longer life. Recently Studebaker published a list of more than 250 operators whose Studebakers in bus service had attained mileage figures ranging from 100,000 to 350,000, proving most conclusively the stamina and long life of Studebaker busses.

# STUDEBAKER

# More Studebaker Busses



10-passenger Sedan-type Bus, on the Studebaker Bus Chassis of 184-inch wheelbase. Body, measuring 198 inches long and 76 inches wide, is distinctive in design and appearance. Lacquer finished in a choice of two color combinations. Four wide doors, also driver's door and an emergency door on the left. Cross seats or semi-chair type seats accommodate 19 passengers in comfort. (Also available in full-chair type for 15 passengers.) Completely equipped. The coupon below will bring further particulars.

## The Most Powerful Bus Chassis of its Size in the World

*The Studebaker Bus Chassis has more power yet costs less  
—to equal its power, you must pay at least \$2565 more*

ACCORDING to the rating of the Society of Automotive Engineers, the new Studebaker Bus Chassis is the most powerful bus chassis of its size and weight.

There are 50 chassis on the market with *less power and more weight.*

The next bus chassis to equal it in rated horsepower costs \$2565 more—practically double its price.

It excels in power. It excels in stamina. For the engine is matched by a chassis of remarkable durability.

### Surplus Strength—Excess Mileage

Tremendous mileage records achieved under the ardest conditions of bus service in all parts of the country testify to the amazing strength and sturdiness of the Studebaker chassis.

Two busses on the Big Six chassis have covered 100,000 miles and 150,000 miles, respectively, in the service of the Northern Transit Company, Flint, Mich., and are still in daily operation.

The Cannon Ball Transportation Company, Portsmouth, Ohio, operates 13 Studebaker busses. Ten of these busses, bought in 1924,

are Big Sixes—and already eight have covered over 100,000 miles; two over 150,000 miles.

Another Studebaker bus, owned by the Greensburg, New Alexandria and Blairsville Bus Company, New Alexandria, Pa., has achieved 165,000 miles since 1923—"and the total cost of parts for replacements is less than \$75."

### More Profit for Operators

The new Studebaker Bus Chassis retains all the advantages of the Big Six Chassis—in low first cost, low operating cost, and low depreciation cost. But, in addition, it possesses many added factors of safety.

The staunch frame is braced by eight stout members. Powerful hydraulic brakes operate on four wheels, supplemented by service brake on rear wheels and by emergency brake operating on the drive shaft.

The Studebaker Bus Chassis is built in the two sizes proved to be most profitable: (1) 158-inch wheelbase for 12 to 15-passenger bodies and (2) 184-inch wheelbase for 15 to 18-passenger inter-city bodies and a 21-passenger street-car type body.

Hundreds of fleet owners and individual operators are buying Studebakers, convinced that they assure "*more profit per passenger mile.*"

- first cost
- operating cost
- maintenance cost
- depreciation cost

# Lower

### Six Body Designs, 12 to 21 Passengers, \$3935 to \$6150

Prices f. o. b. factory, covering body and chassis, complete. Purchase can be arranged on a liberal Budget Payment Plan—Small down payment and balance in convenient monthly installments.

2-Pass. (including driver) cross-seat Sedan-Type.....	\$3935
5-Pass. (including driver) cross-seat Sedan-Type.....	\$4295
9-Pass. (including driver) cross-seat Sedan-Type.....	\$5050
11-Pass. Pay-As-You-Enter Street-Car Type*.....	\$5125
18-Pass. (including driver) side-entrance Parlor Car.....	\$5300
20-Pass. (including driver) Parlor-Car De Luxe*.....	\$6150

\*Includes dual rear wheels

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

Send me full information on Studebaker Busses without obligation

Name.....

Address.....

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

We have..... busses at present.

Check below the Studebaker Bus about which you desire information.

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

Capacity:..... Passengers.

# BUSSES

# MORE PROFIT PER PASSENGER MILE

# Greater Mileage

# Proven!



**CJB**

**MASTER**

**Ball Bearings**

The new CJB ball bearing is essentially a product of experience—of highly developed and organized knowledge and proper bearing manufacturing.

The economy of the Master Ball Bearing is serving of your investment.

Tell us your bearing needs and we will gladly co-operate with you. Get our Catalog.

## Ahlberg Ground Bearings

*Averaged 47,780 miles per bearing in recent test!*

A large Electric Railway Company, operating over 140 buses in city and intercity service, recently made an interesting ball bearing test, using four passenger buses over various highway routes. Four Ahlberg Ground Bearings and four new bearings of a well known and established brand were alternated in the right and left rear wheels of these four buses.

The buses were inspected periodically and the bearings were removed as soon as they showed wear to the point of looseness.

Here is the result:

**AHLBERG GROUND BEARING**

No.	Installation	Mileage
1—	Right rear wheel bus	380 72,844
2—	Right rear wheel bus	378 27,146
3—	Left rear wheel bus	381 57,456
4—	Left rear wheel bus	371 33,677
Total.....		191,123

**NEW BEARINGS**

No.	Installation	No.	Mileage
5—	Left rear wheel bus	380	36,533
6—	Left rear wheel bus	378	38,046
7—	Right rear wheel bus	381	19,291
8—	Right rear wheel bus	371	67,412

Total..... 161,282  
Average mileage Ahlberg Ground Bearings, 47,780 miles per bearing.

