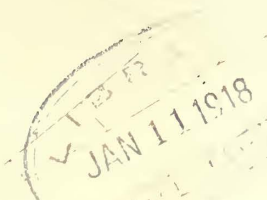


# ELECTRIC RAILWAY JOURNAL

New York, January 5, 1918

McGraw-Hill Publishing Co., Inc.

Volume 51 Number 1



*Pennsylvania R.R. System*

*Norfolk & Western R.R. System*

*New York, New Haven & Hartford R.R. System*

**M**ILES and miles of Phono-Electric trolley wire are used along the lines of these three most important "electrifications"—

Because its exceedingly uniform quality assures even wear—better service—immunity from unanticipated breakage.

Even the most carefully designed catenary suspension cannot take satisfactorily the shocks from current collectors on high-speed or "heavy" trains—

Unless the contact wire has the proper degree of ductility.

It is this ductility—this freedom from crystallization and breakage—better service—that makes Phono-Electric logical for uninterrupted service whether that service is on electrified steam, interurban or city lines.

# Phono-Electric

Bridgeport Brass Company, Bridgeport, Connecticut

# 1918

## *Brighter Days Ahead for the Electric Railway Industry*

**T**HE new spirit abroad among the electric railways is a most encouraging sign of the times. Men of the industry are waking up to the fact that their job is not primarily to run cars but to sell service to the public. Practically the entire time of the October conference of the A. E. R. A. was given to this subject. Pressing need of larger revenues is the shock which has roused the managers. The nickel which once bought a half-mile behind a pair of worn-out horses now buys ten miles of fast, comfortable transportation, but when it gets into the Purchasing Agent's hands it will go less than half as far as before. Higher fares and charges for transfers are now being agitated, but before the commissions will grant approval they must be certain of popular backing. To "sell" the public on higher prices means that they must be educated in the fundamental problems of railway economics.

With the realization that people will pay a fair price when they understand the situation, railway managers now see their course clearly. With this returns their old American confidence; they know what is to be done: advertising through newspapers and car cards; fostering the service-selling spirit among employees; improvement of service by running more "quick-service" cars; these are the methods they are following toward larger revenues.

W. S. R.

Westinghouse Electric  
East Pittsburgh,



& Manufacturing Co.  
Pennsylvania

# Westinghouse

# The Electric Railway Industry

## A Review and a Prophecy

**A**s a traveler climbing a mountain will often not realize the height he has attained until, pausing, he looks back over the route he has traversed, so in any industry, if one would obtain a comprehensive view of the industry, he must pause occasionally and survey the field.

The beginning of a new calendar year has long been accepted as a logical period for surveys of this kind and now is, therefore, an appropriate time for those engaged in the electric railway industry to pause and consider.

with all the activities of our country, have been profoundly affected by the material and the sociological developments of the times and the effects of the great world war.

The spirit and effort with which this crisis is being met is a real testimonial to the character and ability of the personnel of the electric railways. Ordinarily it is a slow and laborious process for any large and complicated industry to change its fundamental habits. In endeavoring to meet the economic pressure of recent years, however, the electric railways have not merely changed their habits—they have revolutionized them, and they have done this with a rapidity that is truly astonishing.

Looking back over the past few years two developments in transportation stand out which affected the electric railways profoundly and created new ideas regarding transportation of passengers.

The first was the automobile. The development of this machine established a rival for the electric railways, and this rival was in the unique position of competing with the railways as to quality of service without being obliged to compete in price. Naturally it soon took from the railways a large part of those customers to whom price was no object. Adding insult to injury, however, the "jitney" then appeared, adding new standards of speed and convenience for short-haul passengers. There was a distinct element

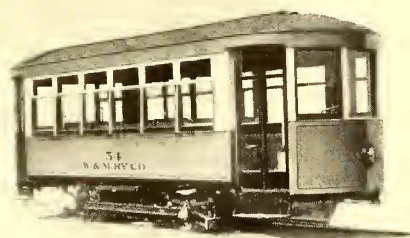
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BIRNEY ONE-MAN CAR



DOUBLE-TRUCK, ONE-MAN CAR



SINGLE-TRUCK, ONE-MAN CAR



of injustice in this competition, in that equality of taxation and responsibility was lost sight of.

The second was the establishment, in the majority of States, of public utility commissions. In the midst of the adjustments due to the automobile and the jitney these public control bodies took the electric railways out of the class of private business, whose first duty is to secure financial returns, and made them subject to trial, condemnation and regulation. The result of these new competitors—auto and jitney—and this new commission control was to affect seriously both the income and the expense accounts of the railways.



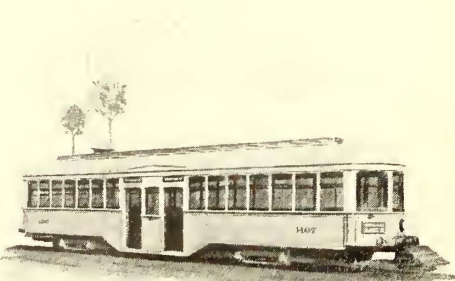
ONE-MAN CARS IN WACO, TEXAS

The first idea that occurs to one when his income suffers is that he should reduce his expenses correspondingly and postpone expenditures for improvements. The railways reacted in the common way. Fortunately for the industry, perhaps, rapidly rising prices of labor and material soon made it evident that no adequate solution could be expected on this basis.

A new spirit is now in evidence among the electric railways. Pressing needs for higher revenues have awakened them to the fact that they are commercial enterprises—that their function is not merely to **run cars** but to **sell service**, and that, like any other manufacturing company, the amount of their product which they can sell depends very largely on how well its quality suits the public and how attractively it is offered. This is an entirely new attitude of mind and a new basis of doing business, and makes clear the course of action for the future.



SOUTHERN PUBLIC UTILITIES  
SINGLE-TRUCK, ONE-MAN CAR



A CLEVELAND CENTER-ENTRANCE CAR

In carrying out the plans, however, an unexpected obstacle arose—in the attitude of the regulating bodies. While it is a familiar saying that you “cannot make bricks without straw” it has not been as clearly recognized that you cannot run railways without money.

The Public Service Commissions have in many instances ordered increased service without giving due consideration to the financial problem involved. The service ordered could only be provided by depriving the stockholders of their fair and just return on their investment. While the commissions are now very generally endeavoring to be fair in their control the railways have arrived at a condition



where the great majority of the electric railways in this country must increase their revenue immediately or go into the hands of receivers.

They cannot give the service the people demand and ought to have unless help is given by the people in the form of increased revenue, reduction in taxes and other financial burdens.

Senator Underwood and other public men have told the electric railway men repeatedly that they should not blame legislators, Public Service Commissions or City Council men when they passed unjust laws or issued unfair orders, placing additional restrictions and burdens on the electric railways, because these representatives of the people were merely responding to the will of the people they represented. If the will or demands of the people were unfair or were based on erroneous assumptions, the burden of educating the people rested with the Public Utility Company and not the legislators. This responsibility the electric railways are assuming.



A SANTA BARBARA, CALIF., CENTER-ENTRANCE CAR

The problem of educating the people is no easy task. The muck-raking press a few years ago established a deep-rooted prejudice against corporations, and the good as well as the bad are suffering as a result; it cannot be eradicated in a few years. The electric railway industry has spent considerable money and effort endeavoring to clear up this unfair attitude, but it is slow work. The daily newspapers, like our legislators, also reflect public opinion.



TRAIN SERVICE IN SCRANTON, PA.

They, too, realize that to ask for fair play for the street railway is unpopular. Fair play is always popular with the public when the public sees that it is fair play. There is a growing knowledge on the part of the public of the street railway business and a growing realization that co-operation and mutual help on the part of the public and its representatives with the railways is necessary.



QUICK SERVICE IN DAYTON, OHIO

The splendid work of many leading railway men during the last six months is beginning to bear fruit. A number of electric railways have been granted increased fares; quite a few daily papers and magazines have published articles

setting forth the true facts regarding the street railway company serving their community. The year 1918 has great promise for the better.

The manufacturers who supply cars and equipments are naturally



(Continued on next page)

very familiar with the condition of the electric railway business. Their business makes it necessary for them to keep in touch with all phases of the industry, such as physical requirements, finances, credits, etc., etc. Their sales force is mingling with the people in all communities, consequently they are in touch with the "car rider's" viewpoint also and are responding to the call of the American



HEAVY TRAFFIC IN WASHINGTON, D. C.

Electric Railway Association in doing their bit toward correcting the numerous wrong impressions that exist regarding the street railways. As a business or industry the electric railway is unique—it is fundamentally in a class by itself. Its function is to transport the people to and from business each day reliably, comfortably, speedily and courteously. This service must be performed all of the time under the critical eye of the public.

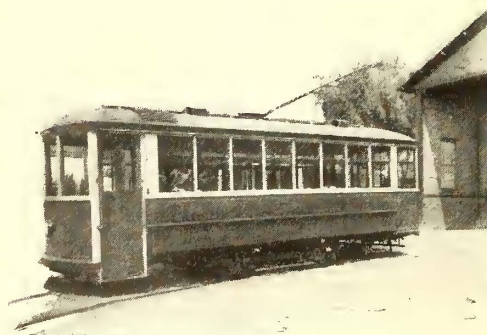
The people demand this kind of service as their right and everybody agrees they are entitled to it. But all reasonable men also agree that since the people demand this as a right they should be equally insistent that their representatives be fair and just and eliminate those things which prevent the railways furnishing the right service.

The street railway is serving the great majority of the citizens of any community, therefore the street cars should have the right of way on its tracks. Frequently several thousand people are delayed by individual automobiles or other vehicles. The railway company cannot afford to take the slightest risk of accident because they know from experience that the average jury will allow exorbitant claims.



MOTOR CAR AND TRAILER,  
PITTSBURGH, PA.

With the ever-increasing burden imposed each year upon them, the railway managers have been kept on the griddle, endeavoring to comply with often unjust demands, and at the same time meet the continuing demands of the people for increased service and the employees for increased wages, and do it all with the same five-cent fare. Up to the war period they were doing heroic work notwithstanding these conditions. The records of the past five years show the progressive steps various railway men have taken, hoping to improve the situation by the introduction of more economical methods of operation and



SINGLE-TRUCK, ONE-MAN CAR

more economical types of cars and equipment. When the great war came, and with it the great advance of raw materials and supplies of all kinds, as well as labor, then, and not until then, did they throw up their hands and say to the people—"It cannot be done on a five-cent



fare." This led to the placing of their financial conditions before many Public Service Commissions, accompanied by a request for increased fares.

A review of what the railway men have been doing will show that scarcely anything has been overlooked that would effect economy, safety and reliability. Many properties have adopted such measures as offered the best solution for their particular requirements. For example, one railway speeded up its schedules and gave better service by using the skip stop. Another improved on this by inventing the stagger stop. A third started traffic surveys and graded its service to the needs of its patrons by "short-line" cars. A fourth reduced congestion and solved the man problem by coupling its cars in trains. A fifth built up its traffic by reducing the headway and met the expense by one-man



LIGHT-WEIGHT CARS IN BOSTON



INTERURBAN TRAINS IN WILMINGTON, N. C.

operation. A sixth, on the other hand, secured similar results with increased headways, by publishing definite time tables and working rigidly to them. A seventh line reduced costs and increased reliability by replacing its obsolete motors, with light weight modern ones. An eighth secured partial results of some sort by taking better care of the equipment it already had. A ninth raised capital for needed improvements by selling securities to its patrons. A tenth—an interurban—established through-freight service

over a connecting line. An eleventh petitioned for increased fares and presented its case, not with a whine, but in so convincing and business-like a manner that the community joined in urging that the increase be granted.

Other dozens of companies did numerous other things, but it is not so much the plans adopted that concern us as the spirit which prompted them—the commercial spirit, the spirit of progress. This is the spirit which is recognizing the kinship of the entire industry. The manufacturers have responded in almost every instance to the call of the electric railway operators and have expended large sums cheerfully in developing any new apparatus which



TRAIN SERVICE IN LOUISVILLE, KY.

gave promise of reducing operating costs, even though the probabilities of reasonable returns were sometimes quite remote. Examples of these are the light-weight motor for 24" wheels; the "HLD" control



(Continued on next page)

for train operation on low-floor surface cars; the light weight circuit breaker; the light weight trolley; re-designing the entire line of railway motors two or three times during the past five years, each change making reductions in weight and increasing the operating efficiency.



CENTER-ENTRANCE CARS IN CLEVELAND, O.

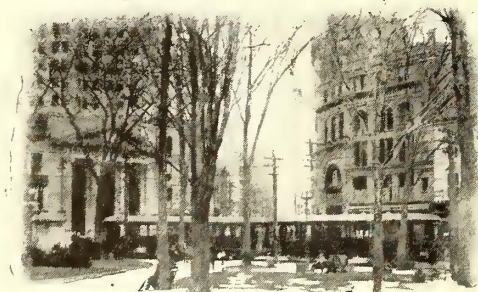
The railways, the public, the public legislative, executive and regulating bodies, the manufacturers are one and all evidencing a growing spirit of kinship—a spirit which is recognizing that they are mutually responsible for service which we must have in the transportation of passengers on our streets.

## What of the Future?

While the condition of the street railway as a business, profitable to its stockholders and satisfactory to its patrons, is perhaps at the lowest point it has ever reached, profiting by the view backward, as outlined above, we are justified in saying that the future of the electric railway industry is bright. Any human endeavor is progressive and successful only through the spirit which permeates it and guides its activities. The new spirit which is prevalent throughout the industry among the street railways, the manufacturers, and the public, is a guarantee that from now on the railways will perform a more valuable and adequate service; the manufacturers will undertake the necessary development of improved apparatus and the public



A BUSY SPOT IN ATLANTA, GA.



TRAIN SERVICE IN WILKES BARRE, PA.

will demand and give the railways the necessary capital to justify the improved condition. We are justified in predicting:

“That the electric railway business, which is perhaps one of the most fundamental businesses of the country, will again come into its own and be a business of good repute and mutual profit to the public, the railways and the manufacturers.”

**Westinghouse Electric & Manufacturing Co.**

East Pittsburgh, Pa.







# The Safety Car For 1918 And Thereafter

Two years ago the Light-Weight Safety Car was little more than a pious wish for a faster, safer, more economical and more satisfactory car unit.

Today it is the standard car of scores of cities—

The first car in the history of American electric railroading which has made good universally.

Won't you ask us the reasons?

## **SAFETY CAR DEVICES CO.**

Main Office—Boatmen's Bank Bldg., ST. LOUIS

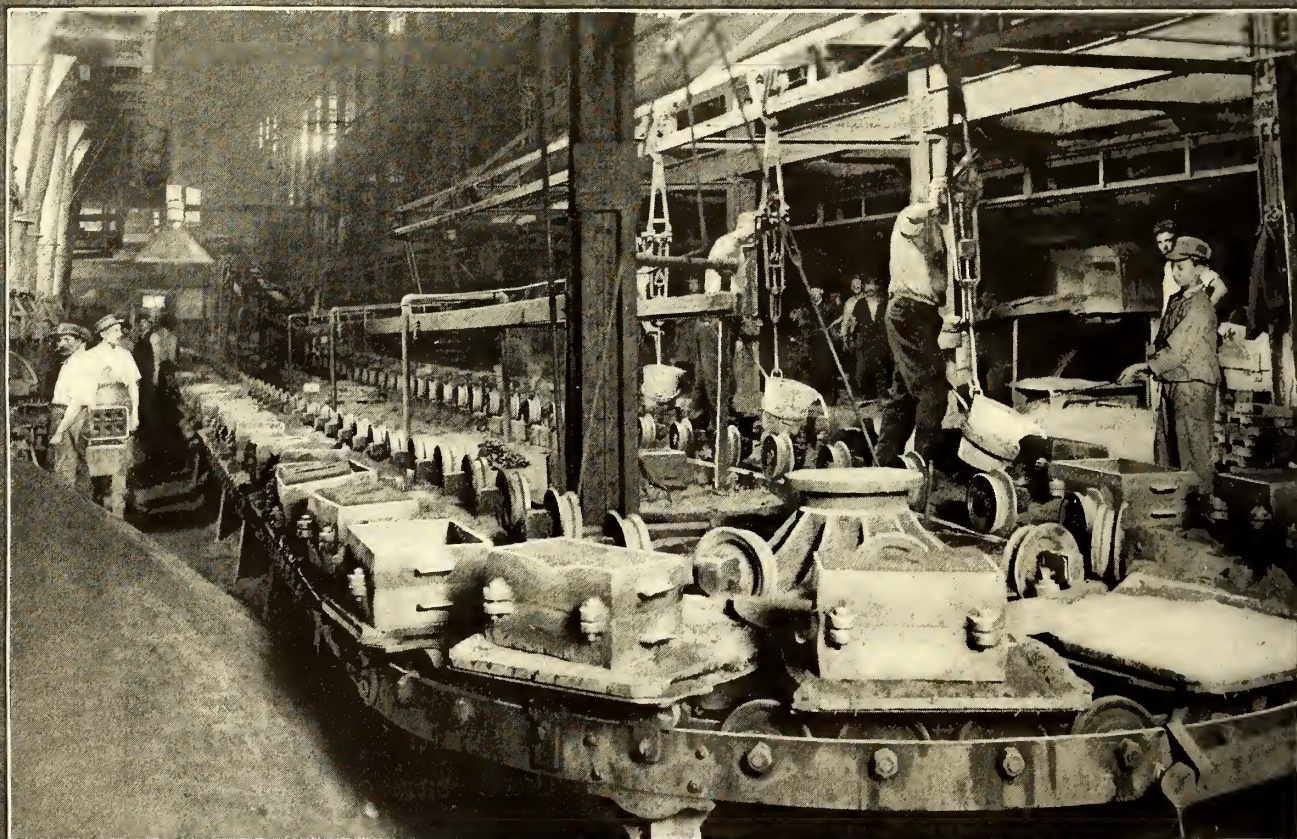
CHICAGO  
Ry. Exch. Bldg.

NEW YORK  
City Invest. Bldg.

PITTSBURGH  
Westinghouse Bldg.

# Meet the Wear at Its Source

That's what we do when we build into our air brakes those wear-resisting qualities obtained only by use of best designs, best materials and skilled workmanship. We weave into the fabric itself the element of enduring quality.



*Brake Building our Business for a Lifetime*

## Westinghouse Traction Brake Company

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Los Angeles, Cal.

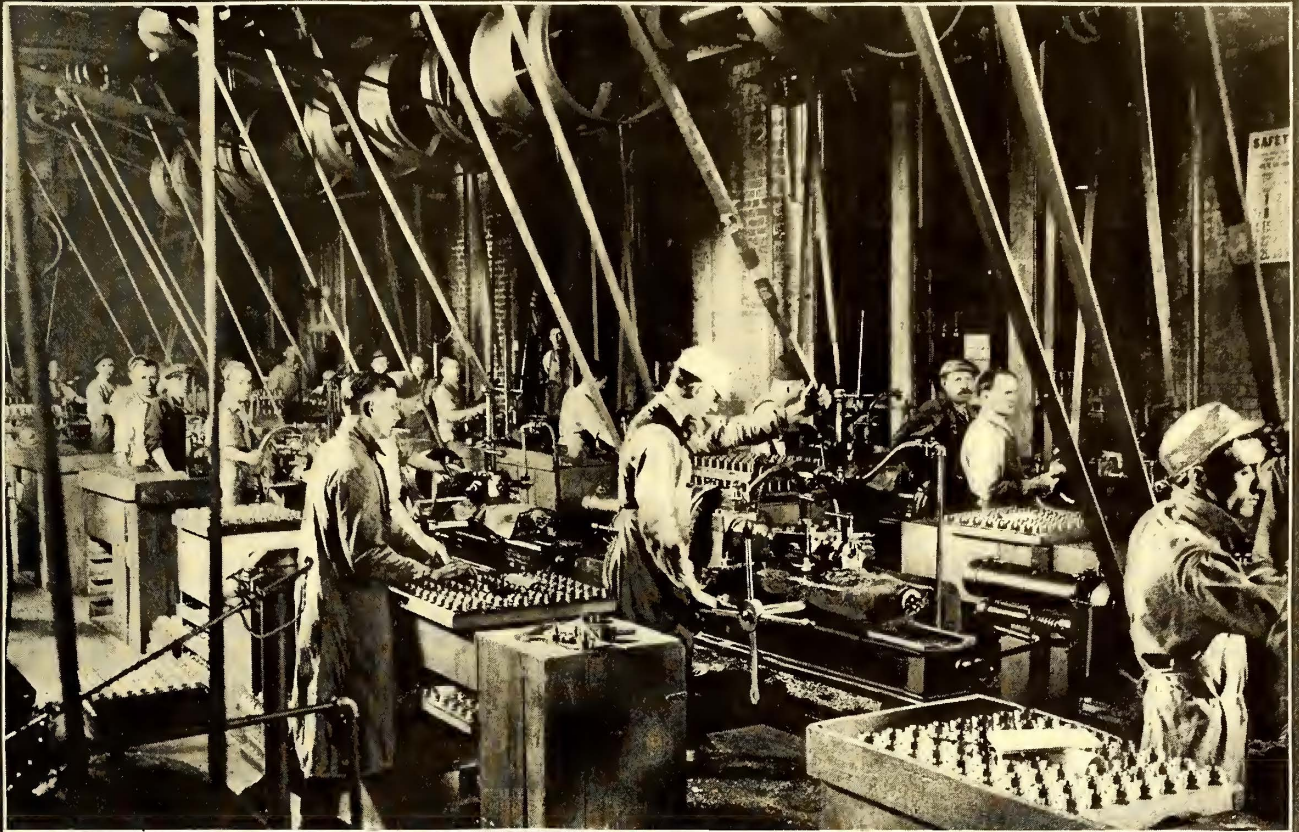


Mexico City  
New York, N. Y.  
Pittsburgh, Pa.

San Francisco  
Seattle, Wash.  
St. Louis, Mo.  
St. Paul, Minn.

# Specialization and Its Advantages

In War as well as Peace, Specialization in every line of human effort makes for larger and better results. The Westinghouse Air Brake is a specialized product of nearly fifty years' standing. Enables efficient operating results at low maintenance expense.



*Brake Building our Business for a Lifetime*

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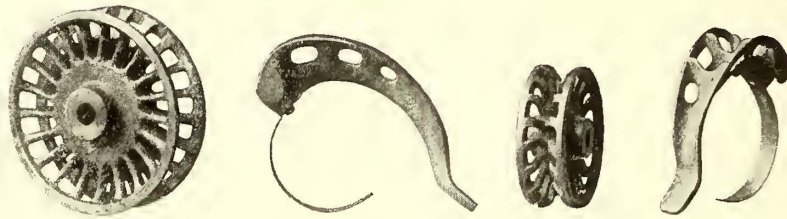
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# Maintain your *Quick-Service* Schedule

with

## Nuttall Sleet Wheels and Scrapers



The *Quick-Service* Car produced for giving quick dependable service to the public and profit to its operators will fail if the principal element of its operation is diminished—*Quick-Service*.

Operating conditions, varying from the ideal in summer to the severe handicaps of winter, require foresight, which proves that good service is governed much less by weather conditions than is commonly believed.

When trolley wires are covered with ice and snow it will be the car equipped with the Nuttall Sleet Wheel or Scraper that will maintain its schedule—being assured a good, clean trolley contact.

*Nuttall Sleet Wheels and Scrapers* are made of the best phosphor bronze—two sizes, 4 and 6 inches; rugged contact surfaces effecting clean wires.

*Prepare for sleet storms—order today*

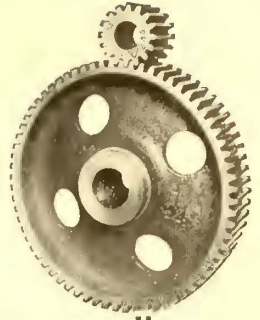
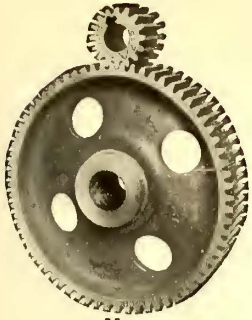
**NUTTALL**  
PITTSBURGH **L**

# Quick-Service Gears and Trolleys

for

## Economical Operation

"It is the little things that count"



Electric Railways all over the country are adopting the **Quick-Service** Car to reduce operating expenses. Though a great saving can be secured with this type of car, still maximum economy can only be attained through the use of equipment parts that give the greatest ultimate service.

### Nuttall **Quick-Service** Gears

are particularly adapted for **Light Weight Rolling Stock**, for the following reasons

- 1 Lightest and Strongest **Quick-Service** Gearing.
- 2 Narrow Face and Reduction of Section eliminates unnecessary weight.
- 3 Life four times untreated cast steel
- 4 Denser and more refined than any other carbon steel.

### Nuttall **Quick-Service** Trolleys

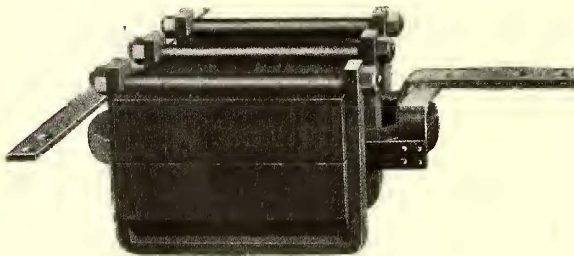
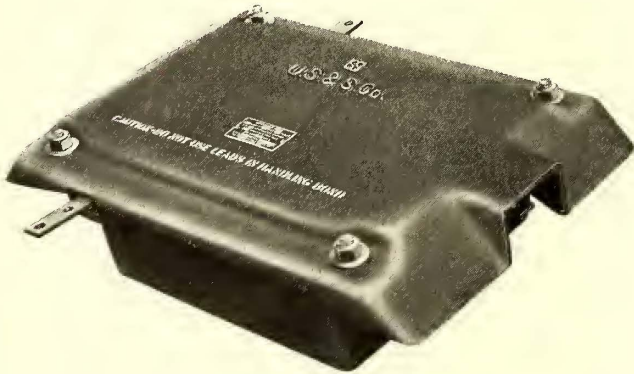
are Union Standard. Their accurate, well-balanced construction makes them sensitive to the slightest variation in the direction of the wire as well as equalizing the swaying motion of the car, thus minimizing the possibility of the wheel leaving the wire. Through an arrangement of the base springs any desired wheel pressure can be obtained.

Though this trolley is of light weight and minimum material it will give long, dependable service.

*Let Us Know Your Requirements*

**NUTTALL**  
PITTSBURGH **L**

# UNION IMPEDANCE BONDS



For service wherever electric propulsion with two rail return is used.

The case is of cast iron, specially sealed and treated before it leaves our foundry to prevent corrosion.

The sloping cover insures protection of bond and terminals from dragging equipment.

The terminal connections are advantageously located, insuring minimum length of leads.

The coils are of strap copper, spirally wound, arranged so as to provide protection against surges and impressed voltages of high frequency.

Adequate insulation is provided between turns. Assembled coils are treated to insure satisfactory operation.

The laminations are assembled under great pressure, and are held securely in place.

Provision is made for terminals of the clamp or bolt type. This allows bond to be disconnected without opening the cable connections at the rails.

"Union" Impedance Bonds have been standardized in ranges of capacities to meet all requirements of either d-c. or a-c. propulsion electric lines.

## The Union Switch & Signal Co.

SWISSVALE, PA.