Average mileage New Bearings, 40,320 miles per bearing.

Average excess in favor of Ahlberg Ground Bearings, 7,480 miles per bearing.

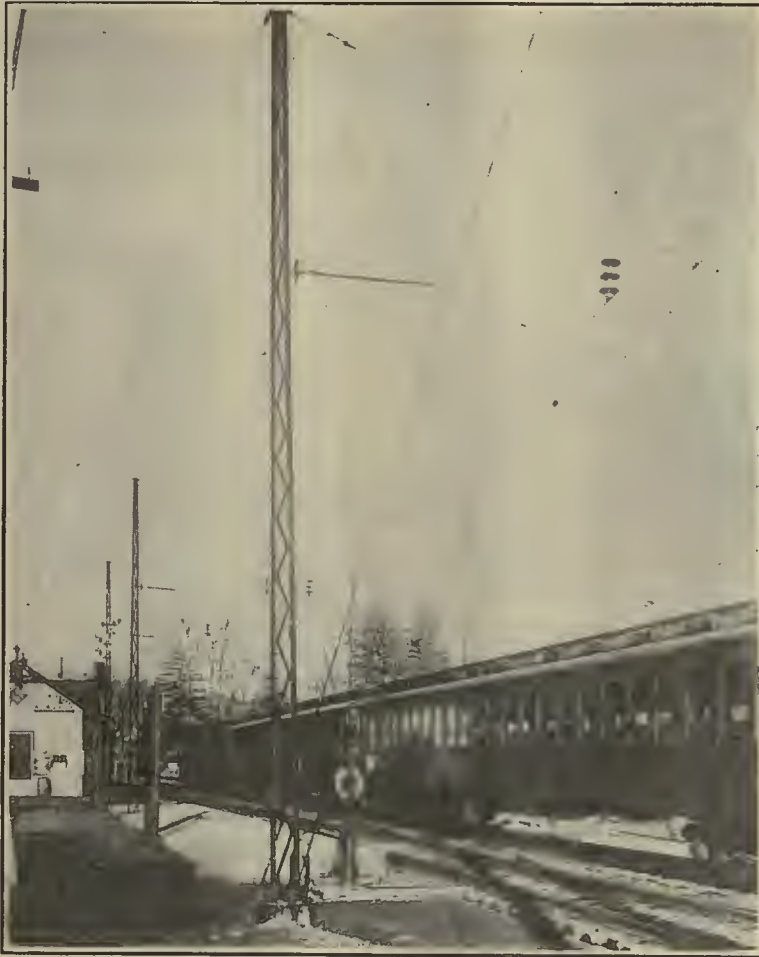
There is an Ahlberg Branch near you, maintaining a complete stock of bearings. Exchange your old bearings at this branch and save about 33 1/3% in bearing costs, get greater mileage and lessen maintenance.

You are sure of the quality when you replace with Ahlberg Ground Bearings.



*This mark means Ahlberg Ground*

**AHLBERG BEARING COMPANY**



## Bates Poles of Steel

*are in keeping with the highest standards*

Railways which follow the highest standards in methods, equipment and construction find Bates Steel Poles eminently desirable from the standpoint of strength, permanence and ease and economy of upkeep. They contribute appreciably to the appearance of the property, and their low first cost is a strong factor in their choice.

*Whatever your requirements, whether poles, towers, or other types of structures, you will find a Bates proposal reasonable.*

INTERNATIONAL  
STANDARD ELECTRIC CORP.  
*General Export Distributors*

SAMUEL BROWN, LTD., *New Zealand*  
JOST ENGINEERING CO., LTD., *India*

BATES-TRUSS

Expanded  
MADE  
ONLY  
BY

**B**ates **E**xpanded **S**teel **T**russ **C**o.

*Sales, Engineering and Executive Offices*  
EAST CHICAGO, INDIANA

# Shuler Front Axles



For Motor Busses

## Bus Endurance

The competent and unfailing judge of any product is that universal sovereign—TIME!

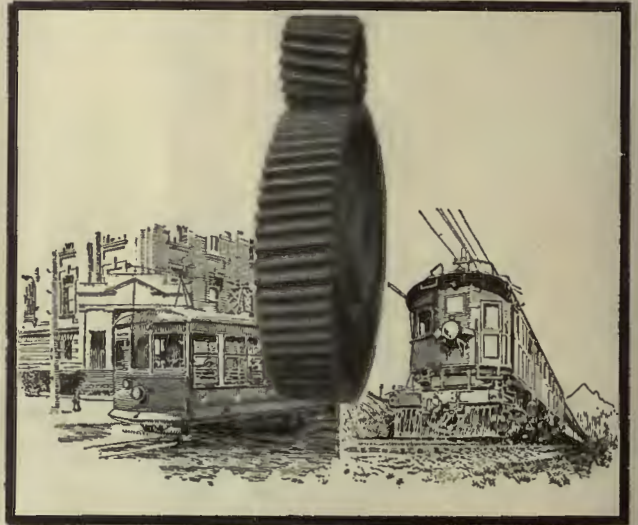
In covering 3,000,000 miles of highways, the Motor Bus *must* be constructed of superior units.

As pioneer manufacturers of FRONT AXLES ONLY we realize the severe test to which this unit is subjected. And time has proved that we do produce a SUPERIOR FRONT AXLE.