Hudson Terminal Bldg.  
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Canadian Express Bldg.  
MONTREAL

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Railway Exchange Bldg.  
ST. LOUIS MO.

Peoples Gas Bldg.  
CHICAGO

Pacific Bldg.  
SAN FRANCISCO

Represented by the GENERAL ELECTRIC CO. in Australasia, South Africa and Argentina



# Electric Railway Journal

## Contents

### Further Electrification of Railroads Important

Electrical equipment presents a most effective way of increasing transportation capacity. F. H. Shepard presents considerations why this is now a timely subject.....Page 4

### Applying Engineering Principles to Railways

J. F. Layng discusses the present situation and its connection with the conservation of the nation's resources; of the electric railway's need for statistical and analytical data; of the economics possible with better equipment and scientific running in co-operation with regulatory bodies, and of improved relations with the men.....Page 8

### How the Pay-as-You-Pass Car Was Developed

The pay-as-you-leave system, introduced first in Cleveland, prevented boarding delays, but caused congestion at important leaving terminals. Peter Witt describes how the present Cleveland car cuts down boarding and alighting time and insures collection of all fares.....Page 30

#### CONSTRUCTION, MAINTENANCE AND EQUIPMENT..44

- Dispatching Trucks and Work Trains. *By C. L. Cadle.*
- Asphalt Plant Used Also for Car Sand Drying to Gain All-Year Use. *By A. E. Harvey.*
- Electrical Interlock for Use with Folding Car Step.
- Reclaiming Warped Resistance Grids. *By W. H. McAloney.*
- Developments in Electrical Apparatus During 1917.
- Cooling Water for Power Plant Purposes.
- New Sander Designed to Prevent Causes of Stoppage.
- Storage Rack for Wooden Car-Repair Parts.
- Retaining a Record of Transfers.

#### EDITORIALS ..... 1

- Some Changes in the Make-Up of the "Journal."
- Will the Government Be Able to Give Us More Coal?
- A Review and a Prophecy.
- Help, Don't Hinder, the Electric Railways.
- Making Both Ends Meet Has Been a Real Job.
- The War Should Stimulate Steam Railroad Electrification.

#### NEW ELECTRIC ROLLING STOCK FOR 1917.....34

#### TRACK REBUILT AND NEW TRACK PLACED IN SERVICE IN THE YEAR 1917.....36

#### THE FINANCIAL WRECKS OF 1917.....39

#### ELECTRIC RAILWAY STATISTICS.....41

#### AMERICAN ASSOCIATION NEWS.....42

#### LONDON LETTER .....51

#### NEWS OF THE ELECTRIC RAILWAYS.....52

- Toledo Report Will be Made to New Mayor.
- Eighty-two Miles of Rapid Transit Lines.
- City and Obstructionist.
- Philadelphia Lease Measure Passed.
- St. Louis Sleeping.
- Fuel Board Takes a Hand.
- Preliminary Subway Survey.

#### FINANCIAL AND CORPORATE.....56

- Dallas Railway Reports.
- Short Topeka Line Abandoned.
- Dan Patch Line Reorganization.

#### TRAFFIC AND TRANSPORTATION.....58

- Commission Upheld in Indianapolis Fare Case.
- Chicago "L" Fare Announcement.
- Wages Dependent on Fares.

#### PERSONAL MENTION .....62

#### CONSTRUCTION NEWS .....64

#### MANUFACTURES AND MARKETS.....66

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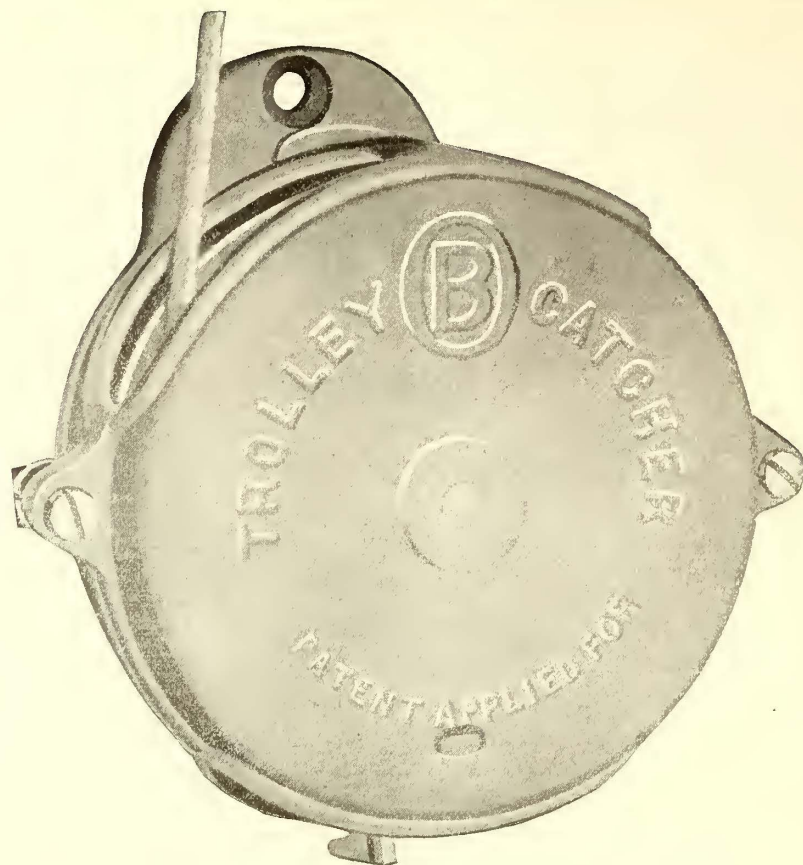
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# O-B Trolley Catcher

for

## Dependable Service with Indifferent Care

Rugged, for rough handling—simple, for a minimum of care—efficient, for quick, dependable action—those are the characteristics of the improved O-B Trolley Catcher.

The three features go together naturally. Simplicity made unnecessary the use of small, delicate parts, consequently the mechanism is rugged. And this refinement of design of course brought efficiency in operation.

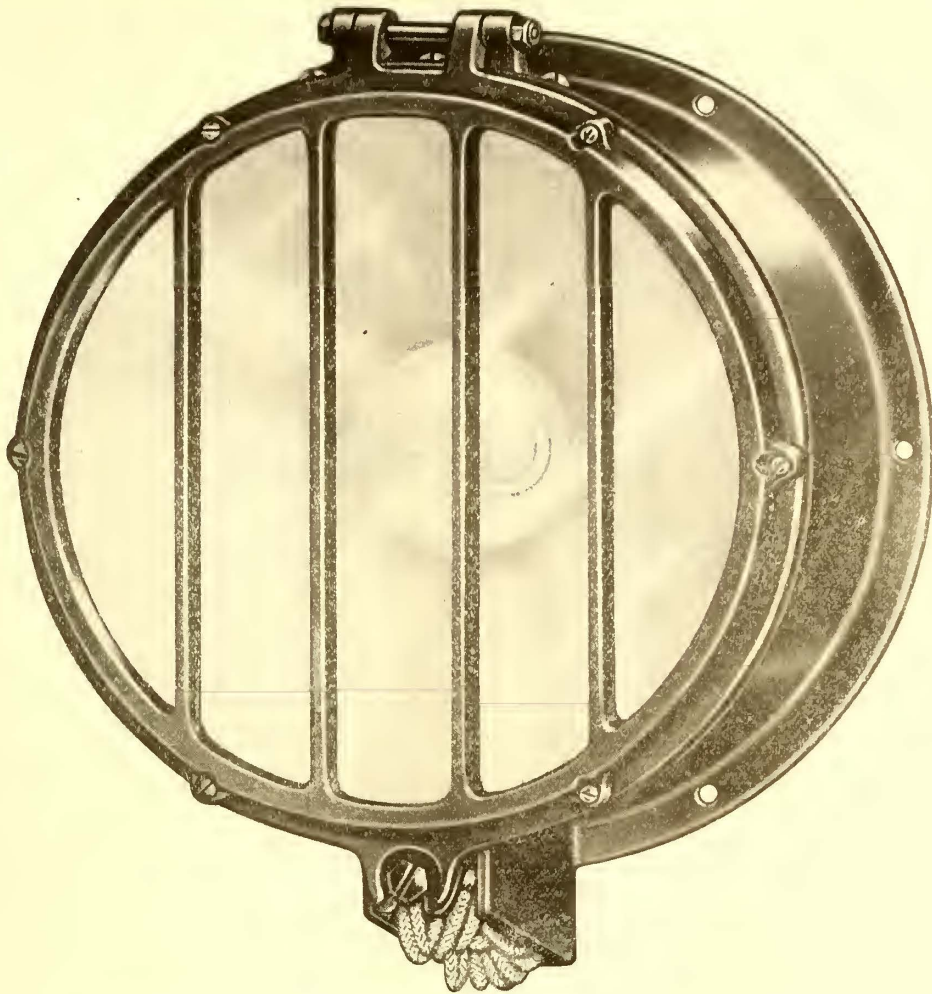
When the wheel leaves the wire the O-B Catcher stops it quickly and holds it securely. Exclusive O-B construction will not permit the pole to “step up.”

There is a reel latch, too, which is useful on numberless occasions. When the rope is removed it locks the reel with the spring wound. So when the rope is replaced the reel is ready to wind it in automatically. The latch has only two parts—there is no chance for it to foul the mechanism proper.

Write for detailed description.

**The Ohio Brass Company**  
Mansfield, Ohio





Type W D S  
For Both City and Suburban Service

## Imperial Incandescent Headlights Are Adaptable to Individual Requirements

There is no one headlight which can be suitable for all conditions. A type which is perfectly fitted for service on one road is nearly useless on some other. Practically every condition encountered in service can be satisfied from the broad range covered by the Crouse-Hinds line of Imperial Incandescents.

There are types for city work exclusively, for mixed suburban and city service, for high speed interurban duty. They have cast iron cases or pressed steel, can be obtained for flush or surface mounting and there are portables. Some have plain doors and others grid doors. The larger types may be furnished to "Light the Way with Crystal Ray or Gold Ray or Sterling Ray."

Each of the many types has certain definite advantages which fit it for some class of service. Our experts can possibly aid you in the selection of the right type or types of headlights for your road. You are quite welcome to their assistance.

**The Ohio Brass Co., Mansfield, Ohio**  
General Sales Agents in U. S. for Crouse-Hinds Imperial Headlights

# Uniformity Cuts Labor

*What Is the Value of Tie Uniformity to You?*

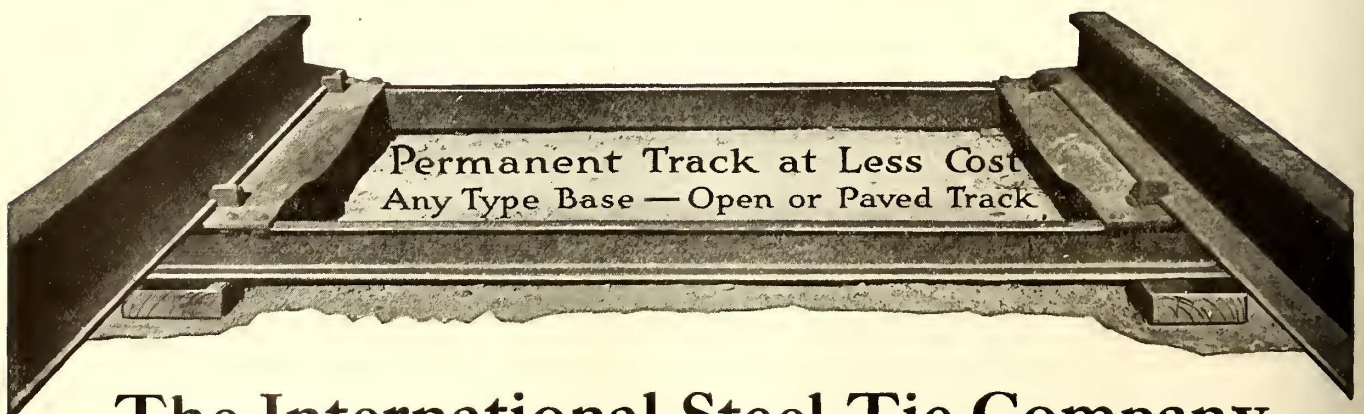
One Sixty-fourth Inch Tolerance Is the  
Maximum Allowance on

## INTERNATIONAL<sup>®</sup> STEEL TWIN TIES

What wooden tie will come within this specification? And your track gauge is fixed within the tie tolerance limit. Your track men have absolutely nothing to do with determining the gauge or the nicety of the fit of the rail fastenings. These are all provided for by thoroughly checked gauges in fabricating the ties. Every tie is like every other one, and every rail fastening is the same.

In the finished track the gauge is correct and the rail fastening is secure. After a track man has once been shown how to apply the clips, that's all that is necessary. Nothing need be left to the judgment of the laborer and he can't make a mistake. Steel Twin Ties are absolute insurance against construction errors. Let us show you this feature.

*Prompt deliveries made from stock*



## The International Steel Tie Company

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**For Eight Years**

# Rico Coasting Recorders

**Have saved coal—bettered operation**

**Hon. W. G. McAdoo**, Secretary of the Treasury and Director-General of the steam railroads of the United States, as president in the year 1911 of the Hudson & Manhattan Railroad (McAdoo Tubes), was the first electric railway operator to place a large order with this company for the Rico Coasting Recorder. His decision has since been

## Confirmed by

### Prominent Engineers

Lt. Col. Bion J. Arnold, Chairman Board of Supervising Engineers, Chicago Traction.	
John A. Beeler.	Sanderson & Porter.
A. L. Drum & Company	L. B. Stillwell.
Kansas City Board of Control.	Stone & Webster.

### Prominent Operators

W. R. Alberger, Vice President and General Manager, San Francisco-Oakland Terminal Railways, operating 256 miles, 360 Recorders.

John A. Beeler, when Manager Denver Tramway Company, 229 miles, 220 Recorders.

M. C. Brush, President Boston Elevated Railway, 526 miles, 538 Recorders.

C. B. Buchanan, General Manager Virginia Railway & Power Company, 262 miles, 211 Recorders.

Britton I. Budd, Member Electric Railway War Board, President Chicago Elevated Railways, 186 miles, 395 Recorders.

J. J. Dempsey, Vice President Brooklyn Rapid Transit System, 779 miles, 500 Recorders.

General George H. Harries, Vice President H. M. Byllesby & Company.

Frank Hedley, Vice President Interborough Rapid Transit Company and New York Railways, 542 miles, 2700 Recorders.

Samuel Insull, Trustee Chicago Elevated Railways, 186 miles, 395 Recorders.

Col. Philip Kealy, President Kansas City Railways, 301 miles, 670 Recorders.

Horace Lowry, President Twin City Rapid Transit Company, 445 miles, 1100 Recorders.

Edward A. Maher, Jr., Vice President and General Manager Third Avenue Railway System, New York, 280 miles, 1125 Recorders.

Pennsylvania Railroad (Long Island and West Jersey & Seashore Electrifications), 372 miles, 89 Recorders.

Theodore P. Shonts, President Interborough Rapid Transit Company and New York Railways, 542 miles, 2700 Recorders.

Paul Shoup, President Pacific Electric Railway, 1060 miles, 600 Recorders.

Sir Albert H. Stanley, President Board of Trade of Great Britain, formerly Managing Director London Electric Railway, the greatest rapid transit system of Europe, 300 Recorders.

Stone & Webster (Seven properties).

United Gas & Engineering Corporation, Knoxville and Elmira.

The following presents a partial record of installations, one typical case being selected for each year.

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## Time is the Essence of Railroading

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# 1910

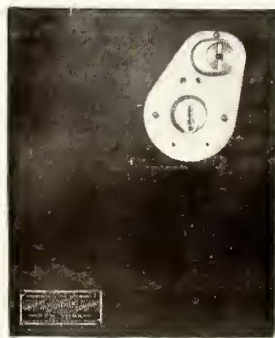
**L. B. Stillwell** reported in April, 1910, to the Interborough Rapid Transit Company that it was most desirable to measure the **Coasting;**

That the accelerating difference in motormen was found to be equivalent to 40.5% coasting, or 36% saving in power;

That the braking difference in motormen was found to be equivalent to 48.5% coasting, or 35.5% saving in power;

That a reduction in time of stop from 15 to 10 seconds would save 25% in power.

Since 1911, in accordance with the recommendations of Mr. Stillwell, the New York subway and elevated lines have been completely and most successfully equipped with Rico Coasting Recorders.



# 1911

**Stone & Webster**, in January and February, 1911, made their first installation of Rico Coasting Recorder on the Northern Texas Traction Company.

They found an immediate saving of 12.7% in energy, a reduction of the acceleration period from 40.3 seconds to 20.7 seconds and of the braking period from 28.5 to 18.5 seconds.

As these initial results were constantly bettered by some six years' experience—

Stone & Webster, in 1916, made Rico Coasting Recorders standard also on the Tarrant County Traction Co., the Houston Electric Co., Houston-Galveston Interurban Ry., Columbus Electric Co., Cape Breton Electric Co., Ltd., and Houghton County Traction Company.



## Time is the Essence of Railroading

# 1912

**John A. Beeler**, Consulting Engineer, as vice-president and general manager Denver Tramway Company, in 1912, was the next big operator to see the value of the Rico Coasting Recorder.

Within one year after installation, the coasting had been raised to 29.6% and the consumption of energy cut down 17.2%.

This was equivalent to a saving of about **\$60 a day in the coal bill alone!**

In 1915 Mr. Beeler reported that the energy saving had gone up to 25%, the coasting raised to 38%, front-end accidents decreased 41% and armature life increased over 50%!

Denver has been using the Rico Coasting Recorder with splendid results for some six years.



# 1913

**Sir Albert H. Stanley**, when managing director London Electric Railway, authorized the installation of Rico Coasting Recorders.

The first tests on the Hampstead Tube, made during 1913, raised the general average of coasting to 37.1%, and the maximum to 47.4%.

The average increase in coasting was 14.6% and the reduction in energy requirements, 18.4%.

Sir Albert, therefore, was an **efficient fuel administrator** before Great Britain needed so much more coal for the needs of herself and her Allies.

The entire tube system of London has been served by Rico Coasting Recorders for nearly five years with the same success as on American railways.



## Time is the Essence of Railroading



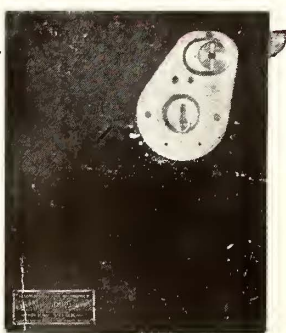
# 1914

**W. R. Alberger**, vice-president and general manager, San Francisco-Oakland Terminal Railways, was responsible for that company's adoption of the Rico Coasting Recorder.

In the preliminary tests on this system, the lowest man's coasting had been raised from 2.9 to 33.5%; the highest man's coasting from 16.6 to 53.6%; the average coasting from 8 to 43.8%!

Between June 30, 1914, and June 30, 1916, this company **saved \$118,681 in power cost** alone; and the savings now exceed **\$125,000 a year**.

At present prices for power, the savings for 1917 will be greater still.



# 1915

**United Gas & Electric Corporation** installed Rico Coasting Recorders on its Knoxville lines in 1915.

Among the advantages of Rico Coasting Recorders noted by the management in addition to the 18.5% decrease in energy were the following:

Fewer flat wheels; decreased accidents; immediate knowledge of defective armatures and motormen's valves; automatic daily report of efficient and inefficient motormen; elimination of unnecessary layovers at terminals; and

Use of fewer cars (as three for four on one line) without decrease in mileage.



## Time is the Essence of Railroading

# 1916

**Paul Shoup**, president Pacific Electric System, authorized, in 1913, trial of the Rico Coasting Recorder on the heavily traveled Pasadena Lines.

These tests showed that with the use of the Recorder alone, the motormen could save 11.2% in energy.

In 1916 the entire Pacific Electric System was equipped—600 Recorders in all—for all classes of service.

And the results under the able management of this great railway are constantly improving, both in saving of fuel and in speeding up of schedules.



# 1917



**Horace Lowry**, President, Twin City Rapid Transit Company, operating in St. Paul and Minneapolis, after exhaustive investigation, authorized the installation of 1100 Rico Coasting Recorders.

The decision of this well-managed, conservative railway, and of its consulting engineers, **A. L.**

**Drum & Company**, was another significant endorsement of the Rico Coasting Recorder as the best possible device for

Saving power, decreasing car maintenance, improving operation and obtaining the most economical schedule speed.



**Time is the Essence of Railroading**

# These electric railways are answering for Coal Economy in the Rico Coasting



232 Rico Coasting Recorders Showed the Slack in the Line at Vancouver, B. C.

Rico Coasting Recorders are on Every Car Speeding over the Houston-Galveston Causeway

Stone & Webster Equip Cape Breton Electric Co. Ltd. with Rico Coasting Recorders

200 Rico Coasting Recorders Cut Brake Shoes 48% on Hudson & Manhattan

650 Rico Coasting Recorders ordered by The Kansas City Railways Company

Pacific Electric Railway's 600 Rico Coasting Recorders

1102 Rico Coasting Recorders on the Third Avenue Railroad, N.Y.

Manhoning & Shenango RICO Recorder Road

Havana's Fastest Cars Carry Rico Coasting Recorders

No Roads Are To Rico Coasting Recorder

Short Line has Rico Coasting Recorder on Every Car

The Pennsylvania Railroad uses Rico Coasting Recorders on its Long Island and New Jersey Suburban Service

211 Rico Coasting Recorders are at Work in Ole Virginia

Stone & Webster Equip Houghton County Traction Company Houghton Mich with Rico Coasting Recorders

1842 New York City Railways Cars Carry Rico Coasting Recorders

The True Principle for Measuring Operating Efficiency

Time is the Essence of Railroad

Cold Cars and Reduced Service are not well received Simplest and Quickest Way to secure Real Economies

## Time is the Essence of Railroad



# Fuel Administrator Garfield's Appeal Nation's Crisis by the use of **Recorders**



**Rico Coasting Recorders are on Every Car in Norfolk, Virginia**

**The Knoxville Lines of the United Gas & Electric Corporation use Rico Coasting Recorders through Knoxville, Tenn.**

**220 Rico Coasting Recorders Increased Amature Life 50 per cent at Denver, Colorado**

**600 Additional Rico Coasting Recorders**

**360 Rico Coasting Recorders Paid \$183.71 each per annum at Oakland**

**153 Rico Coasting Recorders ordered by Stone & Webster for St. Louis**

**183 Rico Coasting Recorders for the Northern Texas Traction Company**

**4400 Rico Coasting Recorders Used in New York Alone**

**300 Rico Coasting Recorders Are at Work Under London, England**

**538 Rico Coasting Recorders in the Service of the Boston "L"**

**Complete Equipment of Rico Coasting Recorders for the World's Biggest Elevated Railway System, Chicago**

**The True Principle for Measuring Operating Efficiency**

**Time is the Essence of Railroadng**

**COLUMBUS, GA. Another Stone & Webster Property adopts Rico Coasting Recorders**

**The True Principle for Measuring Operating Efficiency**

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Fuel Administrator Garfield's Appeal Nation's Crisis by the use of

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Twin City Rapid Transit Rico Recorder Road

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The True Principle for Measuring Operating Efficiency

without diminishing the Revenue from Riding.

**Time is the Essence of Railroad**



# 1918

finds the Rico Coasting Recorder the standard fuel and power saver for electric railway car operation commercially accepted and adopted by leading railways everywhere and recommended by prominent engineers and Public Service Commissions. Acknowledging this fact, the railway manager will ask:

## *How am I going to get the money?*

You can pay for the Rico Coasting Recorder just as you pay for your coal—out of your operating revenue. The Rico Coasting Recorder will pay for itself **in coal savings alone** within a year on almost any electric railway. When you charge its purchase to capital account, you will be increasing the **permanent** value of your property; and after the end of the first year the Recorder will be clear gain to you every succeeding year in continuing to save you thousands of tons of coal and improving your operation.



## Time is the Essence of Railroading

### Railway Improvement Company

61 Broadway, New York

# To make money, save time, reduce stops and promote safety—Use these Keystone Specialties



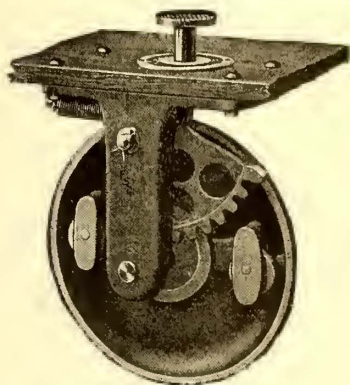
**Faraday Car Signal Systems**

Operates from line voltage—no batteries. Faraday Push Buttons, Buzzers and Resistances furnish an Ideal, failure-proof car signal system.



**Illuminated Car Signs**

With these signs destination names can easily be changed and cars rerouted. Well labeled cars make more money. They eliminate the unnecessary stop caused by the intending rider being unable to decipher the destination name within braking distance. They eliminate unnecessary car stops.



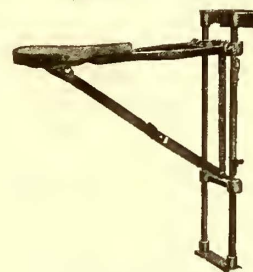
**Keystone Rotary Gongs**

A louder gong and more continuous to meet requirements resulting from modern, heavy, noisy traffic in cities. Cuts down accident claims.



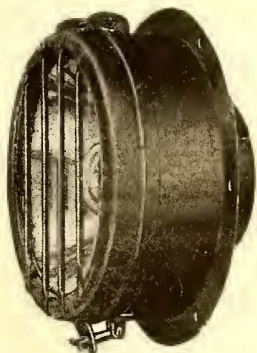
**Safety Car Lighting Fixtures**

To light up your cars scientifically, efficiently and safely. To save you money. A rapid creator of good public relations.



**Keystone Motorman's Seats**

For the motorman or conductor. A real collapsible, safe and durable seat. They make operators more contented.



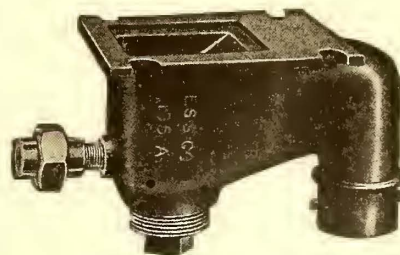
**"Golden Glow" Headlights**

To light up a path of safety for your cars. Only their famous reflectors can project the distinctive "Golden Glow" light.



**Keystone Trolley Catchers**

To protect your overhead construction from "flying" poles, thus preventing delays and tie-ups.



**Keystone Air Sanders and Valves**

To automatically sand your tracks by compressed air. A real device for safety and accident prevention.