**Shuler Axle Co.**  
INCORPORATED  
LOUISVILLE, KY.

Member of Motor Truck Industries, Inc., of America

# Do away with gear noise!



## Nuttall Helical Gears meet present day requirements

Noisy spur gears are no longer tolerable. They're an unnecessary source of public irritation. Worse still, they wear faster and cost more in the long run.

The answer to the modernization problem in gearing is—Nuttall Helical Gears on all your cars. Their smooth, silent operation, at any speed, means better operating conditions all round.



**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.



# LONG LIFE

**E**CONOMY BEGINS as soon as *International* poles go in. Their remarkable durability assures long life, low annual cost and added years of reliable service. Leading public utility organizations attribute a life of more than 25 years to Creosoted Pine—and know that the service the year round is dependable and economical.

*International* stands for the best in timber preservation—sound timber, correct seasoning and scientific treatment under rigid chemical control. *International* has had poles in service more than 25 years and their condition indicates they are good for many more years.

**International Creosoting & Construction Co.**  
Galveston—Texarkana—Beaumont

*The illustration shows International poles in service of the Southern Colorado Power Co. between Pueblo and Canon City.*



# *International* Creosoted Yellow Pine Poles



**LASCAR**

The Arab legend still survives that Socotran women used to sit on the rocks and lure the lascar—or mariners—to disaster with their winsomeness.

Since earliest times the drawing power of attractive equipment is on record.

The big trouble with all the legends about such lure is that the poor lascar found that when he yielded to the temptation of attractiveness—that's all there was—there wasn't any more.

So in this big plea for modernization and more attractive equipment, let us raise this Munyon-finger of warning . . . to-wit:

Once you've attracted buyers with winsome equipment, don't let it end with just that—deliver the goods with good commutation.

**EQUIP THE MACHINES WITH MORGANITE BRUSHES**



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. Drummey, 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.



**Cold Dinners**

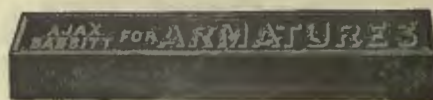
for your passengers?

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

**Griffin Wheel Company**

410 North Michigan Ave.

Chicago, Ill.

**Griffin Wheels**

with  
Chilled Rims  
and

**Chilled Back of Flanges  
For Street and Interurban  
Railways**

FOUNDRIES:

- |         |                |             |
|---------|----------------|-------------|
| Chicago | Boston         | St. Paul    |
| Detroit | Kansas City    | Los Angeles |
| Denver  | Council Bluffs | Tacoma      |
|         | Salt Lake City |             |

—and the Time Switch must be dependable

The 48-page illustrated Bulletin No. 37 tells all about Anderson's Automatic Time Switches



For whatever purpose you use a Time Switch be sure that you can depend upon it.

An occasional failure might exact a penalty far in excess of the total cost of the switch.

But why consider failure, when you can get an Anderson—a Time Switch that will operate as you want it to, year in and year out, with unfailing regularity.

You can depend upon an Anderson, because reliability and dependability is built in from the beginning—and, the men who know, who must trust the Time Switches implicitly, always install Andersons,

Albert & J. M. Anderson Mfg. Co.

289-305 A St., Boston, Mass.

New York

Chicago

Philadelphia

London

Manufacturers of Automatic Time Switches, Overhead Line Material, Heavy Knife Switches, Circuit Breakers, Charging Plugs and Receptacles

KERITE

Pacific Electric Railway Main Street Terminal Los Angeles

Just Out!

FOR reference, for brushing up, or for study—this new book on mathematics for the practicing engineer fills a long-felt need.

MATHEMATICS FOR ENGINEERS

By Raymond W. Dull Consulting Engineer

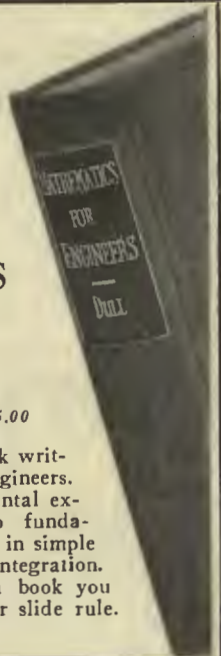
780 pages, 6x9, 686 illustrations, \$5.00

HERE is a mathematics handbook written by an engineer for engineers. The book is not encumbered by mental exercises, but gets right down to fundamentals from brain-saving methods in simple addition, to partial and multiple integration. It is a consulting mathematics; a book you will want on your desk beside your slide rule. See it for ten days free.

FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City Gentlemen: Send me for ten days' free examination: Dull's MATHEMATICS FOR ENGINEERS, \$5.00. I agree to return the book, postpaid, in ten days or to remit for it then.

Name ..... Home Address ..... City ..... State ..... Position ..... Company ..... (Books sent on approval to retail customers in the United States and Canada only.) E. 10-23-26



# AMERICAN BRIDGE COMPANY

EMPIRE BUILDING—71 BROADWAY NEW YORK, N. Y.

Manufacturers of Steel Structures of all classes particularly **BRIDGES AND BUILDINGS**

ALSO STEEL BARGES FOR HARBORS AND RIVERS, STEEL TOWERS FOR ELECTRIC TRANSMISSION, HEROULT ELECTRIC FURNACES, ETC.

SALES OFFICES:

NEW YORK, N. Y.  
Philadelphia, Pa.  
Boston, Mass.  
Baltimore, Md.