## ELECTRIC SERVICE SUPPLIES Co.

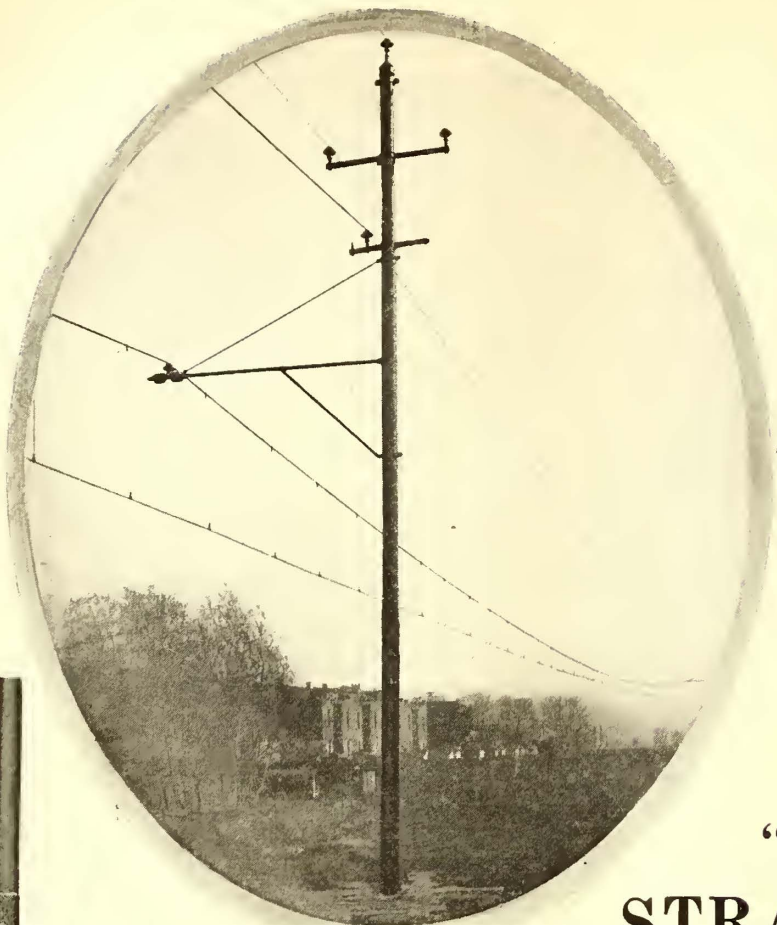
*Manufacturer of Railway Material and Electrical Supplies*

PHILADELPHIA  
17th and Cambria Sts.

NEW YORK  
50 Church St.

CHICAGO  
Monadnock Bldg.

Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Winnipeg



## “ELRECO” STRAIGHTNESS

There is far more than meets the eye in the absolute straightness of the “Elreco” tubular poles.

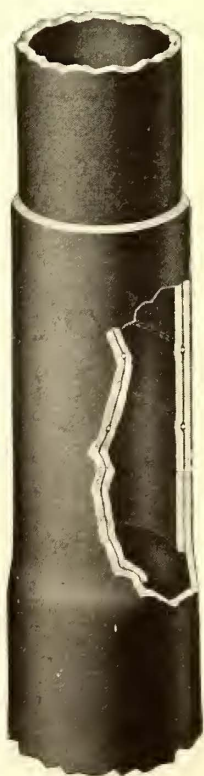
It is because they are tubular and perfectly cylindrical that “Elreco” poles are always straight and true in the ground.

Their circular shape takes all overhead strains, for “Elreco” tubular poles are designed in the only shape that combines the highest limit of efficiency with minimum weight.

### For Sheer Strength and Sheer Elegance

“Elreco” poles must be your choice next time you are in the market for poles.

Get catalog No. 16 which tells all about “Elreco” poles and also about “The Wire Lock” and “The Chamfered Joint,” two features which mark “Elreco” pole-work as the standard of pole engineering.



Observe the  
WIRE LOCK

## ELECTRIC RAILWAY EQUIPMENT CO.

CINCINNATI, OHIO

New York: 30 Church Street

# An interesting Two-Track Service over a one track trestle with "U. S." Electric Type G-1 Signals

To eliminate a grade crossing, the City of Portland, Oregon, is raising the level of Sandy Boulevard, while the Oregon-Washington Railway and Navigation Company is lowering its right-of-way.

In the meantime, the double track line of the Portland Railroad, Light & Power Company has been shifted to a temporary trestle.

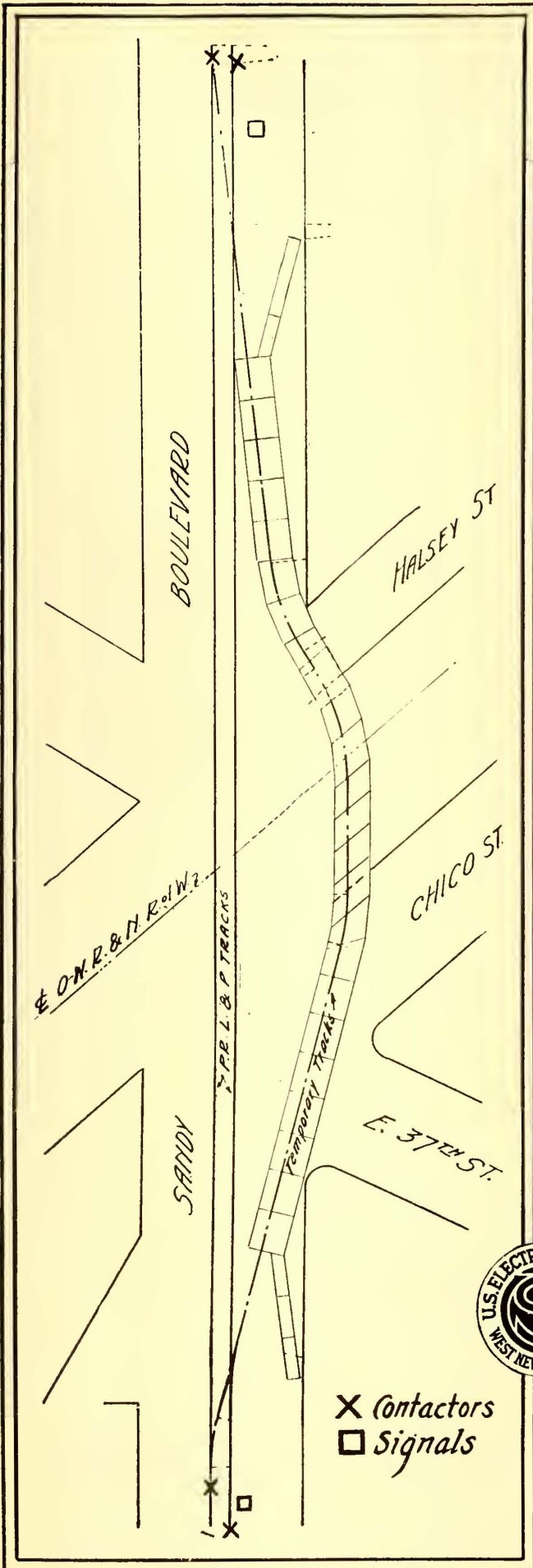
This trestle is so narrow that the tracks and trolley wires are gauntleted 7 in. centers, giving in effect a single track.

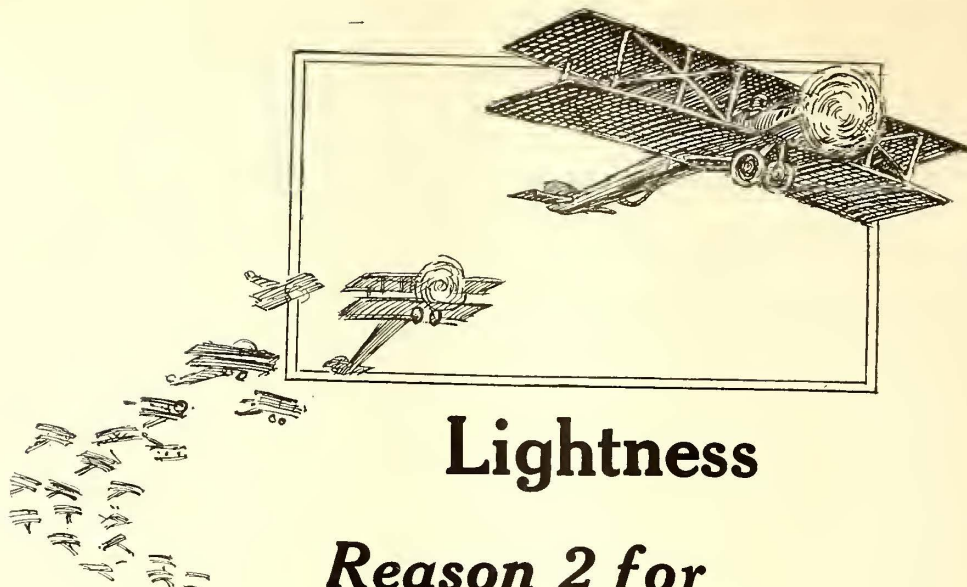
Note how readily safe operation over this temporary structure was secured by using four contractors and two U. S. Electric Signals.

Follow Portland's example of keeping several sets of U. S. Electric Signals on hand for special service.

It insures the safety of all of your passengers all of the time.

**United States Electric Signal Company**  
West Newton, Mass.





## Lightness

### Reason 2 for

# "COPPERWELD" TROLLEY WIRE

"Copperweld" trolley wire weighs 7 to 10 per cent less than copper of equivalent section, so that fewer poles, span wires, hangers, insulators and other fixtures are required.

In these days of extraordinarily high prices, it is worth knowing that the lower cost of "Copperweld" trolley wire itself when compared with copper wire is made still more conspicuous by the savings in the equipment required to carry this trolley wire.

With 40-ft. chestnut poles at \$10 each, cedar poles at \$13 and tubular poles still higher in price, a saving of 10 per cent in the number of poles would in itself be a worthwhile economy.

Fewer poles, span wires, hangers, insulators and other parts also mean a saving in labor and maintenance as well as in first cost.

General Sales Office  
Page Steel and Wire Co.  
30 Church St., New York

Western Sales Office  
Steel Sales Corporation  
Chicago, Illinois

Made from the product of the Copper Clad Steel Co., Pittsburgh, Pa.  
Drawn and sold exclusively by

# PAGE STEEL AND WIRE COMPANY

## MONESSEN, PA.

ESTABLISHED 1883



# Your Spring Drive

## on Bonding Troubles

### Must Be Made with FEWER Men

Uncle Sam's needs are first these days:

His call for men who know how to handle railway equipment is especially insistent.

That means you are going to be short-handed—that four men will have to do the work of eight, two the work of four, one the work of two.

### The Erico Portable Welder

Will enable you to meet this shortage. Its equipment is so easily handled and its application of the Erico Welded Bond so simple, that in emergencies one man could do the work.

The Erico Portable Welder, exclusive of the resistor, consists simply of a furnace box faced by a graphite plate which is pressed against the bond terminal by means of a suitable mounting. The carbon electrode which enters the rear of this box during the

operation draws an arc on this graphite plate. The furnace box and electrode is surrounded by a magnet which focuses the arc on to the graphite plate, producing the desired spread of the heat necessary for the welding of the terminal. This arc is so enclosed that it is not visible to the eye nor does it strike the bond or rail.

The positive control of the heat of the arc made possible by this construction assures an absolutely uniform homogeneous welding of the bond terminal.

ERICO  
THE LINE OF LEAST RESISTANCE

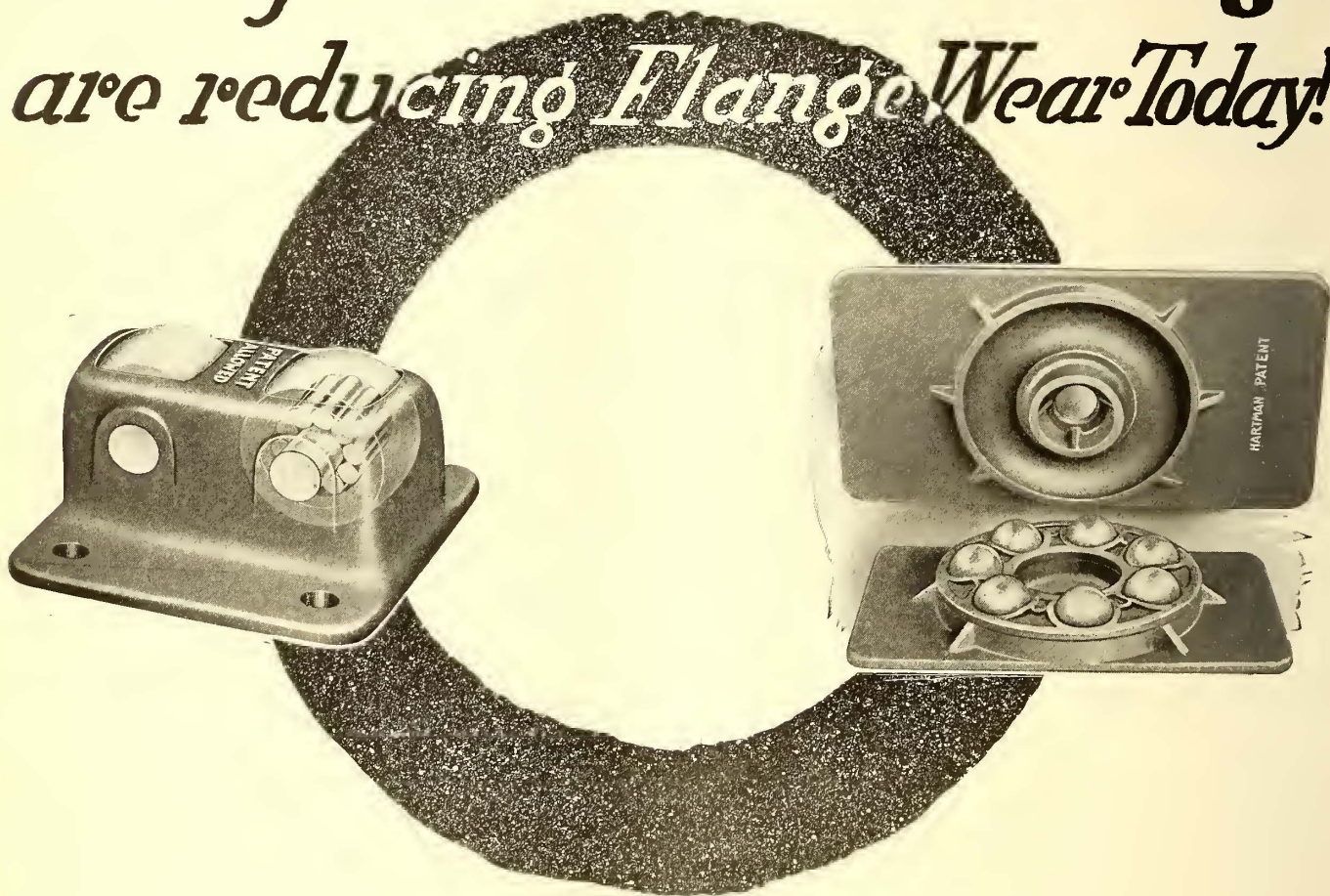


**The Electric Railway Improvement Co.**  
Cleveland

# 200,000

## Perry-Hartman Bearings

*are reducing Flange Wear Today!*



Double the life of your wheels—cut your pull-ins for wheel renewals by fifty per cent, decrease nosing, lessen flange and rail wear, reduce power consumption on curves and eliminate curve lubrication costs by using Perry-Hartman Bearings.

Ninety-five railways of the United States and Canada are securing these re-

sults today on both old and new equipment—their constant repeat orders are forcible testimony.

Send us sketches of your bolsters, present center plates or bearings and we will show you how Perry-Hartman Bearings can be quickly and economically applied—and without obligation on your part.

## Holden & White Inc.

Electric Railway Distributors for the Joliet Railway Supply Company

1508 Fisher Building, Chicago

National Railway Appliance Co., New York and Washington; Grayson Railway Supply Company, St. Louis; C. E. A. Carr Co., Toronto; W. M. McClintock, St. Paul; Alfred Connor, Denver; O. H. Davidson Equipment Co., Salt Lake City; F. F. Bodler, San Francisco; S. I. Wailes, Los Angeles; W. F. McKenney, Portland, Ore.

# *Sand and Sixty*

## *on the South Shore Lines*



# DAVIS STEEL WHEELS

"We've just ordered another carload of Davis Steel Wheels," says the Superintendent of Power and Equipment on the Chicago, Lake Shore and South Bend Railway.

Their 55-ton equipment hits 60 miles per hour in stretches on the sandy south shore of Lake Michigan. They are getting the mileage, *with safety*, from Davis One-Wear Manganese Steel Wheels.

Uniform wheel diameter is important in their A.C. motor operation. By eliminating expensive re-turning of treads and flanges they obtain a better power factor—more economical operation.

The testimony of the South Shore lines warrants your serious thought.



The Standard  
for  
Electric Railway Service

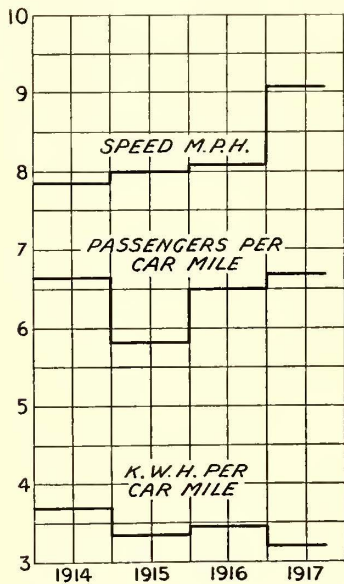
# AMERICAN STEEL FOUNDRIES

1100 McCORMICK BUILDING

CHICAGO

# Meter the Car Energy

Note what they did in



It's one thing to spasmodically cut down power consumption. It's quite a different thing to hold that gain over a period of years. That's the real test!

And that's what they did in Davenport—made the gain and held it!

In June, 1915, the Tri-City Railways installed ECONOMY METERS on their cars. A reduction in power consumption was apparent at once.

In November, 1917, the company had not only held the saving, but materially increased it.

The accompanying chart, taken from the ELECTRIC RAILWAY JOURNAL of Dec. 15th, shows the downward trend of the energy consumption curve, notwithstanding an increase in schedule speed.

The Journal article, describing the Tri-City Railways' experience with meters, says in part:

"The records covering the entire Illinois and Iowa electric railway properties for the last four years and averaged over all the lines for each year, show an increase in passengers, per car mile, of .9 per cent and per car hour of 15.9 per cent and, despite these increases, a decrease in energy consumption per car mile, of 13 per cent. \* \* \* \*

"Other than the installation of meters, there has been no change in particular on the system which would tend to better the energy consumption."

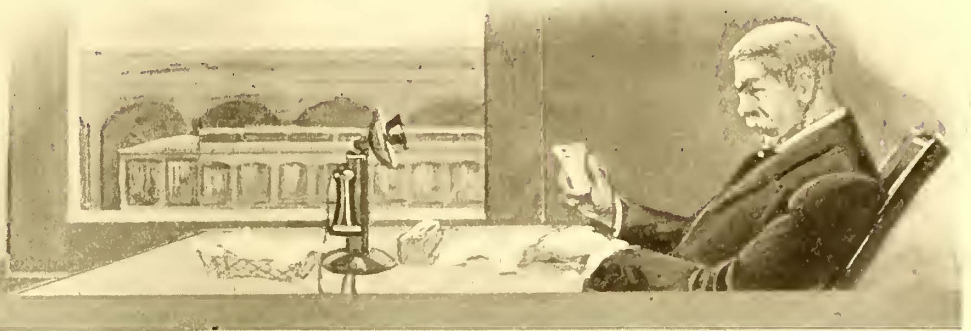
**Showing the Reduction in Power Consumption Accomplished by the Tri-City Railways after Installing Economy Meters on their Cars**

METER THE ENERGY—That's What You Want to Save

**ECONOMY ELECTRIC DEVICES CO.**  
*Exclusive Sales Agent Sangamo Economy Railway Meters*  
 Old Colony Bldg. Chicago, Ill.

# — and Save the Fuel!

## Davenport



This device on your cars will start paying for itself AT ONCE.

It posts the motorman on the least wasteful method of using the motive power.

It shows him how he wastes energy by failing to accelerate quickly enough.

It points out to him the cost to his company when he continually "fans" the brakes.

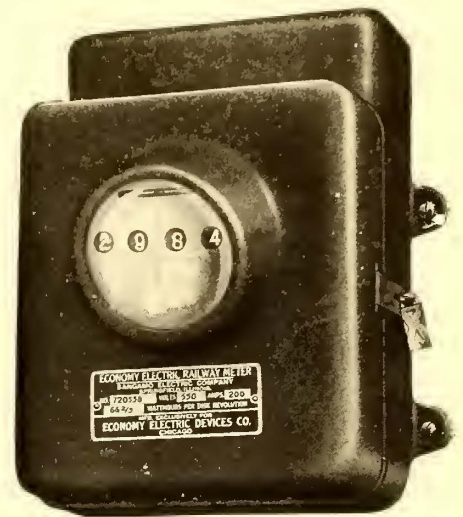
It proves to him that proper coasting saves energy and improper coasting wastes it.

It teaches him how to safely handle his car in the most economical manner and stimulates him to greater efficiency in competition with his fellow workers "on the front end."

It enables electric railways to effect generous savings at the coal pile.

*We shall be pleased to supply you with any desired technical data and to quote you on your requirements.*

The Economy Meter promotes more economical use of energy in car operation. It is easily installed by connecting in series with the car circuit breaker. It displays the car motor energy consumption on cyclometer dials like a fare register. These readings are the basis for checking the performance of motormen. Comparison of the records induces sustained effort to excel. Thus energy is saved.



The  
**ECONOMY Meter**  
*"The Watchdog of Your Power"*

**RUGGED**  
**TIME-TRIED**  
**EASILY INSTALLED**  
**Low in First Cost**  
**Low in Maintenance**

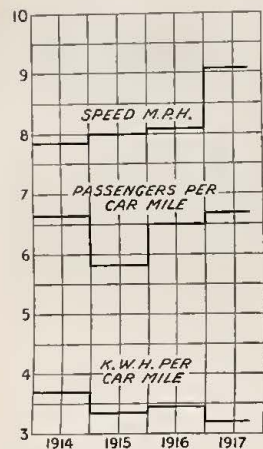
*METER THE ENERGY—That's What You Want to Save*

**ECONOMY ELECTRIC DEVICES CO.**  
*Exclusive Sales Agent Sangamo Economy Railway Meters*  
**Old Colony Bldg. Chicago, Ill.**



# Meter the Car Energy

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TIME-TRIED  
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**ECONOMY ELECTRIC DEVICES CO.**  
*Exclusive Sales Agent Sangamo Economy Railway Meters*  
 Old Colony Bldg. Chicago, Ill.



© Social Press Service

*Conductresses on National Pneumatic Cars In Modern New York*

## National Pneumatic Door and Step Control SPEEDS THE CAR

Perhaps, when your conductor is just beginning his day's work—and has nothing else to divide his attention—he can operate the door and step mechanisms by hand practically as fast as by means of air.

But on a schedule of eight stops per mile, eighty stops an hour, eight hundred stops a day, Mr. Conductor or Miss Conductress

would soon have to slow up and lose one second or more at every stop.

Whereas the operation of doors and steps by air—

Is just as snappy, just as speedy and just as safe at the crest of the rush hour—

As it was for the first stop made out of the carhouse.

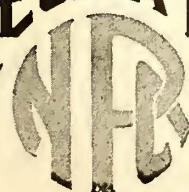


**Almost Every Peter Witt Car in Use Is  
Equipped with National Pneumatic  
Door and Step Control**



# NATIONAL PNEUMATIC COMPANY

50 Church St. New York



515 Laflin St. Chicago





*A Motoress on a Car In Ancient Rome*

## National Pneumatic Door and Step Control GETS THE FARES

One of our shrewdest electric railway men said lately that air brakes would pay for themselves if they did no more—

Than remove the temptation of the motorman to skip intending passengers.

Exactly the same reasoning holds for the use of air-operated

doors at either end of the car—

Because the operators of front-entrance cars will accept every person who offers to ride—

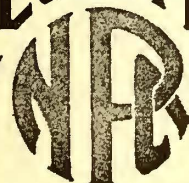
While the conductors of rear-entrance cars will be much more likely to re-open the doors for the last-second customer.



The Safety Cars Equipped by the Safety Car Devices Company Include National Pneumatic Engines



**NATIONAL PNEUMATIC COMPANY**



50 Church St. New York

515 Laflin St. Chicago

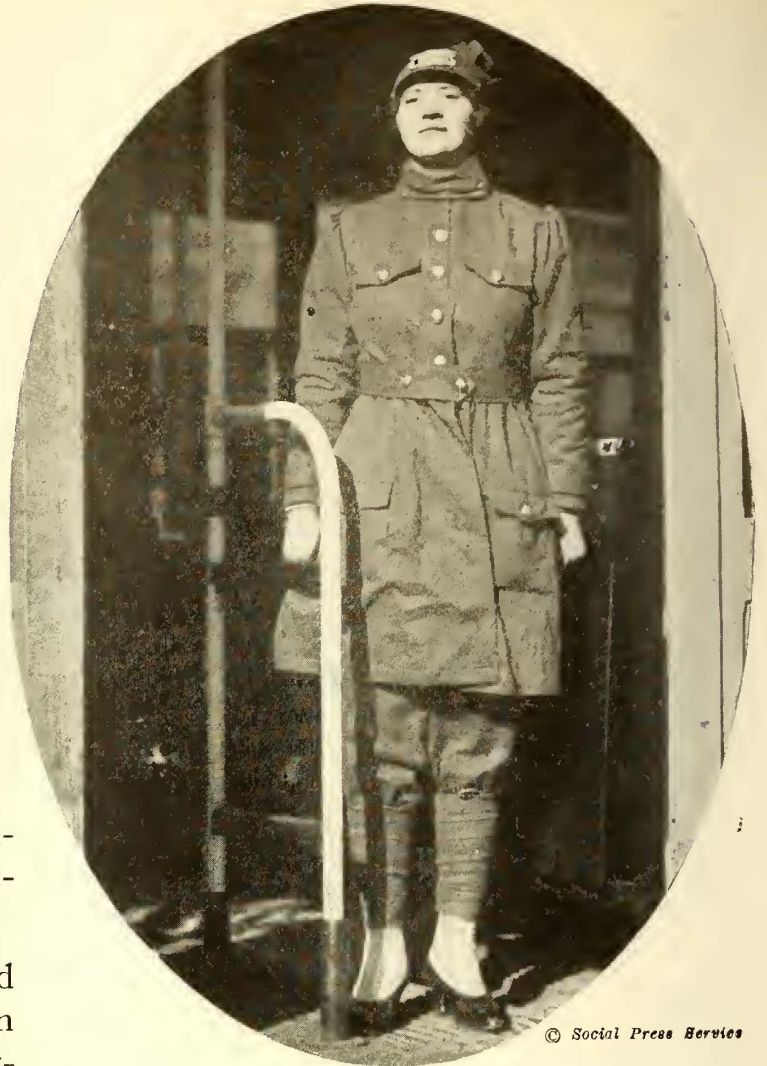
## National Pneumatic Door and Step Control

# HOLDS THE EMPLOYEES

It costs \$50 to \$100 each to examine, investigate, train and accept a platform recruit.

And until this employee has had at least three years' service, an average accident charge of several hundred dollars must be added.

To reduce these expenses and also to enjoy the public relations advantages of experienced employees, it is necessary to make platform service more attractive.



© Social Press Service

The first conductress on the New York Railway's center entrance cars, which are equipped with National Pneumatic Door Engines

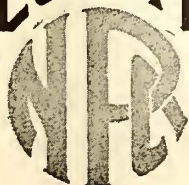
The operation of doors and steps by air not only makes this service attractive to a larger number of men, but even makes platform employment entirely feasible for women.



**Women Are Now Operating Both City and  
Rapid Transit Cars Equipped with  
National Pneumatic Control**



# NATIONAL PNEUMATIC COMPANY



50 Church St. New York

515 Laflin St. Chicago



© International Film Service

The First Woman Guard on the New York Municipal Railway's Rapid Transit Cars, 250 of which have National Pneumatic Door Engines

### National Pneumatic Door and Step Control

# PLEASES THE PATRONS

the "door-open" interval in winter—

Are the immediate outward proofs of satisfactory service to the public.

Unfailing obedience to the patrons' desire to board the car, together with the—

Rapid opening and closing of doors with gratifying speed, absolute safety and minimizing of

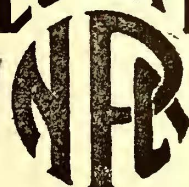
Deeper, though less apparent to the eye, is the development of a more courteous attitude by the platform employees who, freed from the fatigue of physical effort, find the time to—



**Think of the Passenger as a Customer  
because assisted by National  
Pneumatic Control**



## NATIONAL PNEUMATIC COMPANY



50 Church St. New York

515 Laflin St. Chicago

Why not duplicate this on  
Your Cars?

# Power Consumption

July { 0.97%  
Decrease

Aug. { 2.48%  
Decrease

Sept. { 3.06%  
Decrease

Oct. { 7.96%  
Decrease

Nov. { 10.84%  
Decrease

Note the Steady Downward  
Trend—*Think What It Means*  
in Decreased Operating Costs



Showing recorder location on one of the 1200 cars of the Connecticut Company

*"Power wasted is the true measure of the motormen's relative efficiency."*

**The Arthur  
Power-Saving  
Recorder Co.  
New Haven, Conn.**

One chief factor in producing the above results was the use of

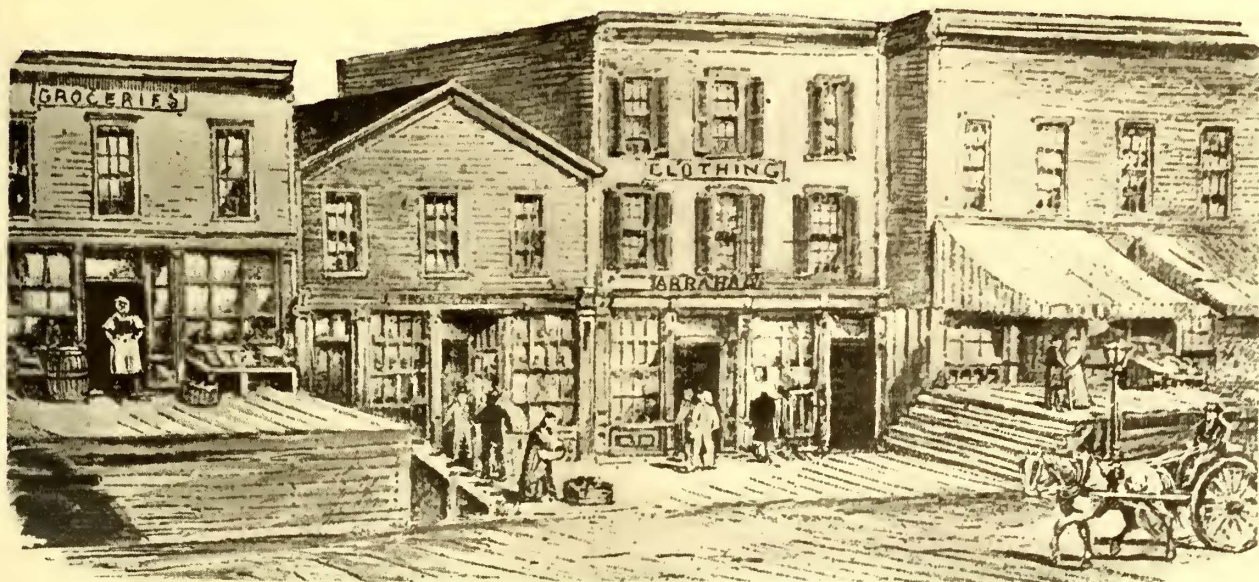
## ARTHUR Power-Saving Recorders

on all cars together with a systematic education of motormen in the best use of power and the best means of car operation.

The Connecticut Company  
New Haven Division

July to November, inclusive.

Month	K.W.H. Per Car Mile		% Difference
	1916	1917	
July	2,985	2,956	0.97% Decrease
August	2,988	2,914	2.48% Decrease
September	2,973	2,882	3.06% Decrease
October	3,142	2,892	7.96% Decrease
November	3,593	3,204	10.84% Decrease



When a railroad was first put into operation between Chicago and Elgin in 1848 some Chicago merchants gravely expressed the opinion that railroads and canals would ruin the city. Before this road was opened farmers between these two cities hauled their products to town in wagons, which caused "great congestion in the streets"!

## Before the Railroads Made Chicago

a lot at 144 Lake Street sold for \$100. Twenty years later—in 1853—\$64,000 could not buy this same property. Today \$250 or more is paid for a square foot of "down-town" real estate in Chicago.

In 1845 the business of one Chicago jewelry house amounted to \$3000.

Seven years later—four years after the railroad to Elgin was opened—the yearly business of that house had increased to \$126,000.

In 1905, 14 per cent of the world's railway mileage centered in Chicago and today the city is known as the greatest railway center in the United States.

In 1897 Chicago had 957.82 miles of street railways—more than twice as much as any other city at that time.

So while the railroads were a great factor in the development of Chicago as a national business center, the street railways have been just as big a factor in the growth of the city itself—a factor that made the city more desirable as a home, increased land values, and accelerated business in general.

# Galena Oils

and Galena Service have helped to make possible the modern efficiency of street and interurban railways. An efficiency which has done so much to build up the great cities of the United States.

By helping the railways to solve their lubricating problems, Galena Oils and Galena Service have done their "bit" in the advancement of that industry. They will continue to contribute to this progress by anticipating the lubrication demands of our railways.

## Galena-Signal Oil Co.

Franklin, Pa.



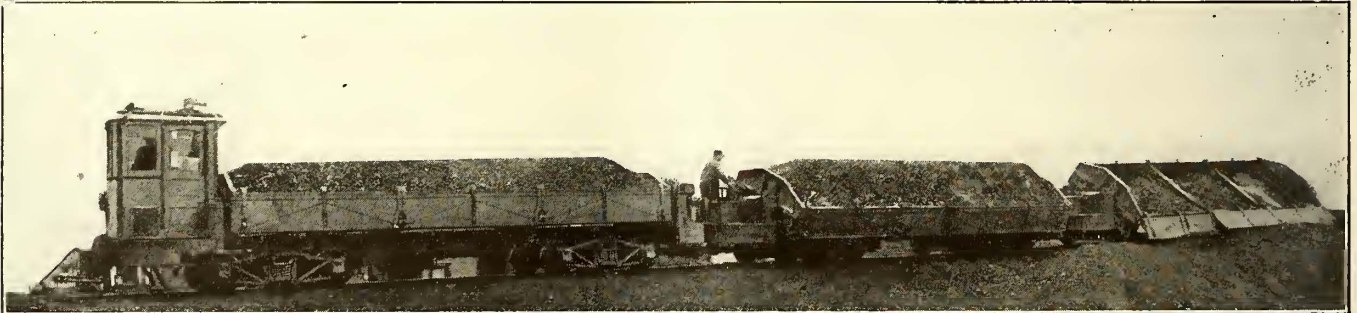
This All Steel Train of Differential Electric Dumping Cars Belongs to the Cleveland Railway Co., Cleveland, Ohio. They save enough labor within one year to pay for themselves. They make more money than passenger cars.

## THE DIFFERENTIAL ELECTRIC DUMPING CAR

is low and may be loaded while in tilted position. It is Electrically operated and discharges the contents far from the tracks. It is light and quick and pleases Everybody.

Trains of them are operated and unloaded in congested districts without interfering with passenger car schedules. Ask us NOW for detailed information about this big money-saver and promoter of better public relations.

**Differential Car Company, 141 Broadway, New York**



## TROLLEY WIRE

**Round Grooved and Figure 8**

If you will agree that one make of trolley wire is able to give longer service than another make—

That one is more economical than another—

Then investigate our trolley wire with a view to cutting your wire costs.



## Weatherproof Wires and Cables

**Star Brand**

Star Brand Wires are made with long service as the most prominent feature.

Because of their ability to render long service they cut wire costs.

Read the words in the cut of the star.

# American Electrical Works

NEW YORK: 165 Broadway  
CHICAGO: 112 West Adams Street  
BOSTON: 176 Federal Street

Phillipsdale, R. I.

CINCINNATI: Traction Building  
SAN FRANCISCO: 612 Howard Street  
SEATTLE: 1002 First Avenue South

# Save the seconds to Improve Service Increase Revenue

## Time is Money

to carrier and  
carried

Especially in city car  
operation

Where the many small  
leaks of time may be

Big enough in the aggregate to cause

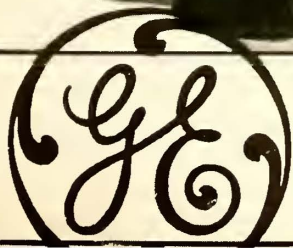
Poor service with low re-  
turns

Instead of

Good service with in-  
creased returns.

## Modern G-E Equipment saves time

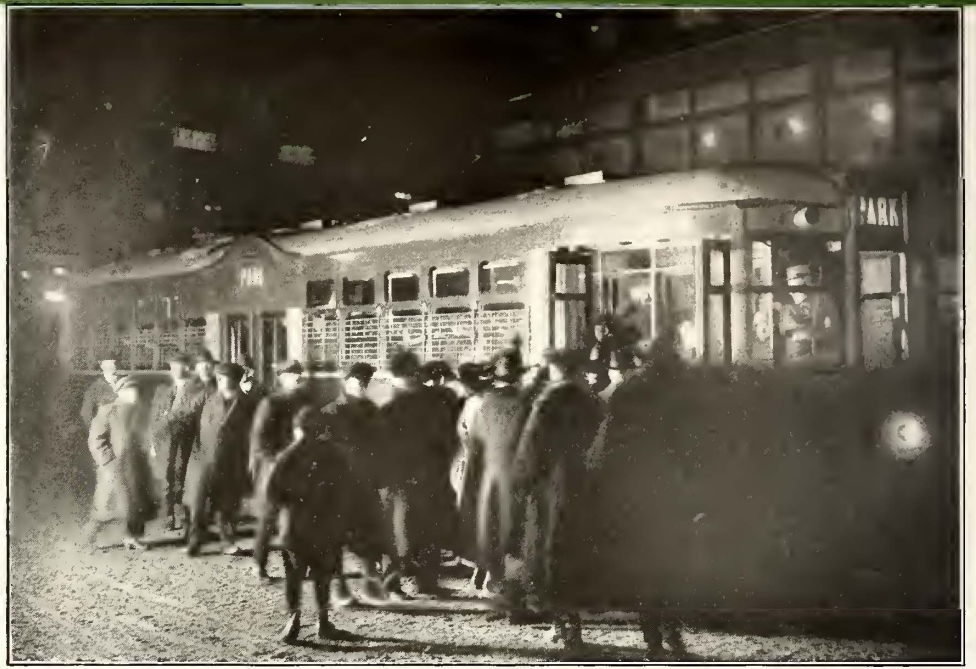
*The following pages  
tell how*



# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities



## Low Rate of Acceleration

### *The Loss*

After making a certain traffic survey, a leading engineer stated that one of the principal things the railway could do to reduce downtown congestion was to accelerate its cars at 2 m.p.h.p.s. instead of 1 to 1½ m.p.h.p.s.!

And this change would also save money as against the expense of rerouting.

One second wasted per stop does not seem important. But consider the aggregate loss on a car with 8 stops per mile, at 10 m.p.h. schedule speed and 12 hours daily use of the car for 360 days a year.

Eight seconds a mile, 1 minute 20 seconds an hour, 16 minutes a day, 5760 minutes a year or

**Eight Days Lost Per Car Per Annum**

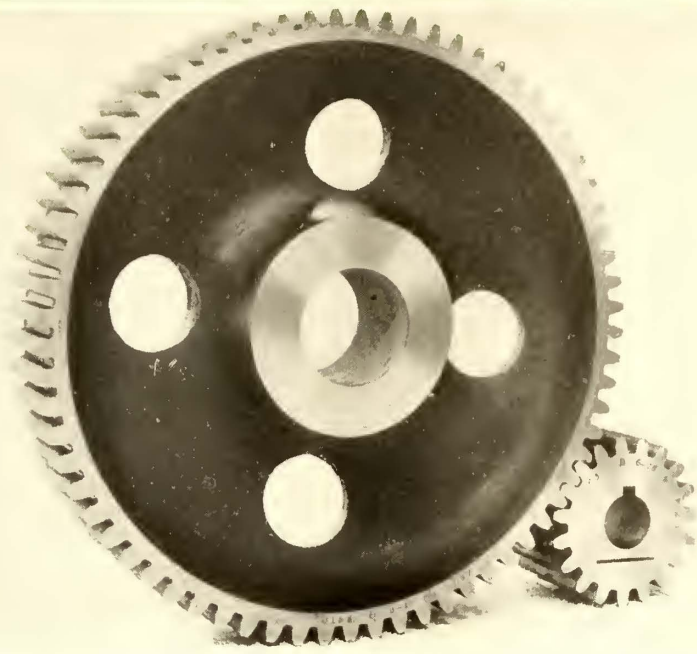
# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities







## Low Rate of Acceleration

### *The Remedy*

G-E equipment offers two ways to secure the time and money-saving advantages of high rates of acceleration.

### **A Change of Gearing**

Your present motors with proper gear ratios may be able to make the desired schedule speeds with the least use of energy. In offering you its gearing the General Electric Company will consider your problems from both the mechanical and traffic standpoint.

### **G-E Motors and G-E Gearing**

The electrical characteristics of modern G-E Motors and their high capacity relative to weight are permitting on light-weight safety cars

### **The Most Efficient Rates of Acceleration**

# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities





## Low Rate of Braking

### *The Loss*

Entirely aside from its inferior ability to prevent accidents, a low rate of braking means costly loss of time—often as much as

### **10 Per Cent Difference in Schedule Speed**

It follows that because of its lower rate of retardation in making normal stops—particularly when the motorman is tired—the handbrake should be used only often enough to insure its reliability when needed.

Every car, no matter how light, should have an air brake to insure the safe, satisfactory and efficient service that can be obtained only through the use of an

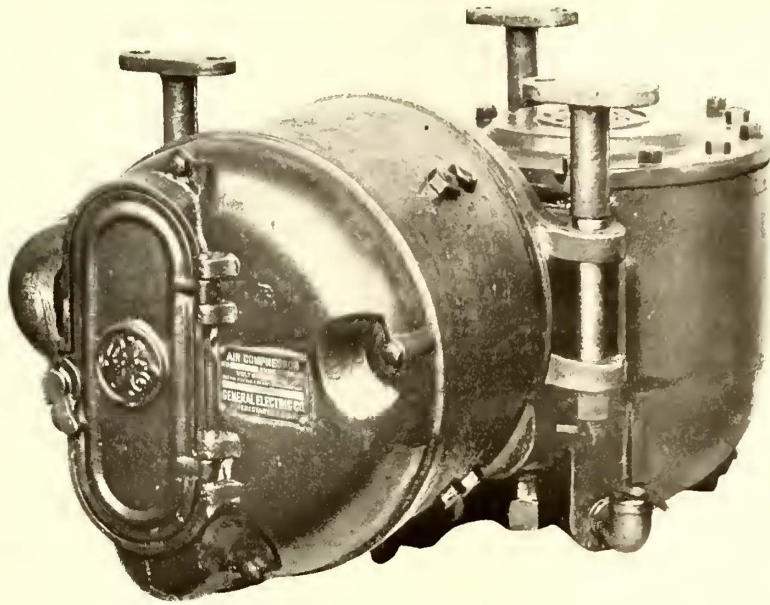
### **Unvaryingly High Rate of Braking**

# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities





## Low Rate of Braking

### *The Remedy*

The CP Type Compressors are noted for low maintenance because of such features as a practically uniform thrust which prevents uneven wear of bearings; continuous, positive lubrication and center gear drive free from dirt. These compressors cover the entire field of modern electric rail-roading.

The General Electric Company offers an air-brake system complete in every operating detail from compressor to motorman's valve.

### **G-E Compressors and Air Brake Equipment**

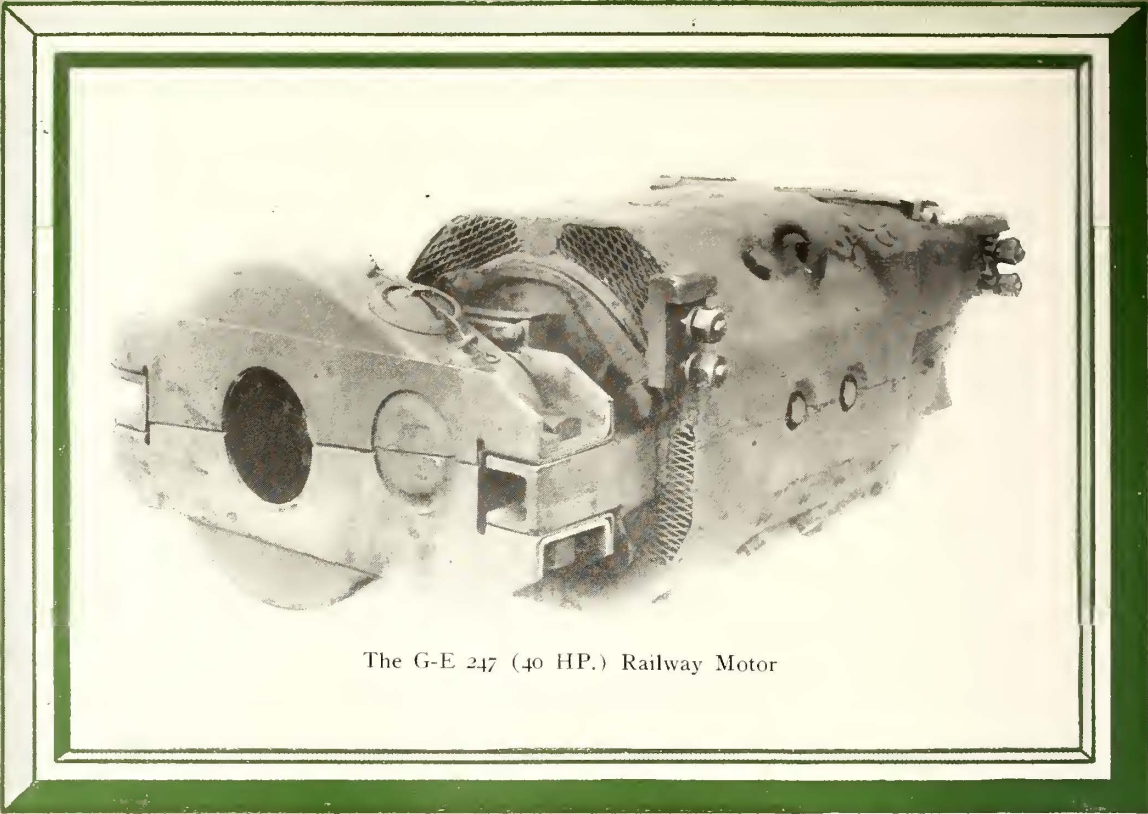
# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities



GE



The G-E 247 (40 HP.) Railway Motor

## High Floors and Steps

### *The Loss*

There can be no question about the loss of time caused by high steps.

When we see a conductor leave the car to lift a child on or off or observe the deliberate movements of the parcel-laden passenger, the loss of time is evident.

It is a fact that even the most active passenger lengthens the standing time of a car because a high floor means an extra step. At a loss of time of say half a second per step—a car carrying 60 passengers from terminal to terminal would lose 30 seconds and add

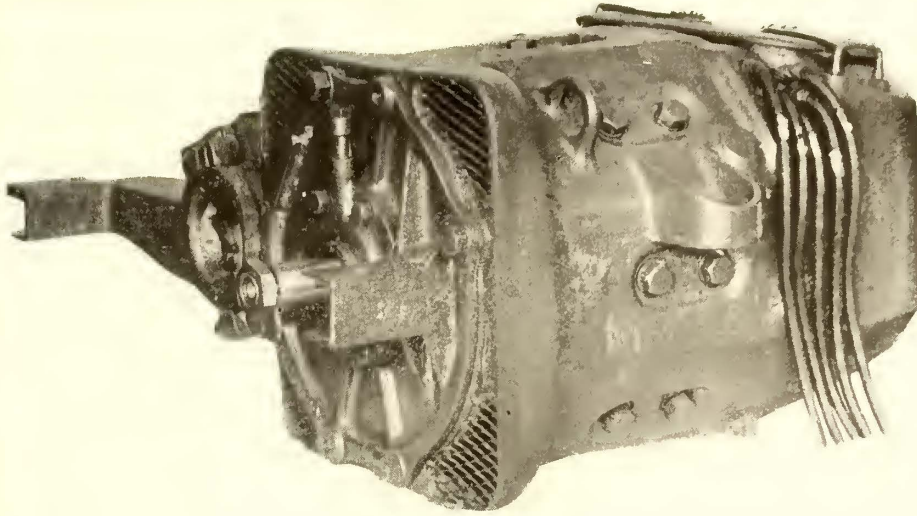
**One More Minute Per Trip**



# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities



The G-E 258 (25 HP.) Railway Motor



## High Floors and Steps

### *The Remedy*

The G-E 258 and G-E 247 Motors are the answer to the elimination of time losses due to high floors and steps.

These motors are of dimensions which permit them to be used with 24 or 26 inch wheels, whereas motors previously available under the same car bodies required 30 inch wheels.

Operated in pairs, the G-E 258 has proved a wonderful success under the lightweight safety car; and operated in quadruple sets, both the G-E 258 and G-E 247 have proved equally adapted to the largest low-floor city cars of the day.

**G-E 258 and G-E 247 Motors Are the Recognized Standards for Low-Floor City Cars**



# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities





## **Hand-Operated Doors and Steps *The Loss***

The air-brake on city cars was once considered a luxury for the motorman.

Now we know that in speeding up schedules, the air-brake lowers operating costs and betters service.

So is it proving with air-operated doors and steps.

Hand operation of doors and steps slows down the schedule.

Nor does hand operation encourage the motorman of a prepayment car to open his doors quickly for exit—but he will do this promptly and as a matter of course with pneumatically-operated doors. By reducing opposing streams of travel

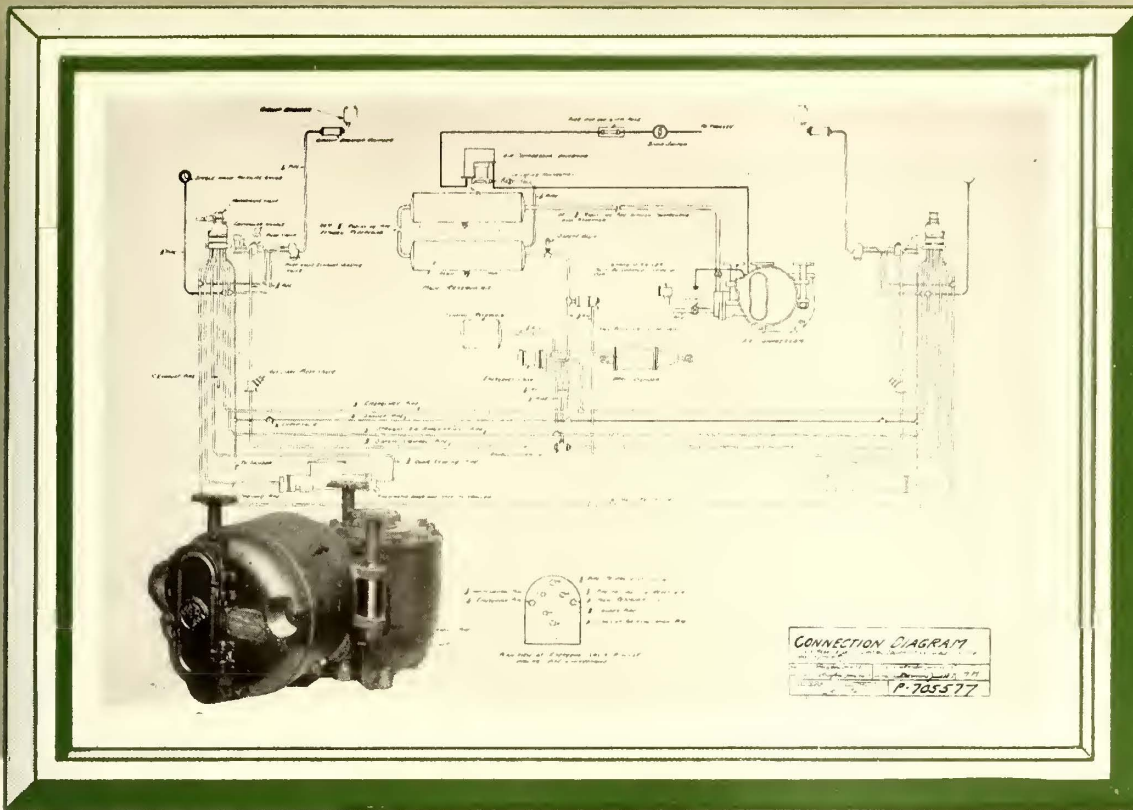
**Air Operation Saves Many Seconds Per Trip**



# **General Electric Company**

General Office: Schenectady, N. Y.

Sales offices in all large cities



## Hand-Operated Doors and Steps

### *The Remedy*

In the combination of control, braking, door and step devices operated by air, we see the most efficient use of the time elements of acceleration, braking and stops.

But in any car with air-operated doors and steps so much responsibility centers upon the compressor and governor that their reliability is of extraordinary importance.

Ease of upkeep actually is vital to operators with limited shop facilities.

Early recognition of these requirements is responsible for the wide sale and successful use of the

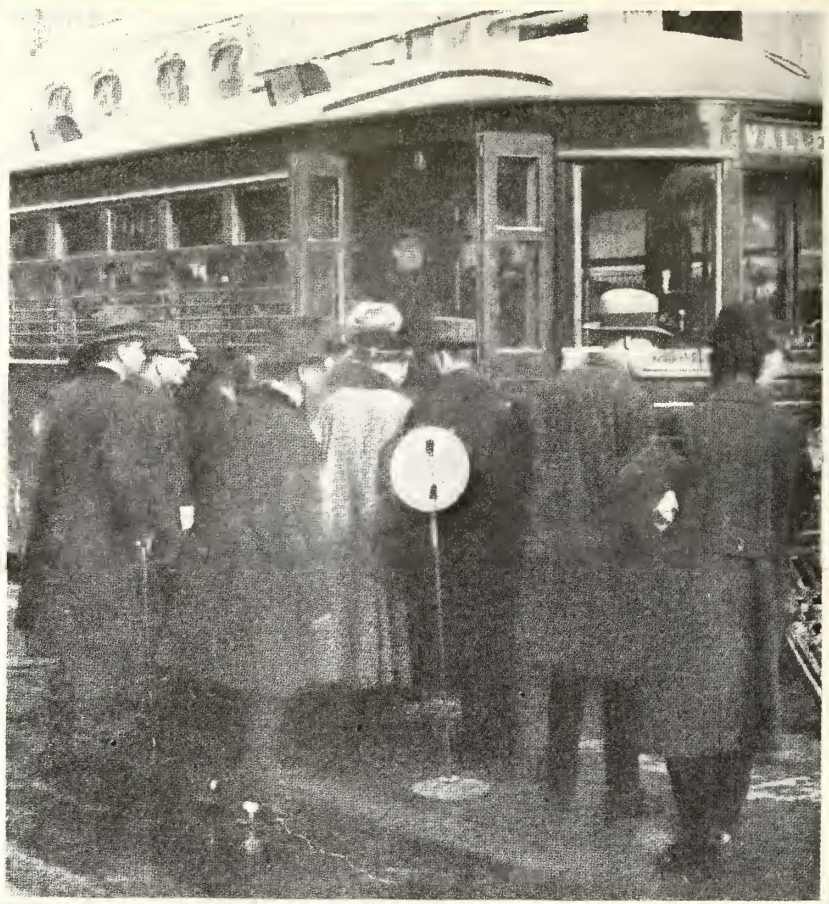
**CP-25 Air Compressor and ML Governor**

# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities





## **Bulky Platform Equipment**

### ***The Loss***

Less tangible than some of the other factors discussed has been the loss of time due to bulky equipment on the platform.