PITTSBURGH, PA.  
Cincinnati, Ohio  
Cleveland, Ohio  
Detroit, Mich.

CHICAGO, ILL.  
St. Louis, Mo.  
Denver, Colo.  
Salt Lake City, Utah

Duluth, Minn.  
Minneapolis, Minn.

Pacific Coast Representative:  
U. S. Steel Products Co.,  
Pacific Coast Dept.  
San Francisco, Cal.  
Los Angeles, Cal.

Portland, Ore.  
Seattle, Wash.

Export Representative: United States Steel Products Co., 30 Church Street, New York.

## Wharton Special Trackwork

Trackwork of superior quality, incorporating the famous Tisco Manganese Steel.

WM. WHARTON JR. & CO., Inc.  
EASTON, PA.

OFFICES:

Boston Chicago El Paso Montreal New York  
Philadelphia Pittsburgh San Francisco Scranton



## Bethlehem Products for Electric Railways

Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

Catalog Sent on Request

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

# BETHLEHEM

## 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.



Special Track Work of every description

## THE BUDA COMPANY

Harvey (Suburb Chicago) Illinois

## SPECIALISTS

in the

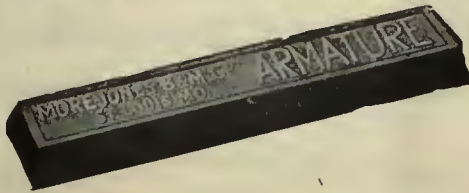
Design and Manufacture of

Standard—Insulated—and  
Compromise Rail Joints

The Rail Joint Company

165 Broadway, New York City

## M-J Armature Babbitt



No less than twenty-five different grades of Babbitt have been successfully perfected in the More-Jones line, designed for various services and at varying prices. "Armature" for electric railways is the recognized standard. *Let us quote you.*

More-Jones Brass & Metal Co.  
St. Louis, Mo.

## MORE-JONES QUALITY PRODUCTS

# 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*



B. A. HEGEMAN, Jr., President      H. A. HEGEMAN, First Vice-Pres. and Treas.  
F. T. SARGENT, 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.	Flaxlinum 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	Feasible Drop Brake Staffs
Walter Tractor Snow Plows	

## 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.

*Whatever your requirements*

specify

## Le Carbone Carbon Brushes

*They talk for themselves*

## 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

# Bankers and Engineers

## Ford, Bacon & Davis Incorporated Engineers

115 Broadway, New York  
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## The J. G. White Engineering Corporation

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EXAMINATIONS REPORTS APPRAISALS  
ON  
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# THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of  
Water Tube Boilers  
of continuing reliability

Makers of Steam Superheaters  
since 1898 and of Chain Grate  
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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., 805 Gasco Building

**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, I. C. Smith Building  
HAVANA, CUBA, Calle de Aguiar 104  
SAN JUAN, Porto Rico, Royal Bank Building

**WORKS**  
Bayonne, N. J.  
Barberton, Ohio

## KELLY, COOKE & COMPANY

ENGINEERS

Operation and Management

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PARKWAY at SIXTEENTH ST. PHILADELPHIA

Our advertisement in the issue of October 9 showed how  
**HASKELITE and PLYMETL**  
have proved their claims to superiority.

*Another full page ad will appear November 6*

HASKELITE MANUFACTURING CORPORATION  
133 W. Washington St., Chicago, Ill.

## F. J. BRENNAN

Traffic Analyst, Schedules

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Better Quality Seats  
For Cars and Buses

Hale-Kilburn Co.  
1800 Lehigh Ave., Philadelphia, Pa.

## Transmission Line and Special Crossing Structures, Catenary Bridges

WRITE FOR OUR NEW DESCRIPTIVE CATALOG

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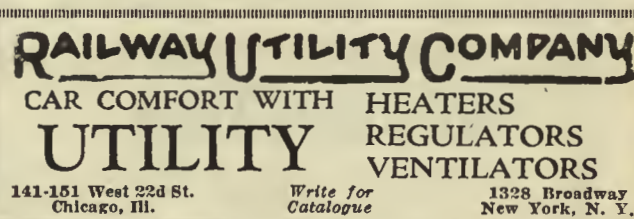
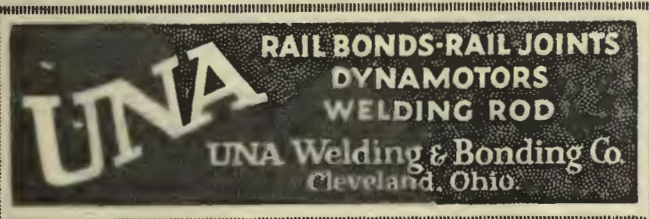
Railway Track-work Co., Philadelphia

682

## THE P. EDWARD WISH SERVICE

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

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

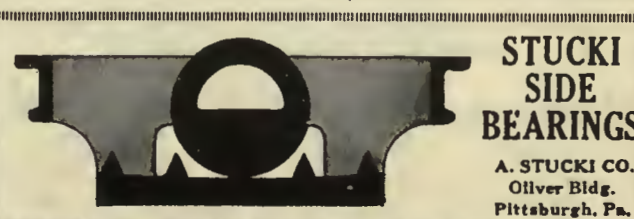


"Axle Specialist Since 1866"  
Address all Mail to Post Office Box 515, Richmond, Va.