Recent developments have given this factor still greater importance. For example, on one-man cars, and many other types of cars, a single platform which receives all entering passengers must serve for control, brakes, door and step mechanisms, fare box, operator's stool and the operator himself—

Hence under these congested conditions it is more important than ever before to

**Install Platform Equipment That Is  
Compact and Reliable**

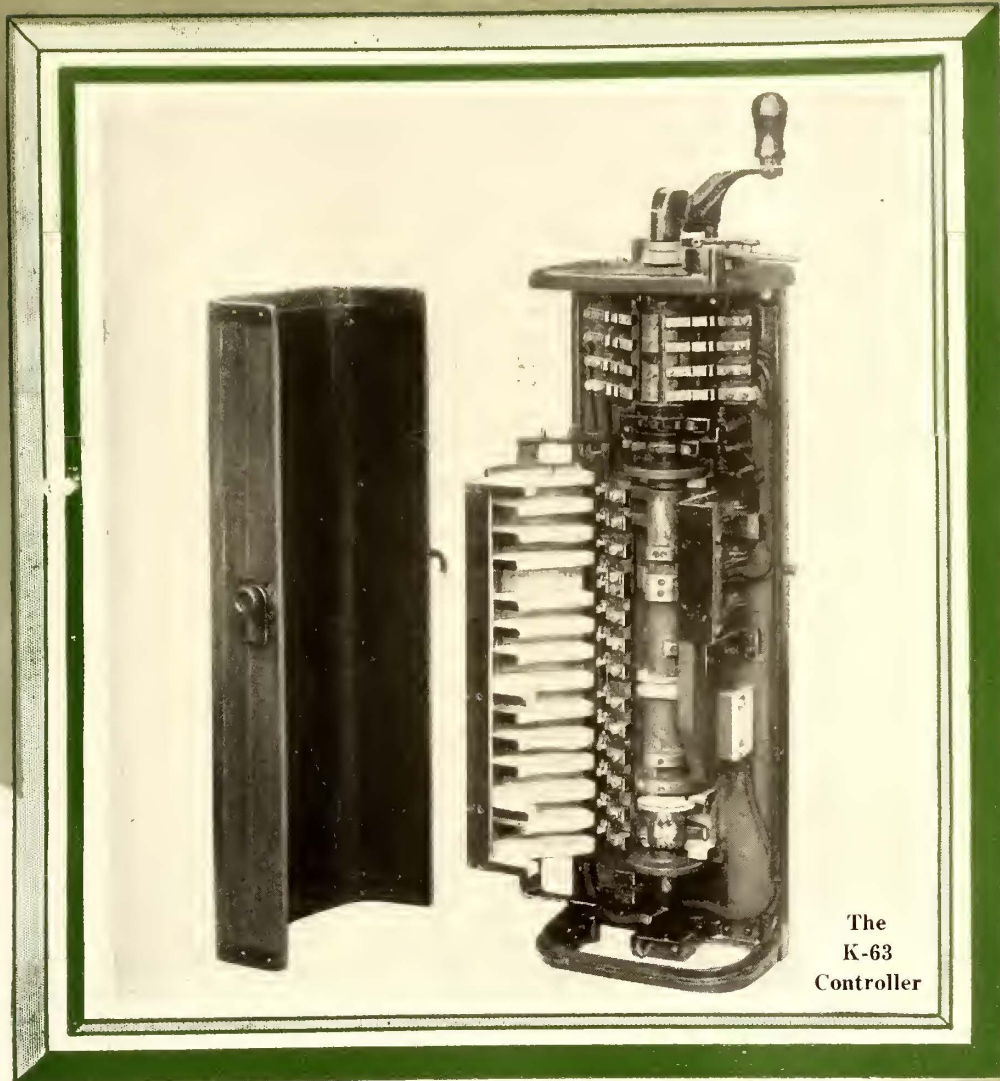
# **General Electric Company**

General Office: Schenectady, N. Y.

Sales offices in all large cities







The  
K-63  
Controller

## Bulky Platform Equipment

### *The Remedy*

The General Electric Air Brake system and air-operated doors and steps will go a long way toward clearing the platform since they eliminate the need for long brake and door-operating handles.

In addition to this is the exceptionally light and small controller—the K-63—designed for equipments up to two 40 h.p. 600 volt motors.

Sprague-General Electric P. C. Control is still another solution of the congestion problem. In addition, it provides automatic acceleration which promotes the highest possible schedule speed; most economical use of energy; absolute protection against abuse of equipment; insurance against throwing passengers by jerky manipulation and relief of motorman from detail attention to controller notching, thus allowing him to

**Take Advantage of Every Opportunity  
to Make Time Safely**

# General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities





General Electric Company

Schenectady Works.



The principal manufacturing plants of the General Electric Company are located at Schenectady, N. Y.; Lynn and Pittsfield, Mass.; Harrison, Newark and Watessing, N. J.; Cleveland, Ohio; Erie, Pa.; and Fort Wayne, Ind. The total floor space is nearly 15,000,000 square feet.

To insure correspondence against avoidable delay, all communications to the Company should be addressed to the sales office nearest the writer.

**THE SALES OFFICES OF THE GENERAL ELECTRIC COMPANY ARE AS FOLLOWS:**

Atlanta, Ga.	Third National Bank Building	Los Angeles, Cal.	724 S. Spring Street
Baltimore, Md.	Lexington Street Building	Louisville, Ky.	Starks Building
Birmingham, Ala.	Brown-Marx Building	Memphis, Tenn.	Randolph Building
Boston, Mass.	84 State Street	Milwaukee, Wis.	Public Service Building
Buffalo, N. Y.	Electric Building	Minneapolis, Minn.	410 Third Ave., North
Butte, Montana	Electric Building	Nashville, Tenn.	Stahlmann Building
Charleston, W. Va.	Charleston National Bank Building	New Haven, Conn.	Second National Bank Building
Charlotte, N. C.	Commercial National Bank Building	New Orleans, La.	Maison-Blanche Building
Chattanooga, Tenn.	James Building	New York, N. Y.	120 Broadway
Chicago, Ill.	Monadnock Building	Niagara Falls, N. Y.	Gluck Building
Cincinnati, Ohio	Provident Building	*Oklahoma City, Okla.	Terminal Building
Cleveland, Ohio	Illuminating Building	Omaha, Neb.	Union Pacific Building
Columbus, Ohio	Columbus Savings & Trust Building	Philadelphia, Pa.	Witherspoon Building
*Dallas, Texas	Interurban Building	Pittsburgh, Pa.	Oliver Building
Dayton, Ohio	Schwind Building	Portland, Ore.	Electric Building
Denver, Colo.	First National Bank Building	Providence, R. I.	112 Turks Head Building
Des Moines, Iowa	Hippee Building	Richmond, Va.	Virginia Railway and Power Building
†Detroit, Mich.	Dime Savings Bank Building	Rochester, N. Y.	Granite Building
Duluth, Minn.	Fidelity Building	Salt Lake City, Utah	Newhouse Building
Elmira, N. Y.	Hulett Building	San Francisco, Cal.	Rialto Building
*El Paso, Texas	500 San Francisco Street	Schenectady, N. Y.	G-E Works
Erie, Pa.	Marine National Bank Building	Seattle, Wash.	Colman Building
Fort Wayne, Ind.	1600 Broadway	Spokane, Wash.	Paulsen Building
Hartford, Conn.	Hartford National Bank Building	Springfield, Mass.	Massachusetts Mutual Building
*Houston, Texas	Third and Washington Streets	St. Louis, Mo.	Pierce Building
Indianapolis, Ind.	Traction Terminal Building	Syracuse, N. Y.	Onondaga County Savings Bank Bldg.
Jacksonville, Fla.	Heard National Bank Building	Toledo, Ohio	Spitzer Building
Joplin, Mo.	Miners' Bank Building	Washington, D. C.	Evans Building
Kansas City, Mo.	Dwight Building	Youngstown, Ohio	Stambaugh Building
Knoxville, Tenn.	Bank & Trust Building		

† General Electric Company of Michigan

\* Southwest General Electric Company

For Hawaiian business address

Catton Neill & Company, Ltd., Honolulu

For all Canadian business refer to

Canadian General Electric Company, Ltd., Toronto, Ont.

For business in Great Britain refer to

British Thomson-Houston Company, Ltd., Rugby, Eng.

General Foreign Sales Offices: Schenectady, N. Y.; 120

Broadway, N. Y. City; 83 Cannon St., London, E. C. Eng.

**FOREIGN OFFICES AND REPRESENTATIVES**

ARGENTINA: Cia. General Electric S. Americana, Inc., Buenos Aires; AUSTRALIA: Australian General Electric Co., Sydney and Melbourne; BRAZIL: Companhia General Electric do Brazil, Rio de Janeiro; CENTRAL AMERICA: G. Amsinck & Co., New York, U. S. A.; CHILE: International Machinery Co., Santiago, and Nitrate Agencies, Ltd., Iquique; CHINA: Anderson, Meyer & Co., Shanghai; COLOMBIA: Wesselhoef & Wisner, Barranquilla; CUBA: A. Zals & Martinez, Havana; ENGLAND: General Electric Co. (of New York), London; INDIA: General Electric Co. (of New York), Calcutta; JAPAN and KOREA: General Electric Co. and Bagnall & Hilles, Yokohama; Mitsui Bussan Kaisha, Ltd., Tokyo and Seoul; MEXICO: Mexican General Electric Co., Mexico City; NEW ZEALAND: The National Electric & Engineering Co., Ltd., Wellington, Christchurch, Dunedin and Auckland; PERU: W. R. Grace & Co., Lima; PHILIPPINE ISLANDS: Frank L. Strong Machinery Co., Manila; SOUTH AFRICA: South African General Electric Co., Johannesburg, Capetown and Durban.

7556

# General Electric Company

GENERAL OFFICES

SCHENECTADY, N. Y.



# The market for good transportation service at fair prices is greater today than ever

**T**HE peculiar conditions now surrounding the traction business present striking examples of the inexorable working of the law of compensation.

In the face of a "sellers' market" for nearly every other commodity, the purveyor of traction service faces a "buyers' market."

In almost every general line of business the seller is delivering what, when and how, it pleases him to deliver, at almost any price it pleases him to charge.

The electric railway company is being forced to deliver a constantly better product with a constantly mounting cost at a price which the buyer fixes.

Under these circumstances it is not surprising that the electric railway industry forgets that during many years, when other lines of business were struggling for meager profits, the electric railway industry was having everything its own way, the sellers of transportation were enjoying absolute domination of the market, the buyer (the

public) was eagerly accepting whatever service it could get on any terms the seller chose to name.

Those days of joyous opulence and arrogance for transportation sellers have been gone now these many years and the dominant spirit of electric railway companies today is one of superior service and strict economy for a rate that will yield a fair return on investment.

Had the progress in the changing of the old order of things been simultaneous throughout the whole industry and had it been accompanied by the vigorous continuous education of the public, it is highly probable that the complexion of things would now be vastly more satisfactory and profitable for the electric railway industry as a whole.

Unfortunately, this progress was "spotty," halting, and the element of the education of the buyer was and still is sadly neglected.

The buyer, still finding a few instances of the reactionary tendency, looks with suspicion on the goods deliv-

ered and the prices charged and in the absence of full and sufficient information as to the real facts harbors the ancient suspicion and grudge.

It seems then manifest that what is frequently called "the trouble with the electric railway industry" is simply a state of mind.

First a state of mind of some operating companies which are not perfecting service and achieving economies to the full extent of possibility; and second, a state of mind of the public due to ignorance and prejudice which the industry has not yet taken sufficiently vigorous means to remove.

**Here is no place for  
pessimism, doubt, or foreboding.**

**What is needed is  
vigorous, concerted, continuous action.**

Great strides have been made in rendering better service at lower costs of operation.

The public is learning, and is getting a clearer vision of traction problems and a more thorough idea of the true relation of the electric railway to the public.

Both of these elements in progress can be tremendously speeded up. Action to that end is the most pressing and important business of every company, every manufacturer, and every educational factor in the field.

Much of encouragement for such action exists in the tendency toward fare increases, as shown by the rulings of various public service commissions. As such increases are granted they will afford the opportunity for better service to the public.

Not less important, from the standpoint of earning power, is the great

opportunity for development of freight business which now confronts the industry.

The market for transportation service is greater than it ever was and is constantly growing. The opportunities for the exploitation of that market on a sound, economic, business-like basis are continually growing. If the latent energy of the industry is used to anything like its possible power, this present cloud of ignorance and prejudice will quickly pass, the chill of inertia will melt away and the electric railway industry will come into the broad sunshine of prosperity.

The deadliest policy the electric railway company or the manufacturer serving the field can adopt is a policy of drifting.

"It is always easy to get unanimous consent to do nothing."

## **Electric Railway Journal**

Tenth Avenue at 36th Street

**New York**

Member Audit Bureau of Circulations



# Peacock Improved

## On the Peter Witt Cars at Buffalo

The one hundred new Peter Witt cars at Buffalo will make a hit because they promote the **quick** handling of passengers.

The Peacock Improved Brakes on these one hundred cars will make a hit because they promote the **safe** handling of passengers.

The Peacock Improved is excellent for any front-entrance car because of its compactness.

There is a Peacock for any and every character of electric railway car. Let us help you pick just the right one for your service.

## National Brake Company

Ellicott Square, Buffalo, N. Y.

---

# Bankers and Engineers

## Electric Railway, Lighting and Power Company Bonds

ENTIRE ISSUES PURCHASED

### THE NATIONAL CITY CO.

NATIONAL CITY BANK BUILDING N. Y.  
Correspondent Offices in Twenty-three Cities

## THE J. G. WHITE COMPANIES

ENGINEERS  
FINANCIERS



CONTRACTORS  
OPERATORS

43 EXCHANGE PLACE . . . . . NEW YORK  
LONDON . . . . . CHICAGO

## THE ARNOLD COMPANY

ENGINEERS—CONSTRUCTORS  
ELECTRICAL—CIVIL—MECHANICAL

105 SOUTH LA SALLE STREET  
CHICAGO  
111 BROADWAY  
NEW YORK

## Arthur D. Little, Inc.

Our chemical control of electric properties provides not only tests of fuel, lubricants, water, wire, bearing materials, etc., but also specifications for purchases, as well as constant research for betterment and economy in supplies and in operation. Successful experience in this work for many years warrants us in inviting correspondence and bidding visitors welcome to acquaint themselves with our methods of service.

93 Broad Street, Boston, Mass.

## ALBERT S. RICHEY

ELECTRIC RAILWAY ENGINEER

WORCESTER POLYTECHNIC INSTITUTE  
WORCESTER, MASSACHUSETTS

Robert W. Hunt Jno. J. Cone Jas. C. Hallsted D. W. McNaugher

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BUREAU OF INSPECTION TESTS & CONSULTATION  
Inspection and Test of all Electrical Equipment

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Suite 1710 DETECTIVES Suite 715  
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## The Standard Paving Pitch

NOT every pitch is suitable for paving. Roofing-pitch, for example, would not do at all, although it looks much the same and contractors sometimes attempt to use it on the theory that it is the same thing.

A good paving-pitch will last as long as the pavement—that is to say, twenty or thirty years—and at the end of that time it will be exactly as good as new and fit to use once more in a new pavement if it were worth while to take it off the old blocks.

The Barrett Company has been manufacturing Paving Pitch for something like forty years. We can photograph almost any old pitch-filled pavement and be fairly certain that when we look it up we will find that the pitch in the joints is a Barrett product of a generation ago.

Contractors who use Barrett's Paving Pitch know that it does not bubble and boil over in the kettle. That means that it is free from water and the lighter oils. They find that it holds its heat well and is easily handled by unskilled labor. They find that when hot it is just the right consistency to flow easily into the joints and form a waterproof seal, without, on

the other hand, being so liquid that it runs through to the gutters.

In short, they find that Barrett's Paving Pitch is made especially for their use with all their practical difficulties in mind.

The municipal engineer who specifies Barrett's Paving Pitch knows that he can identify the goods by the label on the job. He knows that he is getting a standard product with forty years of experience to back it up; he knows that it is the same material that has made good in lots of other pavements which he knows of elsewhere.

In preferring pitch to cement or sand, the municipal engineer knows that he will get a pavement where every joint is an *expansion-joint*; a pavement in which cracks, breaks, blow-outs are unknown and impossible; a pavement that will not expand and thrust the curbing out of line or damage tracks or manholes; a pavement, in short, that will always be a credit to his management.

The standard pitch is Barrett's Paving Pitch. Look for the label on the barrels.

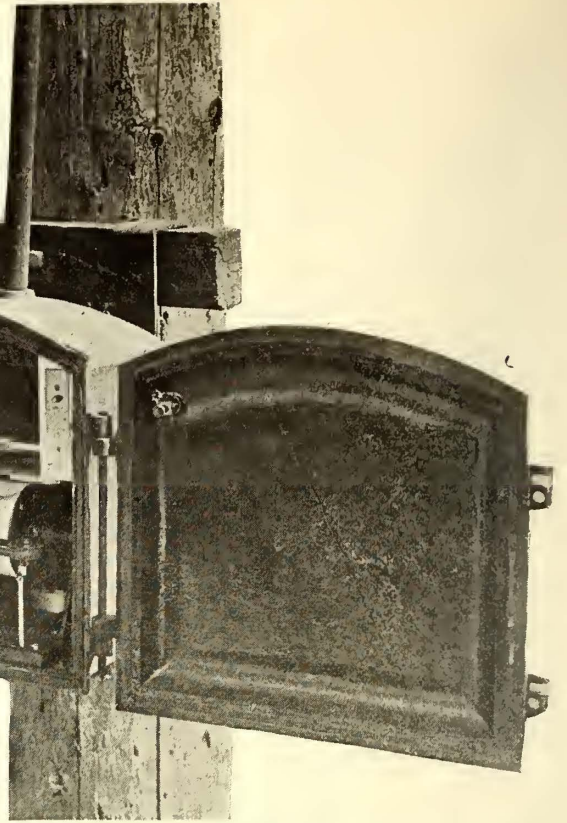
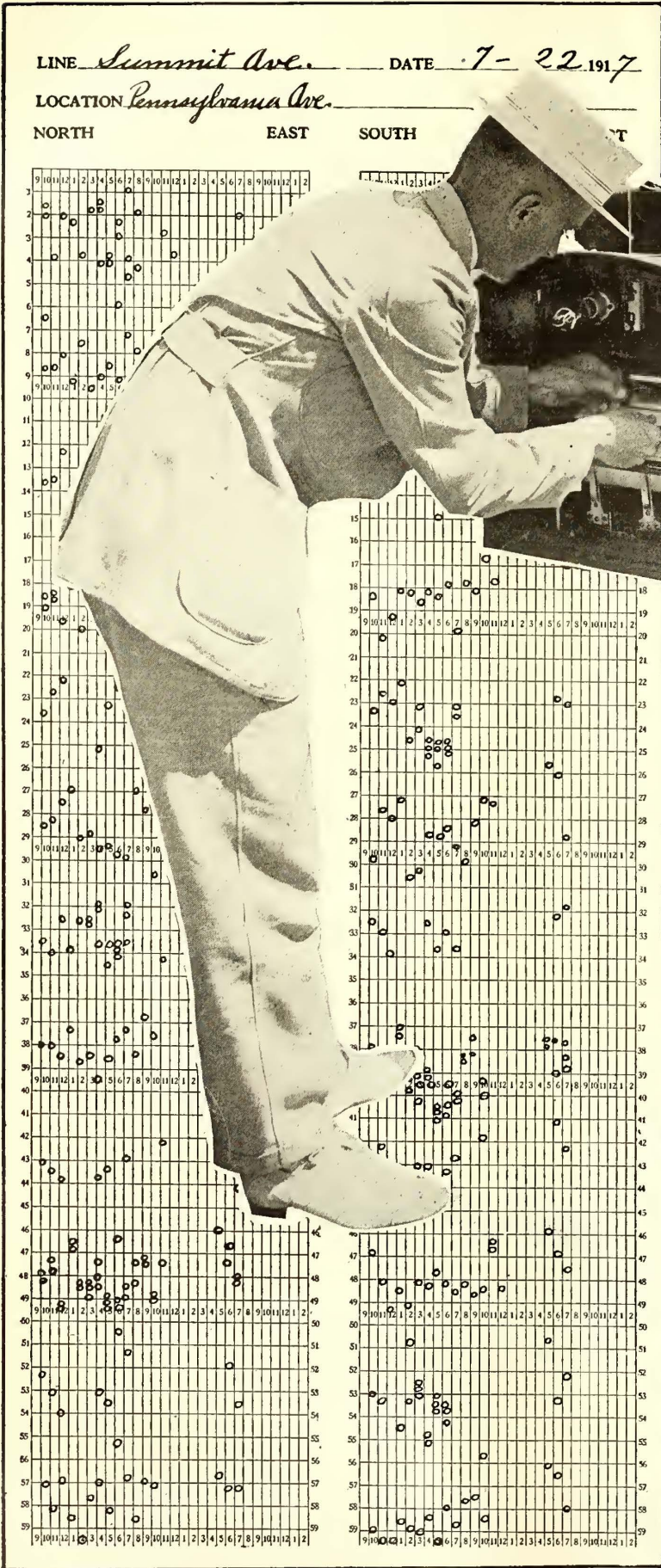
Booklets on request. Address our nearest office.

### The Barrett Company

New York	Chicago	Philadelphia	Boston	St. Louis
Cleveland	Cincinnati	Pittsburgh	Detroit	Birmingham
Kansas City	Minneapolis	Nashville	Salt Lake City	Seattle
Peoria	THE BARRETT CO., Limited:	Montreal	Toronto	Winnipeg
Vancouver	St. John, N. B.	Halifax, N. S.	Sydney, N. S.	



Second Street, looking east from Elm Street, Fort Madison, Iowa. Brick pavement filled with Barrett's Paving Pitch



# NACHOD

## Headway Recorders

### Have Helped to Perfect the Fort Worth Service

This sheet is the kind of record the Northern Texas Traction Company gets of the car-spacing conditions on its lines, including the Summit Avenue line, which is making such great history in Safety Car Operation.

Accuracy in making time-points and equal loading of cars is indispensable to the highest standards of service.

The Nachod Headway Recorder, by giving you a daily history of car movements, will enable you to find the weak spots in your present service—whether they are due to causes *within* or *without* your control.

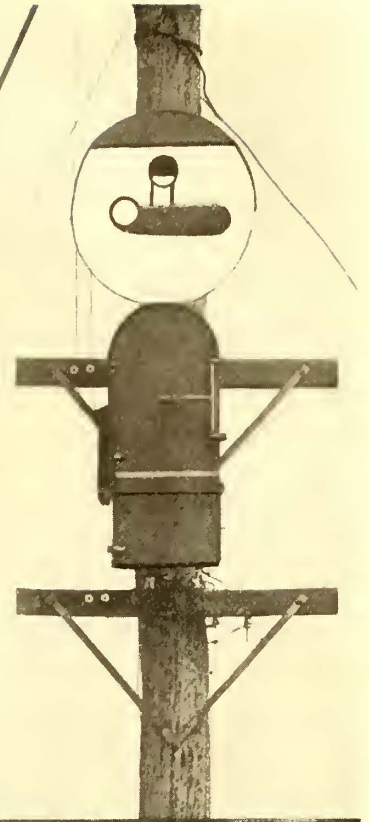
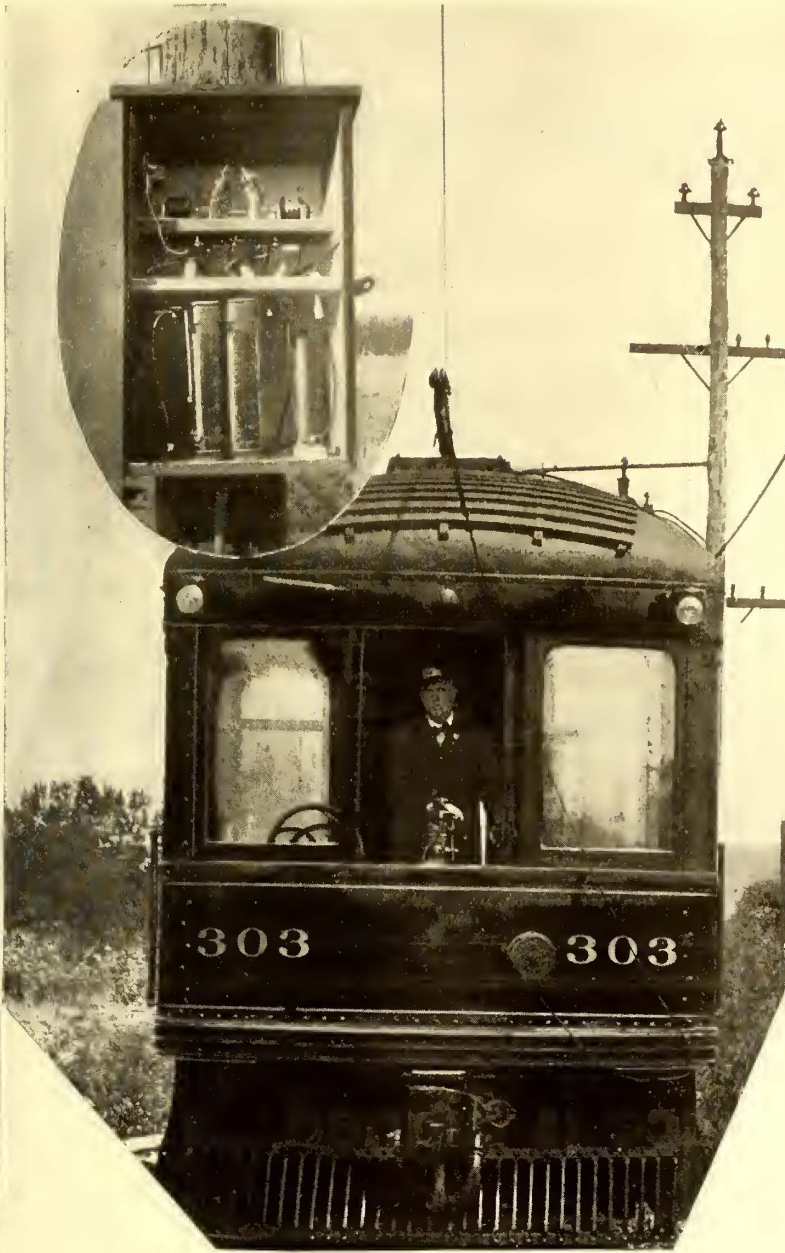
Nachod Signals and Crossing Bells have made a name for themselves.

## Nachod Signal Co.

INC.

4773 Louisville Ave.  
Louisville, Ky.





**SPEED**  
with  
**SAFETY**  
Regardless of Weather

# C-H-A-P-M-A-N

## Track Relay Signal System

The Chapman Track Relay Signal System gives you exactly what you have been looking for.

A system of almost the same low cost as trolley contacts, but with the freedom from speed and weather limitations common to elaborate track circuit equipments.

The reason is that in the new Chapman system the signals are set by the passing of the *car* wheels over an insulated track of suitable length and location.

THEREBY ELIMINATING: slow-downs required in approaching trolley contact signals. Distortion of contactors when approaching at high speed in spite of orders.

Eventual failure of distorted contactors to register signal indications.

Unreliability of trolley contactors because of snow, ice and sleet.

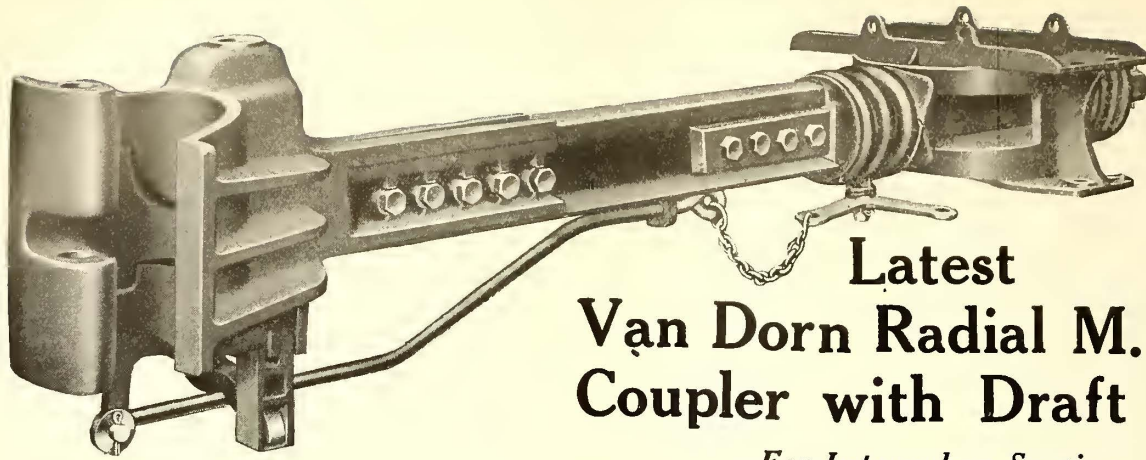
High cost and inconvenience of contactor maintenance, whereas the Chapman track relay can be placed in an accessible weatherproof box and demands no upkeep except occasional replacement of electrolyte.

THE CHAPMAN SYSTEM IS ALSO EASILY ADAPTED FOR USE AS A CROSSING SIGNAL.

Please write us direct for full particulars.

**Charles N. Wood Co.,**

**14 Federal St.,  
Boston, Mass.**



## Latest Van Dorn Radial M. C. B. Coupler with Draft Gear

*For Interurban Service*

**THE VAN DORN No. 880 M. C. B. COUPLER WITH DRAFT GEAR** as shown above is well balanced and has the greatest strength possible for its weight.

### COUPLER HEAD

Has positive locking, unlocking, and knuckle throw positions.

Has extended guard arm and butting wall which greatly facilitate coupling and prevent buckling in train operations.

Couples by impact and is uncoupled from the outside of the car.

The deep knuckle permits wide, free vertical movement.

### DRAFT GEAR

The draft gear is very effective in absorbing shocks. It allows a free radial swing of over 120 degrees, which insures operation without binding on short radius curves.

*This equipment is especially adapted to low interurban cars.*

**VAN DORN COUPLER COMPANY, 2325 South Paulina Street, Chicago**

## When Peace is Signed

**T**HE nations of the world will embark upon the most extensive scheme of reconstruction ever inaugurated in the history of the world. Railways, steamers, factories and agricultural implements will be needed at short notice in quantities that stagger imagination. Raw materials will change hands in thousands of tons where formerly 1000 lb. orders were a fair average.

The demand will be sudden; it will be overwhelming.

The only manufacturers to benefit will be those whose names and products are *known*, and who are *now* announcing their abilities to fill large orders.

**T**HE specialized field covered by this magazine will be second to none when the great drive for trade conquest begins—and the advertiser whose name appears regularly in its pages will be a few jumps ahead of his competitors whose names are strangers to it.

Do the big purchasing agents know you? Have they card-indexes of your ads, your catalogs?

If you are a regular advertiser in Electric Railway Journal you may be sure that they know all about you and your product when the moment comes for placing those rush orders!

**Electric Railway Journal**

Member Audit Bureau of Circulations

# Drew Overhead Line Material

## Will Make Your 1918 Appropriation Go Farther

All Drew Overhead Line Material helps you affect worth-while economies in your operating and maintenance departments. Drew Clinch Ears, Frogs and Crossings give you maximum mileage at minimum cost.

During these times when every dollar should do double duty, Drew quality will be thoroughly appreciated on your lines.



### SAMSON Splicers and Splicing Ears Are Saving for Other Roads

Are they for yours?

If not, this will be a splendid time to prove to yourself, and enjoy the savings.

Samsons cost little to install—when once in place they are there for the life of the wire. No arcing—no hard spots. Samsons are easy on the trolley wheel.

Whether you have one mile or a hundred—Samsons will demonstrate their money saving ability.

*Why not give them a trial?*

The Drew Service Department is waiting to cooperate with you in securing the utmost service efficiency from every dollar spent for overhead. Why not get the benefit?

## Drew Electric & Mfg. Co.

Offices—Indianapolis, Ind.—Works

District Representatives in Principal Cities

### DREW POLE SLEEVES

#### Solve The Steel Pole Problem at Low Cost

Make old steel poles good as new. Save time, money and labor wherever there's a steel pole on your property.

Investigate.



**DREW OVERHEAD LINE MATERIAL IS STANDARD ON KEENLY MANAGED ROADS—GET QUOTATIONS**

# Storage Batteries

in

## Electric Railway Service

### LOAD REGULATION

For carrying peaks and fluctuations of load, especially in connection with water-power developments or where power is purchased on the basis of maximum demand, the "Chloride Accumulator" or the "Tudor Accumulator" is adapted.

### LINE REGULATION

Due to the present high price of copper there are cases where the use of a battery for maintaining voltage is more economical than the purchase of copper for feeders. The "Chloride Accumulator" has been largely used in this service by many railways.

### STANDBY SERVICE FOR EXCITER BUS

It is standard practice to install a storage battery connected to the Exciter Bus to prevent interruption in the supply of current for field excitation. Either the "Chloride Accumulator," the "Tudor Accumulator," or the "Exide" Battery can be used.

### OIL SWITCH SERVICE

Storage batteries are used in power houses and sub-stations for the operation of oil switches and supplying current for pilot lamps and emergency station lights in case of failure of the power supply. For this service the "Chloride Accumulator," the "Tudor Accumulator," and the "Exide" Battery are used.

### STORAGE BATTERY STREET CARS

For infrequent service or for conditions where trolley wires are prohibited, storage battery cars offer the most economical and profitable solution of the transportation problem. The "Hycap=Exide" Battery has been largely used in this service. In New York City alone there are in operation nearly 200 storage battery cars equipped with "Hycap=Exide" Batteries.

### MULTIPLE-UNIT CONTROL

The "Exide" Battery and the "Tudor Accumulator" are used by a number of railways for furnishing a supply of low voltage current to be used in connection with the operation of multiple-unit control systems.

### INTERURBAN CAR LIGHTING

A number of interurban electric railway companies have installed batteries on their cars to maintain steady illumination and to overcome fluctuations caused by changes in line voltage, interruptions in third rail at crossings and switches or by temporary failure of power supply. For this service the "Exide" Battery is particularly adapted.

### HEAD AND TAIL LIGHTS

The "Exide" Battery is being used in connection with head lights and tail lights for furnishing current in case of interruptions in power supply.

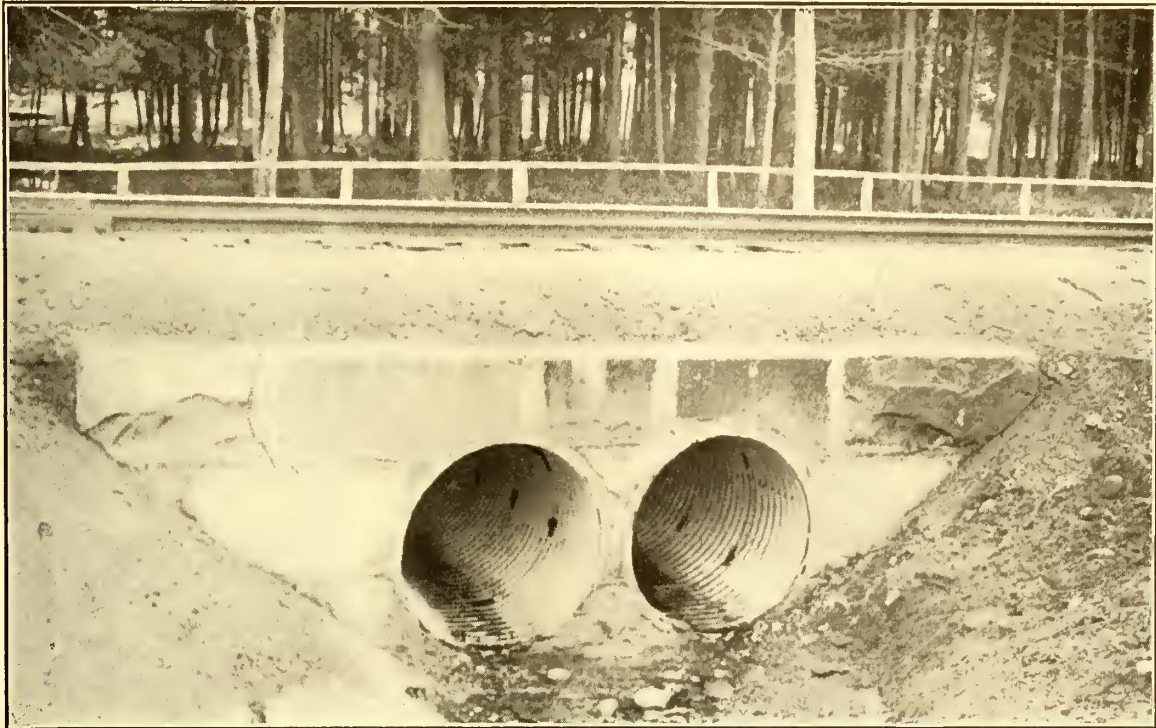
Detailed information on batteries for any of the above services can be secured from any sales office of the company.

## THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator",  
The "Exide", "Hycap=Exide", "Tbin=Exide" and "Ironclad=Exide" Batteries

New York Boston Chicago Washington PHILADELPHIA, PA. Rochester Detroit Minneapolis St. Louis  
Cleveland Atlanta Pittsburgh 1888-1918 San Francisco Denver Kansas City Toronto



# ARMCO IRON CULVERTS

## Give Long Service Under Trying Conditions

The exceptional strength of their joints and the corrugated construction give great mechanical strength and resiliency in "Armco" Iron Culverts.

Because of the purity and evenness of "Armco" Iron, rusting is reduced to the minimum. "Armco" Iron Culverts resist rust—and give long and faithful service—because the elements that cause rust in iron or steel have

been reduced to the lowest point known to the industry.

Great mechanical strength and durability, combined with the ability of "Armco" Iron Culverts to **remain** in the position in which they are installed, even when floods have washed away the roadbed, are the reasons why "Armco" Iron Culverts give

## Maximum Protection at Least Cost

**Arkansas, Little Rock**  
Dixie Culvert & Metal Co.  
**California, Los Angeles**  
California Cor. Culvert Company  
**California, West Berkeley**  
California Cor. Culvert Company  
**Colorado, Denver**  
R. Hardesty Mfg. Co.  
**Delaware, Clayton**  
Delaware Metal Culvert Co.  
**Florida, Jacksonville**  
Dixie Culvert & Metal Co.  
**Georgia, Atlanta**  
Dixie Culvert & Metal Co.  
**Illinois, Springfield**  
Illinois Corrugated Metal Co.  
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W. Q. O'Neill Co.  
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Iowa Pure Iron Culvert Co.  
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Independence Cor. Culvert Co.

**Kansas, Topeka**  
The Road Supply & Metal Co.  
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New England Metal Culvert Co.  
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Michigan Bridge & Pipe Co.  
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Lyle Corrugated Culvert Co.  
**Minnesota, Lyle**  
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Corrugated Culvert Co.  
**Montana, Missoula**  
Montana Culvert Co.

**Nebraska, Wahoo**  
Nebraska Culvert & Mfg. Co.  
**Nevada, Reno**  
Nevada Metal Mfg. Co.  
**New Hampshire, Nashua**  
North-East Metal Culvert Co.  
**New Jersey, Flemington**  
Pennsylvania Metal Culvert Co.  
**New York, Auburn**  
Pennsylvania Metal Culvert Co.  
**North Dakota, Wahpeton**  
Northwestern Sheet & Iron Works  
**Ohio, Middletown**  
American Rolling Mill Co.  
The Ohio Corrugated Culvert Co.  
**Oklahoma, Shawnee**  
Dixie Culvert & Metal Co.  
**Oregon, Portland**  
Coast Culvert & Flume Co.

**Pennsylvania, Warren**  
Pennsylvania Metal Culvert Co.  
**South Dakota, Sioux Falls**  
Sioux Falls Metal Culvert Co.  
**Tennessee, Nashville**  
Tennessee Metal Culvert Co.  
**Texas, Dallas**  
Wyatt Metal Works  
**Texas, El Paso**  
Western Metal Mfg. Co.  
**Texas, Honston**  
Lone Star Culvert Co.  
**Utah, Woods Cross**  
Utah Corrugated Cul. & Flume Co.  
**Virginia, Roanoke**  
Virginia Metal & Culvert Co.  
**Washington, Spokane**  
Spokane Culvert & Tank Co.  
**Wisconsin, Eau Claire**  
Bark River Bridge & Culvert Co.

Canada—Canada Ingot Iron Co., Ltd., Guelph, Sherbrooke, Winnipeg, Calgary.



Write to the nearest manufacturer for full information on Rust-Resisting "Armco" Iron Culverts, Flumes, Siphons, Sheets, Roofing and Formed Products



# The Truly Continuous **THERMIT**

## Promotes Both Efficient Line Voltage

Whatever we have said in the past concerning the elimination of waste in the return circuit applies with multiplied force in these days of fuel cost and fuel scarcity.

You would not tolerate leaks in a boiler.

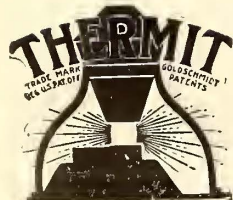
Then why tolerate leaks in track?

Every joint in your track is an actual or potential leak of energy that can be prevented permanently only by making the rail truly continuous.

This continuity has been achieved to a most successful extent with the Thermit Insert Weld at Los Angeles, San Antonio, Youngstown, Pittsburgh, Dallas, New York and other cities.

You can secure the same results in your city regardless of temperature and traffic conditions.

## Read the Following Record of These Ideals with



329-333 Folsom St., San Francisco

## GOLDSCHMIDT

120 BROADWAY,

7300 So. Chicago Ave., Chicago

# Rail Obtained With **WELDS**

## and Comfortable Passenger Car Service

The Thermit Insert Weld has made the mechanical joint an **unnecessary** evil.

When you use Thermit Insert Welds you do not have to worry about the inevitable arrival of the dished joint despite most careful grinding and matching up at the installation of new rails.

You **begin** with a smooth and truly continuous track, and you **keep** it.

The pounding that so quickly breaks up your paving and sub-structure is thus made negligible.

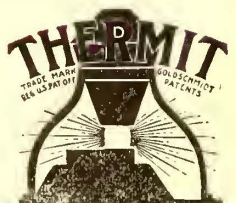
But above all this is the fact that a truly continuous rail means more comfortable riding for your passengers and less maintenance for your cars.

## How One Railway is Attaining Thermit Welds

**THERMIT CO.**  
NEW YORK

103 Richmond St., W., Toronto, Ont.

1427-1429 Western Ave., Pittsburgh, Pa.







# The Truly Continuous THERMIT

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How One Railway is Attaining  
Thermit Welds

**THERMIT CO.**  
NEW YORK  
103 Richmond St., W., Toronto, Ont.

1427-1429 Western Ave., Pittsburgh, Pa.



# This Record of On the Third Avenue Railway System Thermit Welds Made Good

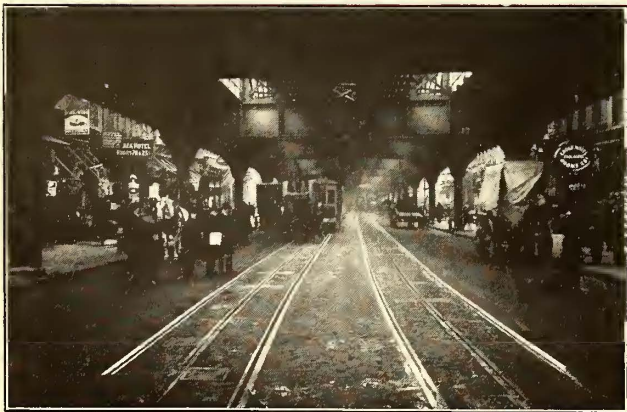
The first Thermit Welds were made by our own men during 1914 on the busy Third Avenue Line between Fifty-sixth and Fifty-ninth Streets to the number of fifty in new 7-in. rail section 429. Half of these welds were made with inserts and half without inserts in accordance with the design of E. M. T. Ryder, Engineer of Maintenance of Way, Third Avenue Railway System. Neither class of Thermit Weld has developed any breaks to date.

## A Thermit Weld Modification for Conduit Track Makes Good

The Ryder modification was developed to meet a condition peculiar to slot-rail conduit construction. New rails come drilled every 2.5 ft. for tie-rods which pass through the slot-rails so that the running rails cannot be conveniently moved to provide a  $\frac{3}{4}$ -in. gap for an insert weld. Therefore, a butt weld is made as follows: The rails are left in contact end to end, but the lip is cut off to obtain a symmetrical section and the base and web are also cut away with oxy-acetylene for a gap of  $\frac{3}{4}$  in.

The second order of Thermit Welds was installed by our own men in 1914 during severe winter weather (10 deg. above zero) and at night. Some twenty-five welds were made under these conditions in old rail section 404 on the Bowery between Chatham Square and Bayard Street. There have been no breaks to date.

## Continue the Installation



Bowery, Between Chatham Square and Bayard St.



Broadway, Between 45th and 59th St.



329-333 Folsom St., San Francisco

# GOLDSCHMIDT

120 BROADWAY,

7300 So. Chicago Ave., Chicago

# Thermit Welds

## of New York Explains the Reorders in Old Rail and New

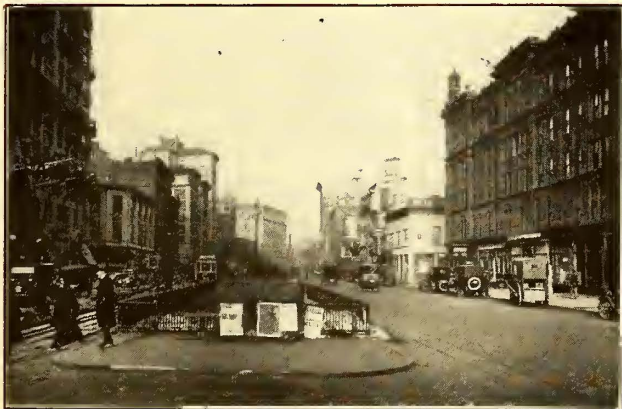
The third order of Thermit Welds was installed in 1915 by the railway's employees on Broadway between Forty-fifth and Fifty-ninth Streets, also in old rail section 340. Here some 50 to 100 welds were made on 5 ft. "dutchmen" to replace severe breakage of cast-welded joints. From this extremely busy section only two breaks are reported.

The fourth order, placed in 1916, covered 400 to 500 Thermit Welds on Third Avenue between Thirty-fourth and Fifty-sixth Streets in rail section 429. On this job, made by Third Avenue men under a Thermit supervisor, only two breaks are reported to date.

The fifth order of Thermit Welds comprised 355 Welds made in 1917 and divided in two installations, both of which were made by the railway's own men.

One was in new high-carbon rail section 493 on Broadway between Seventy-second and Ninety-sixth Streets; the other was in section 494 on the Union Railway's Southern Boulevard line between 149th and Baretto Streets. Exclusive of failures due to poor workmanship, so few breakages have been reported that the Third Avenue Railway System intends to

## of Thermit Welds



Broadway, Between 72d and 96th St.



Southern Boulevard, Between 149th and Baretto St.

**THERMIT CO.**  
NEW YORK

103 Richmond St., W., Toronto, Ont.

1427-1429 Western Ave., Pittsburgh, Pa.





# This Record of

## On the Third Avenue Railway System

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## Continue the Installation



Bowery, Between Chatham Square and Bayard St.



Broadway, Between 45th and 59th St.

**GOLDSCHMIDT**  
120 BROADWAY,  
7300 So. Chicago Ave., Chicago

329-333 Folsom St., San Francisco

# Thermit Welds

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### in Old Rail and New

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Broadway, Between 72d and 96th St.



Southern Boulevard, Between 149th and Baretto St.

**THERMIT CO.**  
NEW YORK  
103 Richmond St., W., Toronto, Ont.

1427-1429 Western Ave., Pittsburgh, Pa.



## If You Can't Raise Your Revenue You Can Reduce Your Expense By Eliminating Joints With the Atlantic Welding Process

A continuous rail is important mechanically for less wear and tear on track, lower pavement upkeep, easy running and reduced maintenance of cars.

A continuous rail is important electrically for insurance against electrolysis, for eliminating the upkeep and replacement of bonds and for retaining the highest, most economical voltage.

# The Atlantic Welding Process

(Patented)

### gives joint and bond in one

At a cost far below that of any other equipment for permanently satisfactory service and with such great convenience that perfect welds are being made at the rate of



**2 to 2½  
welds per hour  
with two welders.**

**And between  
cars on 3-minute  
headways.**

# These three pictures



show the  
application of

## Gailor Welded Joints

(Patented)

on standard  
track construction.

In applying the Gailor Welded Joint, the plates are welded to the head and base of the rails by drawing a carbon arc along the upper and lower edges of the plates.

The current for welding is furnished by an 1100 lb. dynamotor, not a wasteful resistor. This

dynamotor converts the line voltage to proper welding voltage with an efficiency in excess of 80 per cent. The power consumption per joint approximates 5 kw.-hours. Perfect Welds more than  $\frac{1}{2}$  in. deep are made at the remarkable speed of 6 in. per minute.

**by the forces of the Railway Company itself**

We can reduce your arc welding costs. Write us for details.

**ATLANTIC WELDING  
COMPANY**  
30 CHURCH STREET  
NEW YORK

# TITANIUM

## *Titanium Treatment* diminishes your paving and Rail Replacement Burden

For paving replacement alone, the electric railways of America pay an annual tribute of millions of dollars.

By using Titanium-treated rail to extend the period between replacements, particularly

**on curves, special work and congested track**

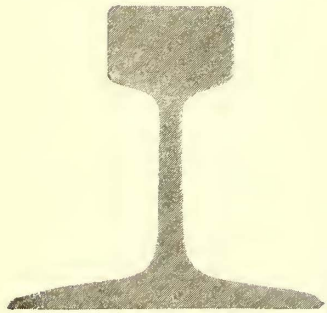
where the ordinary rail often wears out in months rather than years, our customers are not only enjoying important savings in reduced rail and paving replacement charges—

But are also minimizing delays to traffic at the very places where such delays are most disturbing and most costly.

# TITANIUM

## Manufacturing

Niagara Falls,



— Brooklyn — Boston — Kansas City — Los  
Francisco — Washington (*Capital Traction*)  
TITANIUM-Treated Rail



# TITANIUM

## *Titanium Treatment* costs relatively less as **RAILS GROW DEARER**

T-Rail is being quoted now at \$60 a ton and girder rail at \$70 a ton.

This means that at \$2 a ton Titanium insurance for longer, safer life and more reliable transportation is less than 3 per cent of the cost of the rail, whereas it was 5 to 7 per cent of the rail cost in 1913.

**If Titanium was worth a premium of 5% then it's surely worth 3% now**

Considering also, that steel rails, because of present war and future rehabilitation demands, are very unlikely to drop in price—

The inescapable conclusion is that every hard-wear rail ordered today should be Titanium-treated to avoid paying further excess prices before normal conditions are restored.



**ALLOY**  
**Company**  
N. Y.

Angeles — Philadelphia — Pittsburgh — San Co.) are among the contented users of —won't you ask them?





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Angeles — Philadelphia — Pittsburgh — San  
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—won't you ask them?



# Use Lincoln

## For Less Coal at the Plant and Less Labor on the Track

This clipping may be gratifying to electric railway men in proving that street car transportation is regarded as the most important activity in a modern city.

But electric railways will soon have to *prove* to Fuel Administrator Garfield that they are not wasting any of the fuel received under this preferential arrangement.

There are many possible technical and human wastes of power—and therefore of coal—on any railway. The technical waste that can be detected most easily and removed most quickly is the poorly bonded rail joint.

To correct this permanently and economically you can use nothing better than the Lincoln Welded Bond.

The Lincoln System does not merely stick a bond to the rail. It so coalesces bond and rail that they are as *one* electrically and mechanically.

The Lincoln System is consistent and efficient in its use of power for applying the bond—it doesn't waste energy in undertaking to save it.

The Lincoln System is also so conveniently portable that one or two men can work efficiently without calling for a transportation crew and without holding up traffic—even on pretty busy city lines.

The application of Lincoln Welded Bonds would be well worth while if it did no more than cut down your coal needs.

But high voltage is even more important to your transportation department.

# The Lincoln

## 636 Huron Road

### Cleveland Closes Factories to Run Streetcar Lines

Lack of Coal Leads City to  
Cut Off Electric Power  
of 2,000 Plants

125,000 Out of Work

War Contracts Affected and  
Federal Aid Is Again  
Sought

[Special Correspondence]

CLEVELAND, Dec. 15.—By cutting off the electric power of 2,000 Cleveland industrial concerns to-day, throwing 125,000 workers out of employment, the Cleveland Electric Illuminating Company made it possible for streetcars to run to-night and to-morrow.

Of the hundreds of cars of coal being sent to the company, enough will arrive by Monday morning, company officials confidently expect, to assure streetcar and street lighting service for the city and to permit a number of the industrial plants to resume operations.

While agents of State Fuel Administrator Johnson were trying to-day to hasten coal to Cleveland to keep up streetcar service an effort was being made to relieve suffering in 25,000 homes that lacked fuel.

To make its scanty supply of fuel last as long as possible to keep streetcars in operation, the illuminating company cut off current from practically all users of power. In addition to tying up practically every industry in the city, this action resulted in the curtailment of elevator service in most of the downtown buildings. It also resulted in cutting off much of the lighting current from these buildings.