## 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.



## STUCKI SIDE BEARINGS

A. STUCKI CO.  
Oliver Bldg.  
Pittsburgh, Pa.

*The Hardware makes the line  
Hubbard makes the Hardware*



**Hubbard and COMPANY**  
PITTSBURGH • OAKLAND, CAL. • CHICAGO

# Arc Weld Rail Bonds

AND ALL OTHER TYPES

*Descriptive Catalogue Furnished*

## American Steel & Wire Company

Chicago      Boston      Pittsburgh  
New York    Cleveland    Denver  
                 U. S. Steel Products Co.  
San Francisco    Los Angeles    Portland      Seattle

*"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.

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Can. Rep.: Engineering Materials Limited, Montreal.

Cuban Rep.: Victor O. 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 Nat Weights and Full Lengths*

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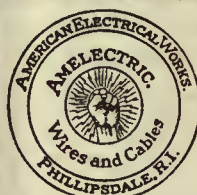
*Manufacturers of bell, signal and other cords.  
Newtonville, Massachusetts*

## 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.**



Reg. U. S. Pat. Office

## AMELECTRIC PRODUCTS

**BARE COPPER WIRE AND CABLE**

**TROLLEY WIRE**

**WEATHERPROOF WIRE AND CABLE**

**PAPER INSULATED UNDERGROUND CABLE**

**MAGNET WIRE**

**AMERICAN ELECTRICAL WORKS  
PHILLIPSDALE, R. I.**

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Cincinnati, Traction Bldg.; New York, 100 E. 42nd St.

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.  
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*Sales Representatives in the Principal Cities*

## ELRECO TUBULAR POLES



COMBINE

Lowest Cost      Lightest Weight  
Least Maintenance      Greatest Adaptability

Catalog complete with engineering data sent on request.

**ELECTRIC RAILWAY EQUIPMENT CO.  
CINCINNATI, OHIO**

New York City, 30 Church Street



# SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

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

INFORMATION:

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

DISPLAYED—RATE PER INCH:

1 to 3 inches.....\$4.50 an inch  
4 to 7 inches..... 4.30 an inch  
8 to 14 inches..... 4.10 an inch  
Rates for larger spaces, or yearly rates, on request.  
An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

ERJ

## POSITIONS WANTED

**SUPERINTENDENT** transportation; wide experience; fine record on city and interurban properties; credited with having built up one of the best groups of trainmen in Middle West and placing property on paying basis. Wishes to make connection with property in need of clean cut, progressive, capable transportation official. PW-940, Electric Railway Journal, Guardian Building, Cleveland, O.

**YOUNG man** wants position providing an opportunity of learning electric railway practice. Graduate of a co-operative course in electrical engineering. PW-941, Electric Railway Journal, 7 So. Dearborn St., Chicago, Ill.

## OFFICIAL PROPOSAL

Bids: Dec. 15.

### Car Advertising Space

Honolulu, Hawaii.

Sealed proposals for the leasing of car advertising space in the street cars and buses operated by the Honolulu Rapid Transit Co., Ltd., of Honolulu, Hawaii, will be received at their office, 1133 Alapai Street, Honolulu, T.H., up to 12 o'clock noon, Wednesday, Dec. 15, 1926.

Specifications as to bids may be obtained from the office of the Company, the Electric Railway Journal or Electric Traction.

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

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.

### Why Save It?

Equipment you have replaced, or for which you have no further use can probably be sold at a good price now. Later it may not be worth as much.

Weed out equipment and let a

*"Searchlight" Ad*

help you sell it promptly

G-02

G-9

## "Opportunity" Advertising: Think "SEARCHLIGHT" First!



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

We solicit a test of TULC  
on your equipment

**The Universal Lubricating Co.**  
Cleveland, Ohio

Chicago Representatives: Jameson-Boss 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



### 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

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



**NACHOD & UNITED STATES  
SIGNAL CO., INC.**  
LOUISVILLE, KY.  
**BLOCK SIGNALS**  
FOR  
**ELECTRIC RAILWAYS**  
**HIGHWAY CROSSING SIGNALS**



COIN COUNTING And Sorting Machines CHANGES CARRIERS Tokens

# WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

**Advertising, Street Car**  
Coiller, Inc. Barrow G  
Doyle, Kitchen & McCormick

**Air Brakes**  
Christensen Air Brake Co.  
Westinghouse Air Brake Co.  
**Air Receiver & Aftercoolers**  
Ingersoll-Rand Co.

**Anchors, Guy**  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Westinghouse E. & M. Co.

**Armature Shop Tools**  
Columbia Machine Works  
Elec. Service Supplies Co.

**Automatic Return Switch**  
Stands  
Ramapo Ajax Corp.

**Automatic Regulators Voltage Current Synchronizing**  
American Brown Boveri  
Elec. Corp.

**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.  
St. Louis Car Co.  
Standard Steel Co.  
Westinghouse E. & M. Co.

**Axles, Carbon Vanadium**  
Johnson & Co., J. R.  
**Axles, Front**  
Shuler Axle Co.

**Axles, Steel**  
Carnegie Steel Co.  
Johnson & Co., J. R.

**Babbitt Metal**  
Ajax Metal Co.  
Johnson & Co., J. R.  
More-Jones Brass and Metal Co.

**Badges and Buttons**  
Elec. Service Supplies Co.  
International Register Co.

**Bearings and Bearing Metals**  
Ajax Metal Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
General Electric Co.  
More-Jones Brass and Metal Co.  
St. Louis Car Co.  
Westinghouse E. & M. Co.