N.Y.  
Tribune  
Dec. 16, 1917

AGENTS:

Lewis Roth Co., 1012 Liberty Bldg., Philadelphia, Pa., 519 W. 38th St., New York, N. Y.

Charles N. Wood Co., 14 Federal Street, Boston, Mass.  
W. H. Elliott, Chattanooga, Tenn.

# Welded Bonds

For Higher Schedule Speed  
and  
Less Labor for the Cars



Lincoln Welder on Worcester Consolidated Street Ry.

You can see readily enough how low voltage affects car lighting, but it's not so apparent to the eye how low voltage affects schedule speed.

For example, a drop of 50 volts with six stops per mile means a loss of 0.8 miles per hour, or say 6 per cent increase in car hours.

Extra car hours cost a lot more than the Lincoln Welded Bonds that would eliminate them.

Consider the fact that this loss in schedule speed is also an equivalent loss in car capacity and is at its worst during the rush hours, at the very time that you need all the car capacity you can get.

So there can be only one conclusion.

Get the Lincoln Welder  
and Lincoln Welded Bonds  
*and get them quick!*

## Bonding Company

Cleveland, Ohio

AGENTS:  
Holden & White, Inc., Fisher Bldg., Chicago, Ill.  
W. C. Burdick, First National Bank Bldg.,  
The Electrical Engineering & Mfg. Co.,  
1st Nat. Bank Bldg., Pittsburgh, Pa.  
Milwaukee, Wis.



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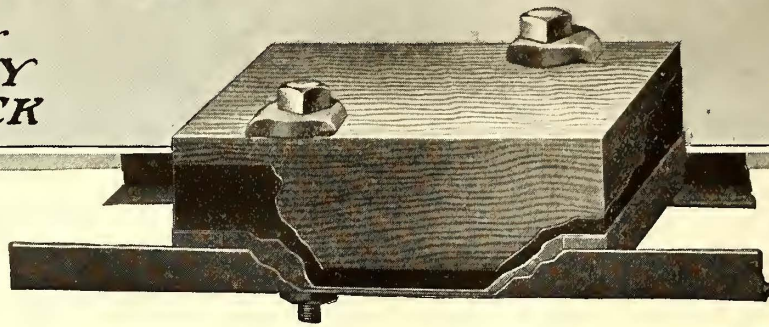
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cago, Ill.  
W. C. Burdick, First National Bank Bldg.,

The Electrical Engineering & Mfg. Co.,  
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Milwaukee, Wis.

# The MECHANICAL RAILWAY TIE

*For  
CITY  
TRACK*

*For  
INTERURBAN  
TRACK*



## The Safety Feature of Mechanical Ties Deserves Your Special Consideration

*The safety of Mechanical Ties is proven. Of the thousands of these ties in service today, some of which have been installed for over six years, not one has ever failed. Nor is one ever likely to fail. Their principle and construction render failure impossible.*

The greatest element of danger in any tie is from its failure to hold the track to gauge. Think of the vigilance exercised by thousands of track walkers, all over the land, to keep spikes driven in and to see that there are not too many rotten ties close enough together to endanger this track gauge. After a wood tie has been subjected to vibration of passing cars for a few years it is only natural that spikes work out frequently.

With the Mechanical Tie the grip on the rails is positive and permanent. In place of spikes,  $\frac{3}{4}$  inch bolts are used. These bolts can not pull out or work away from gauge because they pass through and are held by the steel angles. They cannot rust because they are embedded in asphalt and concrete.

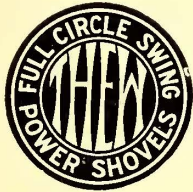
*Investigation will convince you that Mechanical Railway Ties are the safest. Write for full information.*

**THE DAYTON MECHANICAL TIE CO.**

201 Third Street Arcade  
DAYTON, OHIO

*Provides the Desirable Qualities of Wood Plus the Strength of Steel, the Permanence of Concrete and the Resiliency of Asphalt— A Non-Conductor of Vibration*





Offered in sizes and combinations to meet various requirements. Operated by steam, gasoline and electricity. Write for circular "E" and list of electric rail-ways now using Thews.

## Over 300 Yards per Eight-Hour Day

**H**ARD, unblasted concrete sub-base being removed at the rate of over 300 yards per eight-hour day at the intersection of Mason and Broadway Streets, Milwaukee, Wis.

The shovel is owned by The Arrow Engineering Co., of that city, and has been in continuous service for eight months. We quote them as follows:

"We cannot speak too highly for the results obtained with the Thew, we can readily say there is no other 15 Ton shovel that can do the work this Thew 'is doing.'"

This company owns another Thew which they have had in operation for the past five years, and their expression of results obtained therewith is equally convincing.

Thew Electric Railway Shovels offer the distinct advantages of the other types of Thew shovels. All classes of work required on city and interurban lines is play for the Thew, whether it's deep or shallow cuts, track trenching, grading road beds, tearing up track and ballast, removing old ties and rails, the rugged Thew walks through.

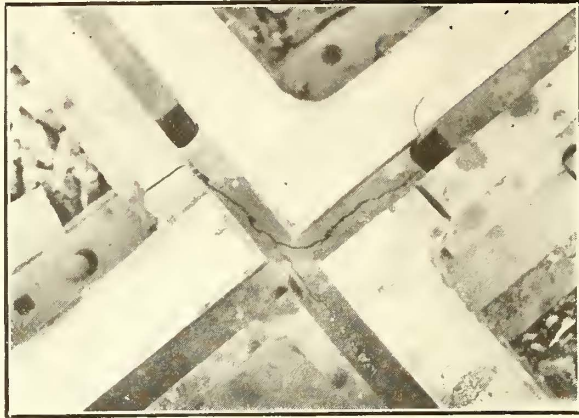
"Thews Are Everywhere"

### The Thew Automatic Shovel Company

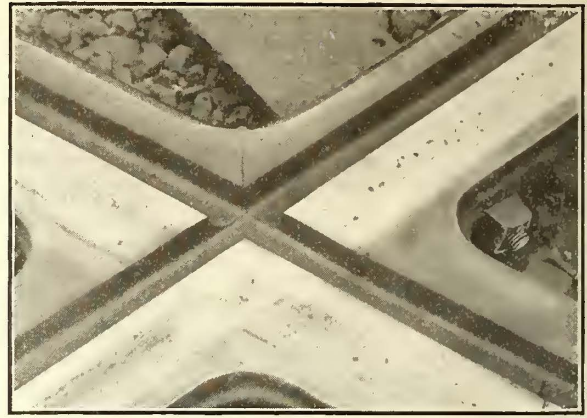
Lorain, Ohio

Sales outside of the United States and Canada handled through the ALLIED CONSTRUCTION MACHINERY CORPORATION, New York, U.S.A.

New York Office:  
30 Church Street



What Happens to a Solid Work Crossing



How a Balkwill Crossing Behaves

## Why Balkwill Articulated Cast Manganese Crossings Are Superior to Rolled Rail Crossings

This picture at the left shows where breaks in the main steel filling or backbone of a rolled rail crossing are usually found.

These breaks are unavoidable because of the lack of flexibility of the rolled steel filler at the flangeway intersection.

In the Balkwill articulated cast-manganese crossing the difficulty is

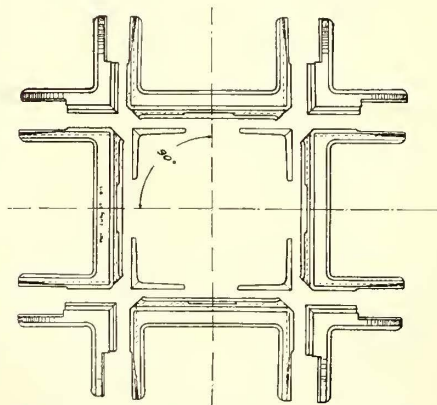
corrected by placing scientifically designed joints at the very places where breakage formerly occurred.

The lower first cost of a rolled rail crossing is therefore not a lower overall cost because it takes several rolled rail crossings to equal the life of one Balkwill crossing. Therefore the Balkwill crossing is the cheapest in the long run. It gives

### MORE WEAR PER DOLLAR THAN ANY OTHER CROSSING YOU CAN BUY

It saves interruptions to traffic, makes less demand on labor, which is now so scarce, and also reduces the cost of making replacements frequently.

Write us for data on existing installations. If your special work manufacturer cannot get prompt deliveries of manganese castings or has not taken out a license to manufacture these crossings, **DON'T ACCEPT A SUBSTITUTE** but write us direct and we will see that your requirements are taken care of.



Joints at the flangeway intersections of Balkwill Crossings positively eliminate breakage

**Order Balkwill Crossings**

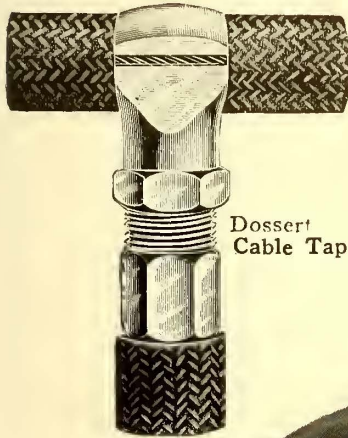
**Direct from Your Special Work Manufacturers**

**The Balkwill Manganese Crossing Co.**

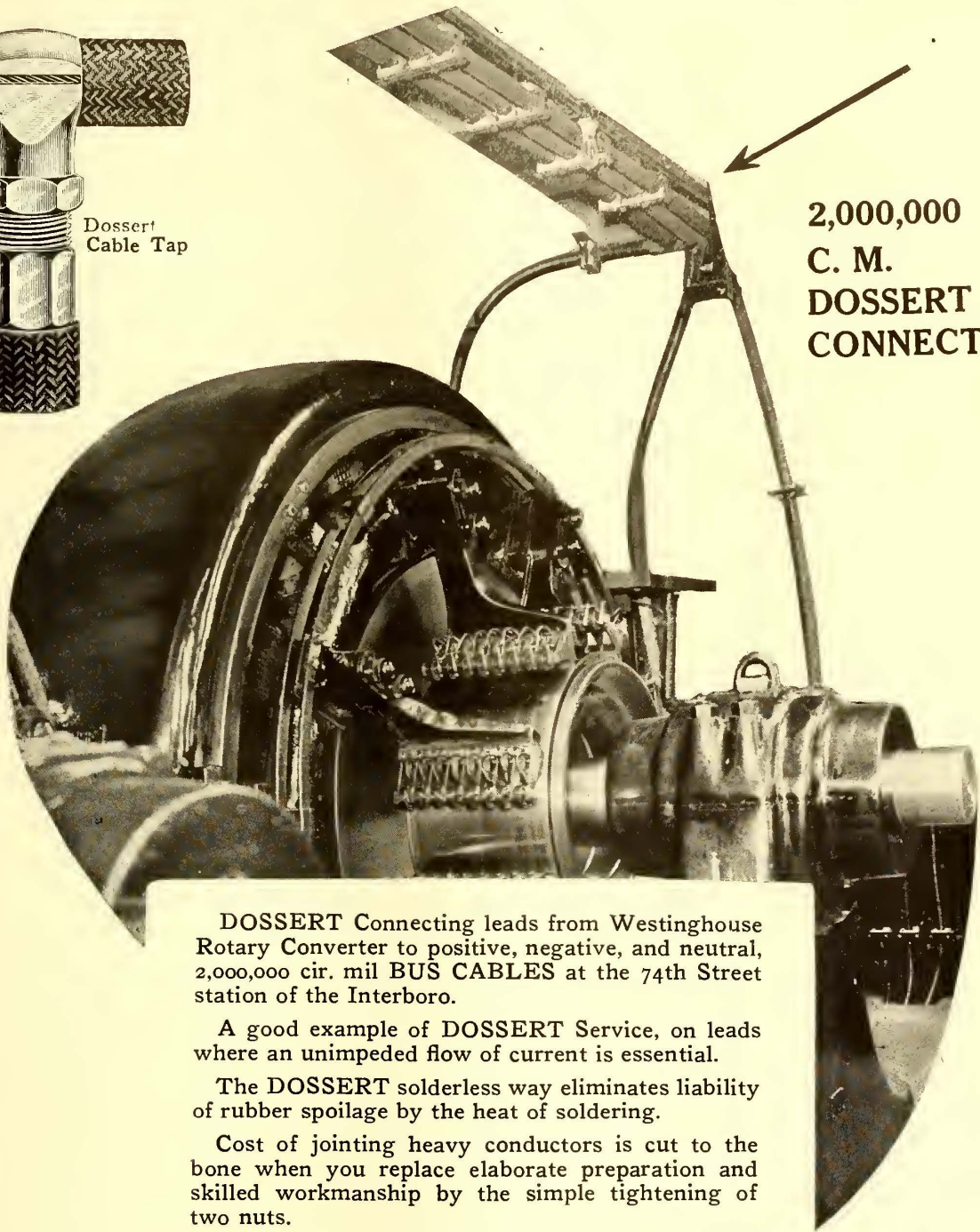
506 Williamson Building, Cleveland, Ohio

# Dossert Connectors

## at the 74th Street station of the Interboro



Dossert Cable Tap



2,000,000  
C. M.  
DOSSERT  
CONNECTORS

DOSSERT Connecting leads from Westinghouse Rotary Converter to positive, negative, and neutral, 2,000,000 cir. mil BUS CABLES at the 74th Street station of the Interboro.

A good example of DOSSERT Service, on leads where an unimpeded flow of current is essential.

The DOSSERT solderless way eliminates liability of rubber spoilage by the heat of soldering.

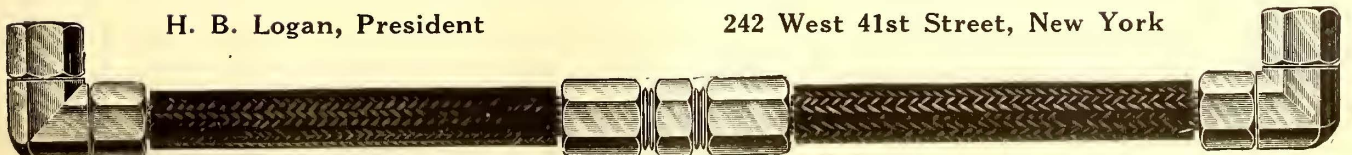
Cost of jointing heavy conductors is cut to the bone when you replace elaborate preparation and skilled workmanship by the simple tightening of two nuts.

Our Catalogue tells the Dossert way.

## DOSSERT & COMPANY

H. B. Logan, President

242 West 41st Street, New York



We entered this war to secure a lasting and honorable peace throughout the world.

It may be a long pull, but let it be a strong pull and a pull altogether and we will win. Our resources are unreservedly at the call of the government.

**THE CUTTER CO.**  
**PHILADELPHIA**

Engineers and Manufacturers of

**I-T-E**  
**CIRCUIT BREAKERS**

# For Better Service in Mechanical Rubber Goods



**T**HE United States Rubber Company, on January 1st, 1918, inaugurates an improved method of marketing in its *Mechanical Goods Division*.

This division includes Rubber Belting, Packing, Fire, Steam, Water, Garden and all other kinds of hose; Rubber Tiling, Mats, Matting, Jar Rings, Toys, Plumbers Supplies; Rubber Tape, Soles, Heels; Fibre Soles and hundreds of other rubber items.

Heretofore these goods have been marketed through subsidiary companies that for years have served all classes of industries, railroads, etc. These subsidiaries include

Revere Rubber Co.

Mechanical Rubber Co., Cleveland

Sawyer Belting Co.

Peerless Rubber Mfg. Co.

Mechanical Rubber Co., Chicago

India Rubber Co.

Eureka Fire Hose Mfg. Co.

This plan will centralize the distribution of all these companies in one organization having branches and agents all over the country. This means quicker and better service everywhere for users of mechanical rubber goods.

The subsidiaries will continue to manufacture the brands such as Holdtite Tape, Rainbow Packing, Four Ace Belting, etc., etc., for which they are famous. The same high standard of quality and workmanship will be maintained. In addition the great seal of the United States Rubber Company, the hall mark of quality and value in rubber goods, will identify these goods.

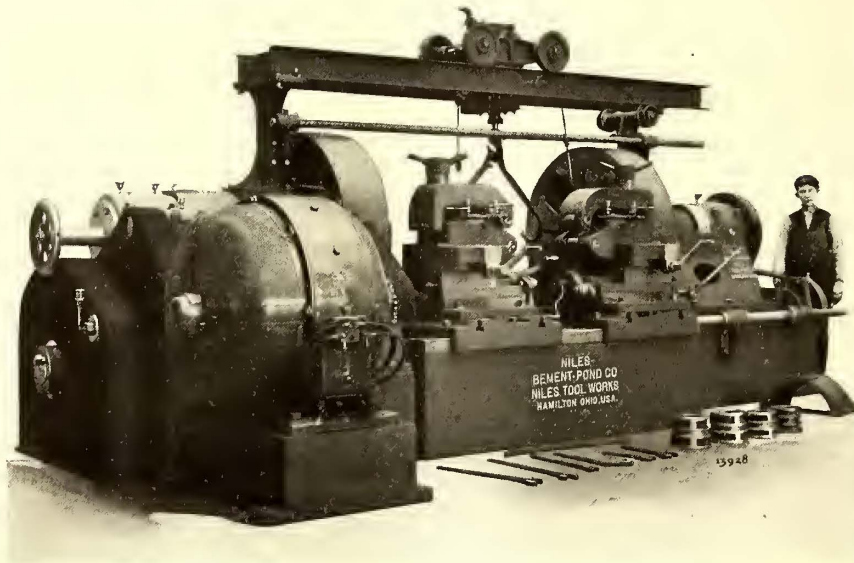
The assembling of all these well known brands in one selling organization makes the most complete line of mechanical rubber goods in the world. With distributors everywhere and factories in the large centers east and west we assure our customers the maximum in service and quality.

## United States Rubber Company

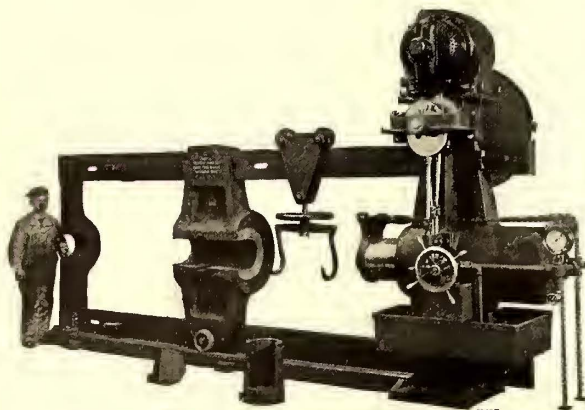
# MACHINE TOOLS

## For Electric Railway Repair Shops

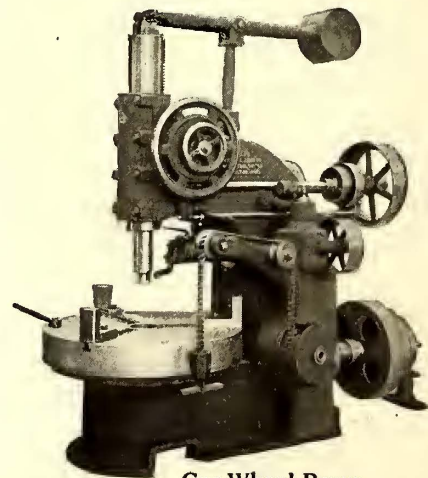
We are in a position to furnish complete machine tool equipment for electric railway repair shops, including steam hammers and electric traveling cranes.



Car Wheel Lathe



Car Wheel Press



Car Wheel Borer

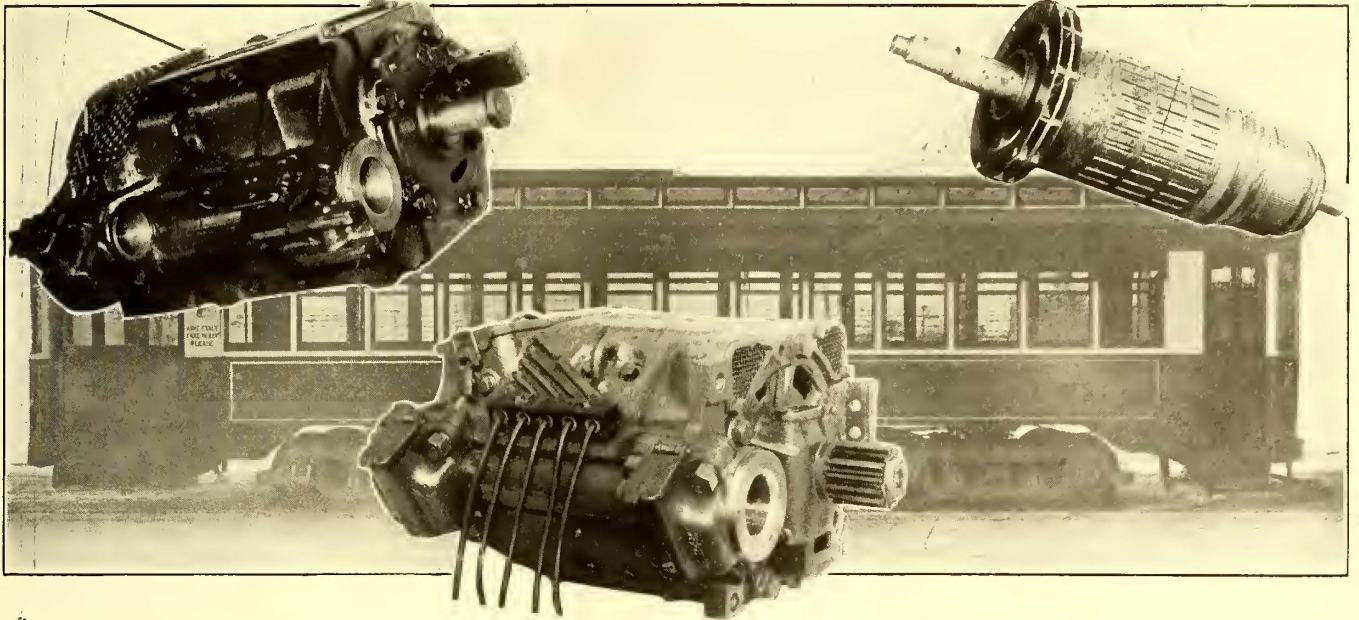
Electric Travelling Cranes - Steam Hammers

# NILES-BEMENT-POND CO.

GENERAL OFFICES, 111 BROADWAY, NEW YORK

OFFICES AND AGENCIES—Boston: 93-95 Oliver St. Philadelphia: 405 N. 21st St. Pittsburgh: Frick Bldg. Cleveland, O.: The Niles Tool Works Co., 730 Superior Ave. Hamilton, O.: The Niles Tool Works Co. Cincinnati: The Niles Tool Works Co., 338 W. Fourth St. Detroit: Kerr Bldg. Chicago: 571 W. Washington Blvd. St. Louis: 516 N. Third St. Birmingham, Ala.: 2015 First Ave. San Francisco: 16 to 18 Fremont St. London, Eng.: 25 Victoria St., S. W. For Colorado, Utah, Wyoming and New Mexico: Hendrie & Bolthoff Manufacturing & Supply Co., Denver. For Canada: The John Bertram & Sons Co., Ltd., Dundas, Montreal, Toronto, Winnipeg, Vancouver.

# Longer Life



## for the Vital Parts of Your Car

Materials of great durability are essential to protect the vital parts of electric cars against any and all destructive influences.

Each type of service requires a specific varnish or compound to meet its specific requirements and no other will serve.

STANDARD INSULATING SPECIALTIES embrace a scientific Standard for EVERY NEED.

Air Drying Voltalac, Elastic Voltalac, Baking Voltalac, Electric Black Finish, Standard Black Finishing and Standard Clear Insulating Varnish.

Impregnite for Railway Field Coils

Manufactured by

**STANDARD VARNISH WORKS**  
 NEW YORK CHICAGO LONDON  
 SAN FRANCISCO PARIS BRUSSELS MELBOURNE  
 INTERNATIONAL VARNISH CO. Limited TORONTO  
 LARGEST IN THE WORLD AND FIRST TO ESTABLISH DEFINITE QUALITY STANDARDS



## Sleet Days Are Here!

Delay No Longer—  
Get a Full Supply of

# Columbia Trolley Wheels

In addition to our standard solid trolley wheels for general service, we direct your attention to the

## Columbia Sleet Cutting Wheel

The ideal trolley wheel for insuring uninterrupted collection of current during the prevalence of hail, sleet, snow or ice. Does its work effectively without the aid of auxiliary sleet-cutting devices.

Columbia trolley wheels of both types in diameters of 4-in., 5-in. and 6-in. are in stock ready for immediate shipment. You can meet many other of your wants by ordering from this general list of Columbia products.

Here are some Columbia-made specialties conveniently listed:

### TOOLS

Armature and Axle Straighteners  
Armature shaft straighteners  
Armature buggies and stands  
Babbiting molds  
Banding and heading machines  
Car hoists  
Car Replacers  
Coil taping machines for armature leads  
Coil winding machines  
Pinion pullers  
Pit jacks  
Signal or target switches  
Tension stands

### CAR EQUIPMENT

Armature and Axle Bearings  
Armature and field coils  
Bearings (Axle and Armature)  
Brush-holders and brush-holder springs  
Brake, door and other Handles  
Brake forgings, riggings, etc.  
Car trimmings  
Commutators  
Controller handles  
Forgings of all kinds  
Gear cases (steel or mall. iron)  
Grid resistors  
Third-rail shoe beams and accessories  
Trolley poles (steel) and wheels



**Columbia Machine Works & Malleable Iron Co.**  
Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

W. R. Kerschner Co., Inc., N. Y.

Holden & White, Inc., Chicago

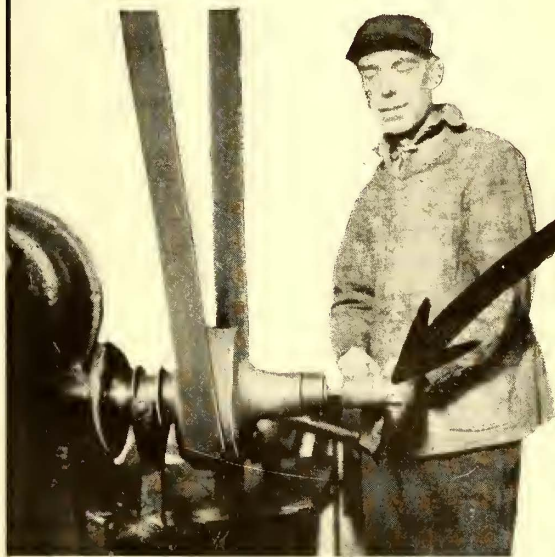
F. F. Bodler, San Francisco





*Atlanta's Arc Headlights*  
*keep a-burning because of*  
**“DELTABESTON”**

**Magnet  
Wire**



If users of arc headlights complain that the magnets burn out, ask 'em why they don't get rid of their troubles by using Deltabeston Magnet Wire.