**Bearings, Ball**  
Ahlberg Bearing Co.

**Bearings, Center and Roller**  
Slide  
Columbia Machine Works  
Stueckl Co., A.

**Bearings, Roller**  
Timken Roller Bearing Co.

**Bells & Buzzers**  
Consolidated Car Heating Co.

**Bells and Gongs**  
Brill Co., The J. G.  
Elec. Service Supplies Co.  
St. Louis Car Co.

**Benders, Rail**  
Railway Trackwork Co.

**Bodies, Bus**  
Lang Body Co.

**Body Material, Haskellite and Plymet**  
Haskellite Mfg. Corp.

**Rollers**  
Babcock & Wilcox Co.

**Bond Testers**  
American Steel & Wire Co.  
Electric Service Supplies Co.

**Bonding Apparatus**  
American Steel & Wire Co.  
Electric Railway Improvement Co.  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Railway Trackwork Co.  
Una Welding & Bonding Co.

**Bonds, Rail**  
Amer. Steel & Wire Co.  
Electric Railway Improvement Co.  
Elec. Service Supplies Co.  
General 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.)  
Bates Expanded Steel Truss Co.  
Columbia Machine Works  
Elec. Ky. Equipment Co.  
Elec. Service Supplies 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 Shoes & 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.  
General Electric Co.  
National Brake Co.  
Safety Car Devices Co.  
St. Louis Car Co.  
Westinghouse Tr. Br. Co.

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

**Brushes, Graphite**  
Morganite Brush Co.

**Brushes, Wire Pneumatic**  
Ingersoll-Rand Co.

**Brushholders**  
Columbia Machine Works

**Bulkheads**  
Haskellite Mfg. Corp.

**Bus Seats**  
Hale-Kilburn Co.  
Heywood-Wakefield Co.

**Bus Wheels, Steel**  
Heywood-Wakefield Co.

**Buses, Motor**  
American Car & Foundries Motor Co.  
Brill Co., The J. G.  
Fargo Motors Co.  
Graham Bros.  
St. Louis Car Co.  
Studebaker Corp. of America

**Bushings, Case Hardened and Manganese**  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Columbia Machine Works  
St. Louis Car Co.

**Cables (See Wires and Cables)**

**Cambrie 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.  
St. Louis Car Co.

**Cars, Gas, Rail**  
Brill Co., The J. G.  
St. Louis Car Co.

**Cars, Passenger, Freight, Express, etc.**  
American Car Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Kuhlman Car Co.  
National Ry. Appliance Co.  
St. Louis Car Co.  
Wason Mfg. Co.

**Cars, Second Hand**  
Electric Equipment Co.

**Cars, Self-Propelled**  
Brill Co., The J. G.  
General Electric Co.

**Castings, Brass Composition or Copper**  
Ajax Metal Co.  
A. & J. M. Anderson Mfg. Co.  
More-Jones Brass & Metal Co.

**Castings, Gray Iron and Steel**  
American Steel Foundries  
Bemis Car Truck Co.  
St. Louis Car Co.  
Standard Steel Works

**Castings, Malleable and Brass**  
Bemis Car Truck Co.  
St. Louis Car Co.

**Castings, Nichrome**  
Driver-Harris Co.

**Catchers and Retrievers, Trolley**  
Elec. Service Supplies Co.  
Ohio Brass Co.  
Wood Co., Chas. N.

**Catenary Construction**  
Archbold-Brady Co.

**Celling Car**  
Haskellite Mfg. Corp.  
Pasatosa Co., Inc.

**Cellings, Plywood, Panels**  
Haskellite Mfg. Corp.

**Chairs, Paclor Car**  
Heywood-Wakefield Co.

**Change Carriers**  
Cleveland Fare Box Co.  
Electric Service Supplies Co.

**Circuit-Breakers**  
A. & J. M. Anderson Mfg. Co.  
General Electric Co.  
Westinghouse E. & M. Co.

**Circuit Breakers (Oil)**  
American Brown Boveri  
Elec. Corp.

**Clamps and Connectors for Wires and Cables**  
Columbia Machine Works  
Elec. Ky. 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.  
St. Louis Car 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.

**Color Counting Machines**  
Cleveland Fare Box Co.  
International Register Co.

**Color Sorting Machines**  
Cleveland Fare Box Co.

**Color Wrappers**  
Cleveland Fare Box Co.

**Commutator Slotters**  
Columbia Machine Works  
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.  
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**  
Columbia Machine Works  
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.  
St. Louis Car Co.  
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.  
St. Louis Car Co.  
Westinghouse Tr. Br. Co.

**Cranes, Hoists & Lifts**  
Electric 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.  
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Faniassote Co., Inc.  
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Elec. Equipment Co.

**Dealer Second Hand Rails**  
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**Derolling Devices (See also Track Work)**

**Derolling Switches**  
Ramapo Ajax Corp.

**Destination Signs**  
Elec. Service Supplies Co.

**Detective Service**  
Wiah-Service, P. Edward

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Consolidated Car Heating Co.  
National Pneumatic Co.  
Safety Car Devices Co.

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Safety Car Devices Co.

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Ohio Brass Co.

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Electric Service Supplies Co.  
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Railway Trackwork Co.

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Una Welding & Bonding Co.

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Beeler, John A.  
Bibbins, J. Rowland  
Brennan, F. J.  
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Ford, Bacon & Davis  
Hemphill & Wells  
Holst, Engelhardt W  
Jackson, Walter  
Kelker & DeLew  
Kelly, Cooke & Co.  
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Consolidated Car Fender Co.  
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Lorain Steel Co.
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Metal & Thermit Corp.  
Railway Trackwork Co.
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Railway Trackwork Co.
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Railway Trackwork Co.
- Grinding Bricks and Wheels**  
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- Guard Rails, Tee Rail & Manganese**  
Ramapo Ajax Corp.  
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Ingersoll-Rand Co.
- Harps, Trolley**  
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St. Louis Car Co.
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- Interrurban Cars (See Cars)**
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(See Rail Joints)
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S. K. F. Industries  
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- Lightning Protection**  
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Electric Service Supplies Co.  
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Wm. Wharton, Jr. & Co.
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- Nuts and Bolts**  
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International Creosoting Co.  
Naugle Pole & Tie Co.
- Poles, Trolley**  
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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.)
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International Register Co.  
Wood Co., Chas. N.
- Rail Braces & Fastenings**  
Ramapo Ajax Corp.
- Rail Grinders (See Grinders)**
- Rail Joints**  
Carnegie Steel Co.  
Rail Joint Co., The
- Rail Joints—Welded**  
Lorain Steel Co.  
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Metal & Thermit Corp.  
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Una Welding & Bonding Co.
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Carnegie Steel Co.
- Railway Safety Switches**  
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Pantastote Co., Inc.
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Haskelite Mfg. Corp.
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Safety Car Devices Co.
- Sanders, Track**  
Brill Co., The J. G.  
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Ohio Brass Co.  
St. Louis Car Co.
- Sash Fixtures, Car**  
Brill Co., The J. G.  
St. Louis Car Co.
- Sash Metal Car Window**  
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Haskelite Mfg. Corp.  
Heywood-Wakefield Co.  
Pantastote Co., Inc.  
St. Louis Car Co.
- Seats, Bus**  
Brill Co., The J. G.  
Hale-Kilburn Co.  
St. Louis Car Co.
- Seats, Car (See also Rattan)**  
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Hale-Kilburn Co.  
Heywood-Wakefield Co.  
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- Shovels**  
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Wood Co., Chas. N.
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St. Louis Car Co.  
Standard Steel Works
- Sprinklers, Track and Road**  
Brill Co., The J. G.  
St. Louis Car Co.
- Steel and Steel Products**  
Carnegie Steel Co.

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We guarantee all grades of poles; also any butt-treating specifications

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Minneapolis, Minn.

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Charles N. Wood Co., Boston



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ANACONDA COPPER MINING COMPANY  
THE AMERICAN BRASS COMPANY

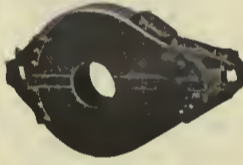
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Seamless—Rivetless—Light Weight  
Best for Service—Durability and Economy. Write Us.

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Jersey City, N. J.



SAMSON SPOT WATERPROOFED TROLLEY CORD

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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.**

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WESTERN & NORTHERN CEDAR  
**NAUGLE POLE & TIE CO.**  
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## 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.

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6209 Hamilton Ave., Detroit, Mich.



## 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**

## Gets Every Fare PEREY TURNSTILES or PASSIMETERS

Use them in your Prepayment Areas and Street Cars

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101 Park Avenue, New York City



## ELECTRICAL WIRES and CABLES

# ROEBLING

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

**ELECTRIC CAR HEATERS**  
**THERMOSTATS BUZZERS**  
**PNEUMATIC DOOR OPERATORS**  
**CONSOLIDATED CAR HEATING CO.**  
NEW YORK ALBANY, N.Y. CHICAGO

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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

## Your Name

in this space in all issues where larger display space is not used backs up your advertising campaign and keeps your name in the alphabetical index.

## THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No. **478E**

**GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.**

**SEVEN WORKS**  
RAMAPO, N. Y.  
RAMAPO, N. Y.  
CHICAGO, ILL.  
EAST ST. LOUIS, ILL.  
LITTLE ROCK, ARK.  
MILWAUKEE, WIS.  
MINNEAPOLIS, MINN.

## Ramapo Ajax Corporation

**RACOR**

RAMAPO AUTOMATIC RETURN SWITCH STANDS FOR PASSING SIDINGS

THE RAIL SPECIAL WORK MANGANESE CONSTRUCTION

SALES OFFICE AT ALL WORKS  
Main Office: HILLBOURN, N. Y.

## H B LIFE GUARDS PROVIDENCE FENDERS

Manufactured by  
**CONSOLIDATED CAR FENDER CO., PROVIDENCE, R. I.**  
General Sales Agents  
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ALPHABETICAL INDEX TO ADVERTISEMENTS

Table listing companies and their page numbers, including Ahlberg Bearing Co., American Car Co., Babcock & Wilcox Co., etc.

Continued from page 104

Continuation of the alphabetical index, listing companies like Stokers, Mechanical; Storage Batteries; Structural Steel; Superheaters; Switches, etc.

# “Builders of Financial Stability”



## Bangor Hydro-electric Company, Maine, getting good results—

Many electric railways are finding two outstanding advantages resulting from the introduction of new cars:

*First*—Lighter weight means lower operating cost, and

*Second*—Increased efficiency and more attractive equipment win increased patronage.

Consequently, many companies are now enjoying a more favorable financial situation.

Modernization of equipment has been productive of very gratifying results up in Bangor, Maine, as is shown by the following comparisons between the cost of operation of light weight modern cars and the heavier and older types displaced.

	Actual Operating Costs	
	Per Car Mile	
	Old Cars	New Cars
Way and Structures .....	7.05c.	6.50c.
Maintenance of Equipment.....	5.71	4.70
Power .....	3.42	0.70
Conducting Transportation .....	11.90	9.40
Traffic .....	0.10	.....
General and Misc .....	4.98	5.40
Total .....	33.16c.	26.70c.

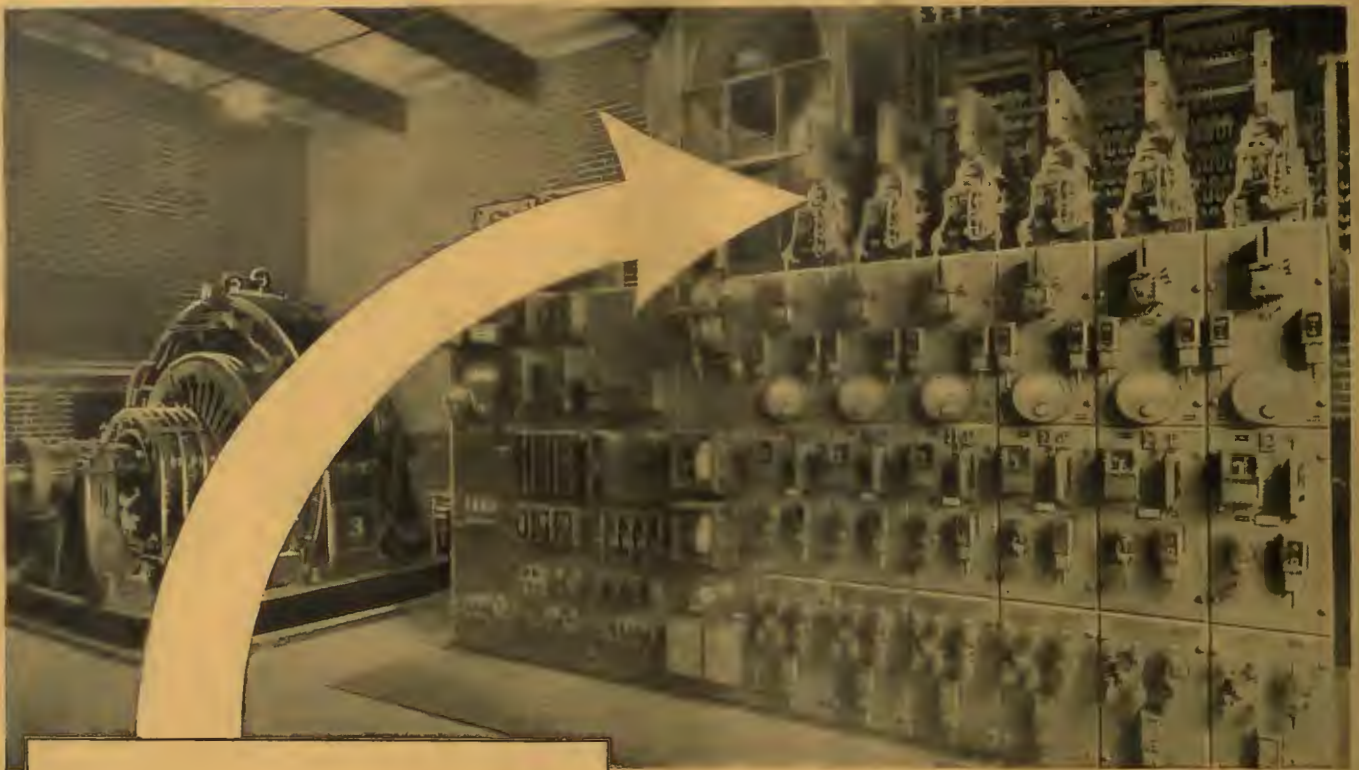
The cars, with which Bangor is served such efficient and economical transportation, are Wason-built.

The J. G. Brill Company  
Philadelphia, Pa.

In building financial stability no other agency has contributed more than—

New **BRILL** Modern Cars

American Car Company  
St. Louis  
The G. C. Kuhlman Car Co.  
Cleveland  
Wason Mfg. Company  
Springfield, Mass.



*Franklin Ave. Substation, United Railways of St. Louis*



*The measure of the added protection*

## What the addition of High-Speed Breakers adds to your substations

With the high-speed type of air circuit breaker, the total elapsed time of a short circuit from initial current rise to complete interruption is but .008 to .015 second.

Operating at such extremely high speed, these breakers open short circuits so quickly that flashovers on commutating machines are prevented. This decreases wear of commutator and brushes and practically eliminates damage from internal grounding. It also insures greater reliability and lower substation maintenance.

Bulletin 44742.1 describes the G-E High-Speed Breaker. Your G-E Office has copies.



A new order of substation protection was instituted with the development of the G-E High-Speed Circuit Breaker nine years ago. During these years about 900 Breakers of this type have been installed. The High-Speed Breaker is not an experiment of recent date.

# GENERAL ELECTRIC