Look at Atlanta! Uses Deltabeston No. 18 Magnet Wire exclusively for its luminous arc headlights because it has found that

**Deltabeston Magnet Wire Does Withstand  
Excessive Heat and Moisture**

Other Delta Products are Delta Tape and Delta Sheeting



**D & W FUSE CO.**  
 PROVIDENCE, R. I.



# SPRAY SPECIALTIES

## Save Coal In the Plant

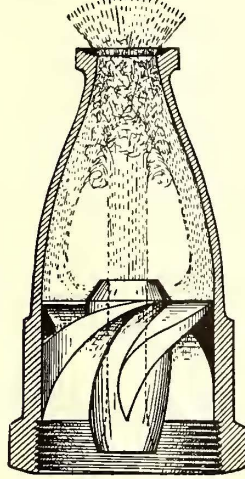
If you will install Spraco power station specialties such as Spray Nozzles, Spray Pond Equipment and Spray Air Washers for steam turbines, you will take an important step in getting

### More Value From Every B. T. U.

The Public Service Corporation of New Jersey, the Pennsylvania - Long Island Electrification, the New Orleans Railway and Light Company and the Mahoning and Shenango Railway and Light Company are among many users of Spraco Power Plant Specialties.

The Spraco Air Washer for turbines not only aids higher generating efficiency but also lengthens greatly the periods between shut-downs for clean-ups.

The  
CENTRAL  
Spray Does It



Patented SPRACO  
Nozzle

## Save Labor in the Shop

The Spraco Self-Cleaning Paint Gun multiplies the output of a shopman just as the pneumatic tamper multiplies the output of a trackman. In addition to the saving in man-power, this gun is superior to the brush in

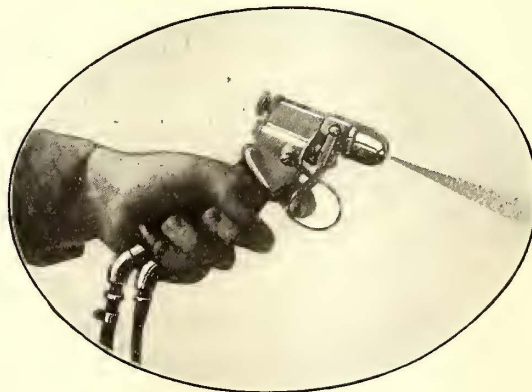
### Painting Parts Hard! to Reach

One form of the Spraco Self-cleaning Gun weighing only 1 lb., is made for the quick, economical coating of car bodies and parts, including

brake - rigging, fenders, and wheel-guards. As the Spraco Gun is not an atomizer but a **spray**; it can handle any of your present varnishes, paints and lacquers.

A variation of the Spraco Gun known as Model 5 will prove equally advantageous for whitewashing walls and partitions.

## Spraco



## Products



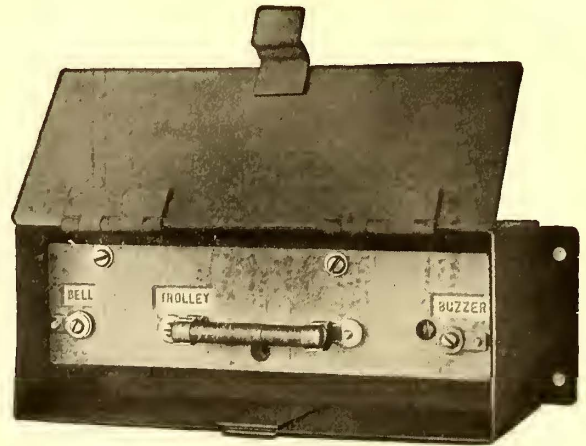
## SPRAY ENGINEERING COMPANY

Engineers for  
Spray Cooling Ponds, Irrigation Systems,  
Air Conditioning, Aerating Reservoirs,  
Odor Condensers, Gas Washing Installations.

93 FEDERAL STREET  
BOSTON, MASS.

Manufacturers of  
Air Washers for Steam Turbine Generators, Spray Nozzles and Spray Pond Equipments, Paint Spraying Apparatus for Bodies, Trucks and Fenders, Humidifiers, Asphalt Nozzles, Gas Washers, Park Sprinklers, Aerating Nozzles.

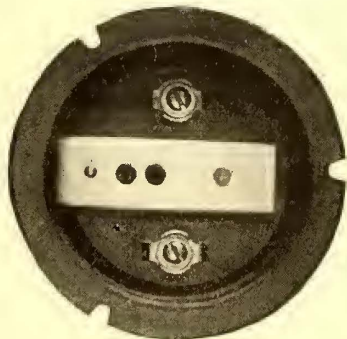
# The New Consolidated Buzzer



*—the last word in simplicity and economy  
A child can take it apart and put it together again*



No Wearing Parts  
Special Resistance  
Trifling Current Operates It  
Circuit Opened and Closed in  
Interrupter—Not in Buzzer  
No Sparking at Push Button  
Approved by Nat. Board of  
Fire Underwriters



The Consolidated way of placing the overhead power supply at the command of the passenger in order to signal a stop is not only more logical than to depend upon a battery, but also far more satisfactory. To you a battery means a continuing expense for replacement and upkeep; while to your passengers it means exasperation when the battery fails to convey their wishes to the motorman.

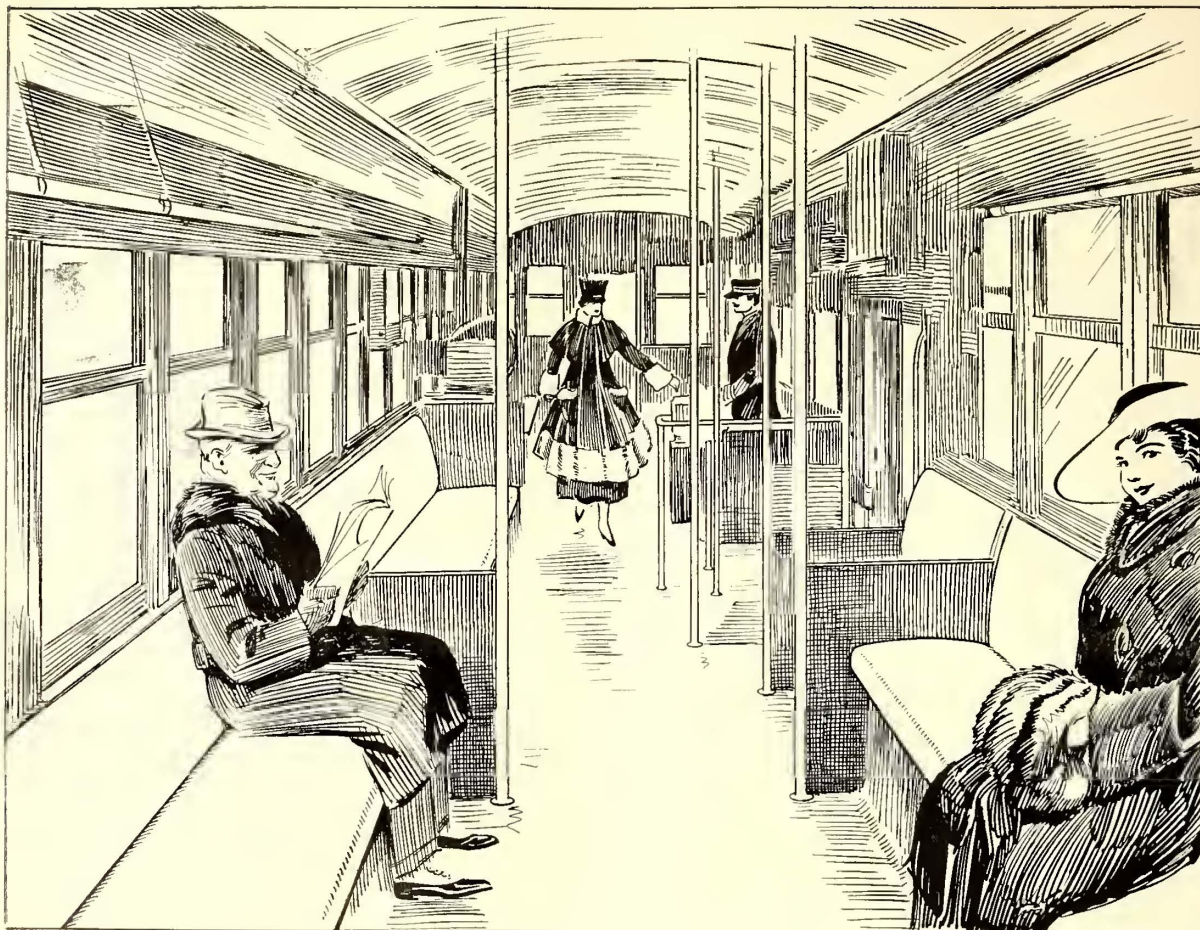
Consolidated Buzzers will give your patrons the pleasant feeling of having their intentions promptly understood and promptly obeyed, while your men will have the satisfaction of avoiding arguments with passengers and of maintaining their schedules with greater ease.

## CONSOLIDATED CAR-HEATING CO.

ALBANY

NEW YORK

CHICAGO



## No Matter What Type of Car You Are Running

At no time in the history of electric railroading has so much thought been given to making car riding attractive than now.

This attractiveness lies largely in three things: More Service, Greater Schedule Speed and Better Seating.

*Better Seating* comprehends as a matter of course the design of shapes and use of materials best suited for each class in that wide range of electric railway service which extends from the frequent-stop city car to the palatial interurban. But seen in a broader way, *Better Seating* also includes the

### Relation of Seating to Service and Speed

Thus in several Hale and Kilburn types for city use certain features like the set-in back construction mean a respectable increase in the car capacity or *service* offered.

Our specialized experience in seating layouts enables us to co-operate effectively with you to make the seating help instead of hinder the

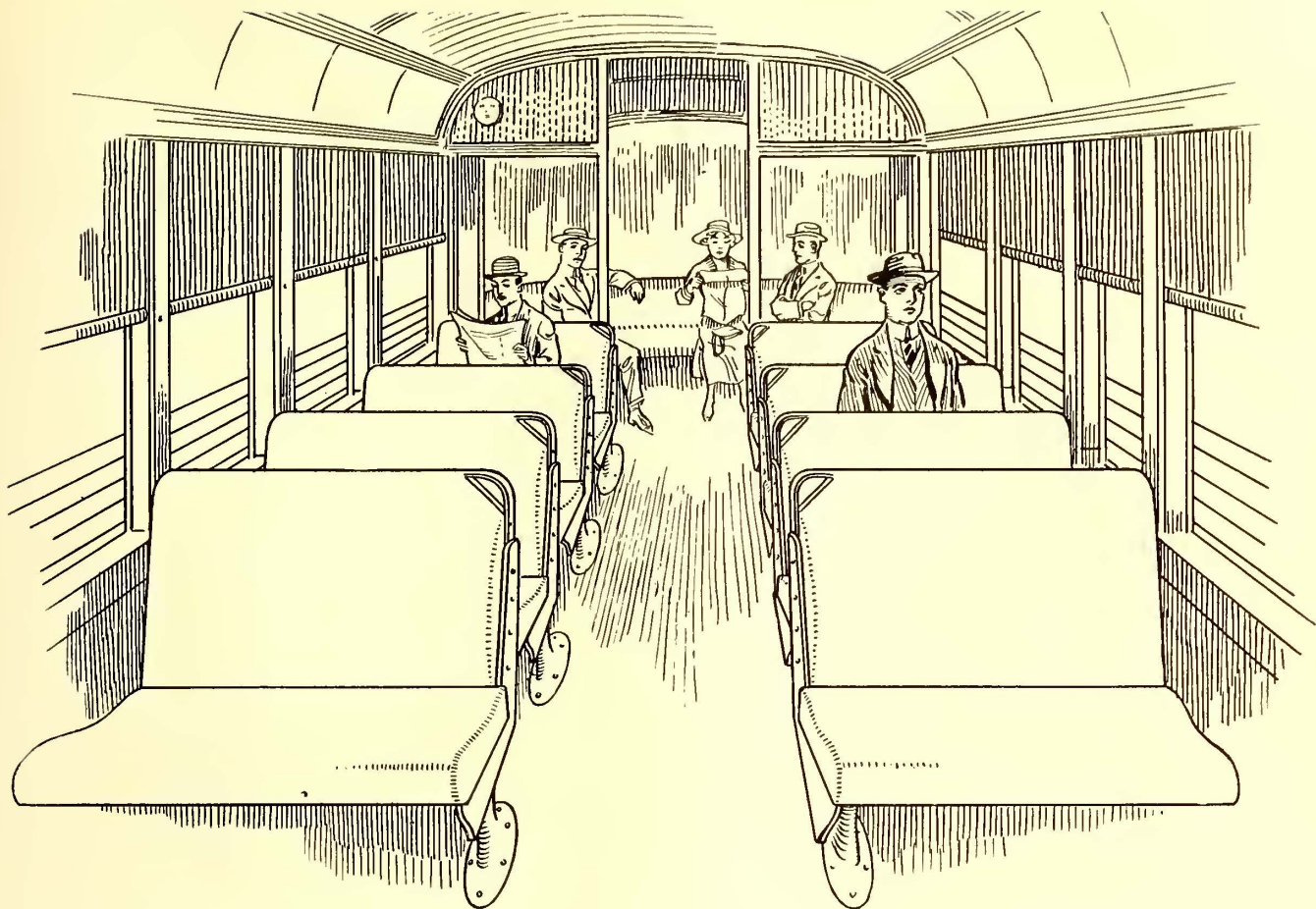
### Quickest Rate of Passenger Interchange



# Hale and

Philadelphia  
Washington

New York  
Atlanta



## Hale and Kilburn Seats Will Build Business for You

Hale and Kilburn alertness to the tendencies of the times is proved by examining the types of seats already in use on modern one-man safety and pay-as-you-pass cars.

For the one-man type, there is, for example, the No. 108, in which simplicity, durability and convenience seemingly can go no further.

The No. 108 has only four parts: The steel aisle wall

end support, the hardwood framed rattan cushion and the hardwood framed rattan back.

The waste of carrying needless dead weight in iron castings is eliminated, for the No. 108 weighs but one-half of designs made without our special steel-pressing machinery.

### Also on many Peter Witt Pay-As-You-Pass Cars

Hale and Kilburn seating service is helping to make these cars the fastest ever designed for the rapid handling of passengers.

Both the all-longitudinal seat cars and those with transverse and circular seats in the rear are made to give

**Comfortable Riding for High-Acceleration,  
High Braking Service**



# Kilburn Co.

Chicago  
San Francisco

Detroit  
Louisville







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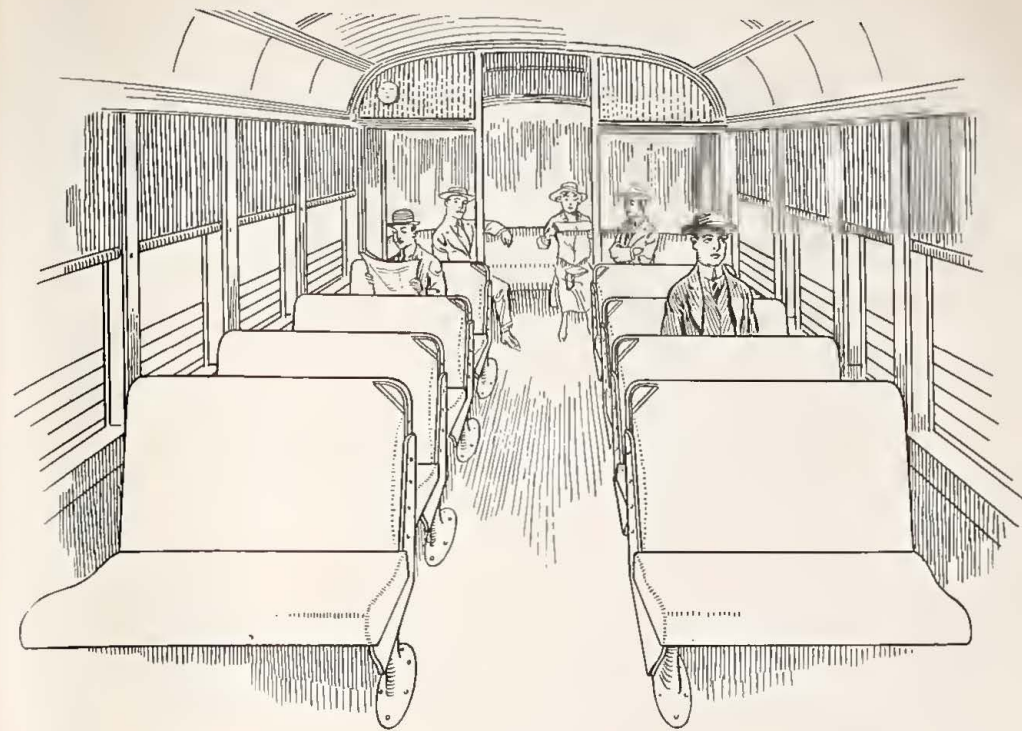
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Washington      Atlanta



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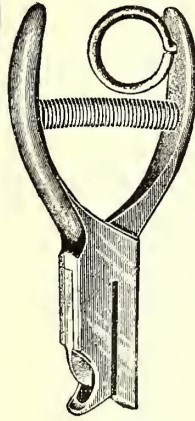


Chicago      Detroit  
San Francisco      Louisville

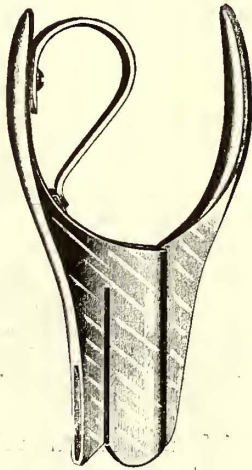


# B - V

## Ticket



## Punches

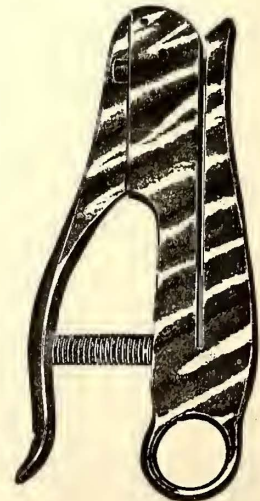
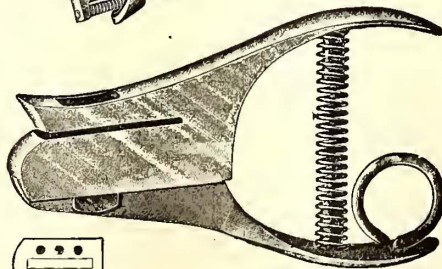
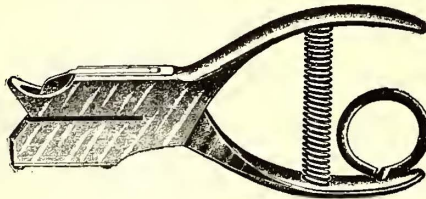
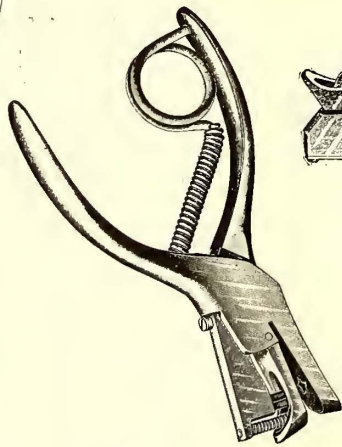
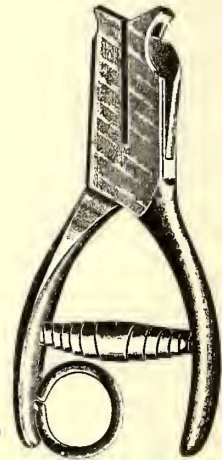


Have been adopted as Standard on the leading electric railways and steam roads in the United States and foreign countries.

*Send for Catalog.*

**BONNEY-VEHSLAGE TOOL CO.**

61 New Jersey R.R. Ave.  
Newark, N. J.

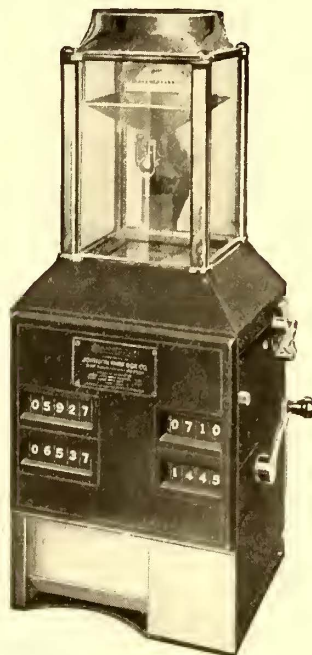


- CINCINNATI
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A car without a  
**JOHNSON  
FARE BOX**  
is like a store  
without a cash  
register



There's hardly a store, even in the smallest town, that hasn't an up-to-the-times cash register.

If it pays a storekeeper to keep tabs on himself, how much more will it pay you to keep a check on others who are handling your money?

While there are more than 10,000 Johnson fare boxes in use today, yet there are still thousands of cars in this country that are without this recognized embodiment of fare collection apparatus which

Gets and keeps the money for the railway company.

Won't you let us help you get all the money you are entitled to receive?

## JOHNSON FARE BOX COMPANY

Jackson Boulevard and Robey St., Chicago

50 East 42nd Street, New York

# An Acre of Diamonds



Have you ever heard Russell Conwell's famous lecture entitled, "Acres of Diamonds"? He shows that the world is full of opportunities for the man who hunts them. Riches are to be found sometimes in the most unexpected places.

Coal deposits excited no interest in the minds of our grandfathers until somebody discovered the possibilities of coal. Electricity was useless to man until he finally recognized its existence and harnessed it up to do his work. It then became a tremendous force in the advancement of civilization.

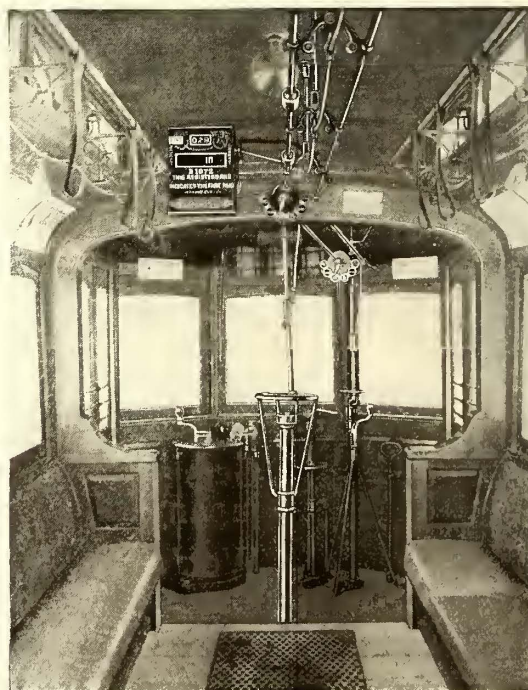
You have a tremendous force for the advancement of your business in the "human nature" part of the men you employ. Your conductors are potential business getters. They are potential income protectors. They are potential advertisers of your business. If you depend upon your publicity agent only for the boosting of your business; if you depend for the protection of your fares on spotters and fare receptacles only and ignore the peculiar possibilities of the human factor in this connection, you, as a railroad man, are missing your "acre of diamonds."

## The Ohmer System

Economy is the order of the day. Economy does not mean spending less money, but it means getting greater value for what you spend. If you have increased the wages of your employes and are not receiving from them greater efficiency, greater loyalty, and a higher standard of service, there is something wrong.

We have assisted materially in bringing success to the electric railway business by solving the problem of the "human factor" as it relates to the conductor and his work, and the electric railway companies which are now maintaining success under adverse conditions are, almost without exception, our clients. They are "Ohmer System Companies."

Let us analyze your local conditions and apply the results of our experience to your needs. It will cost you nothing to get our ideas.

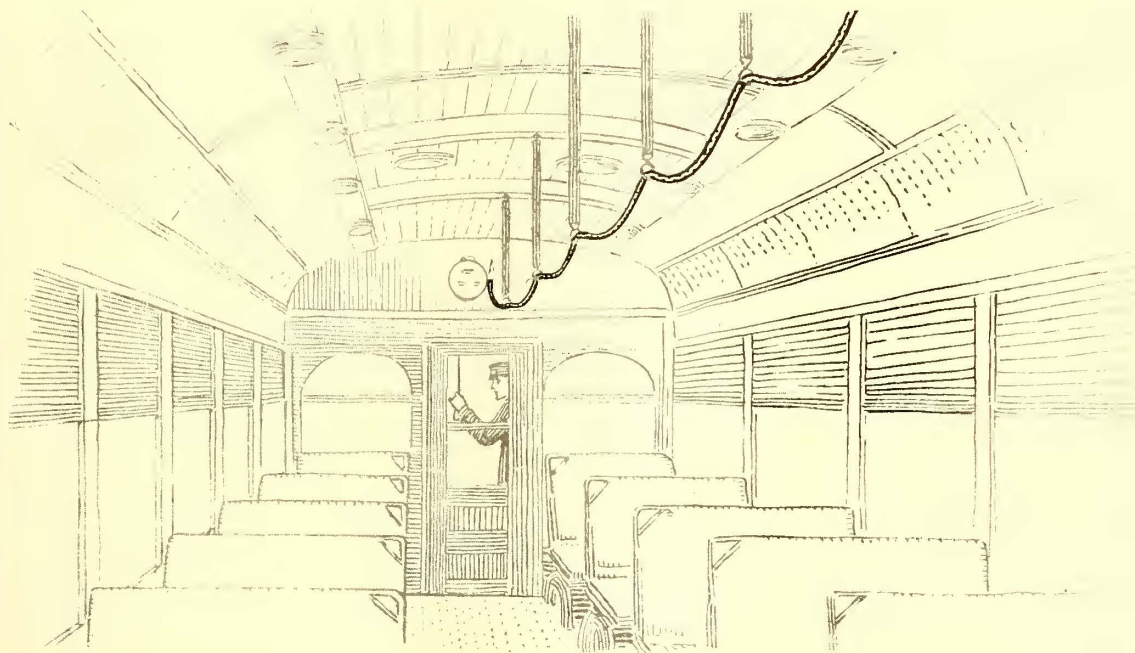


An Ohmer operating equipment adapted to either pay-within, pay-as-you-enter, one-man, or two-man operation

**Ohmer Fare Register Company**  
Dayton, Ohio



# For **STRENGTH** and **DURABILITY**



## **Samson Solid Braided Cotton Bell and Register Cord**

should be on every car operated by a company which believes in the conservation of materials and in true economy of maintenance.

The experience of the largest roads in the country shows that Samson Cord is more durable at less cost than other materials, and is far more economical than common, roughly braided cord.

Samson Bell and Register Cord is the same extra quality as Samson Spot Trolley Cord.

Carried in stock in Mahogany, Drab and White. Special colors made to order. Samples and full information are yours for the asking.

**Samson Cordage Works, Boston, Mass.**

**Useless Weight Means Waste  
of Coal and Money.**

**This is True of Conduit Weights, Too!**

If every electric railway car in the United States was as light in weight per passenger as the

**BIRNEY-STONE & WEBSTER SAFETY CAR**

There would be a handsome reduction in the yearly total of 14,000,000 tons of coal for which the electric railways of this country are responsible.

One of the reasons why the Stone & Webster Safety Car is so efficient in weight is that it is conducted throughout with

## **DURADUCT**

A durable, flexible conduit which is not only most economical in cost, but which saves hundreds of pounds per car as its weight averages only one-ninth that of metal piping.

And the labor item for installation is a lot less, too. Duraduct needs no bending tools nor a husky helper to assist the wireman!

There's no better time than now to let Duraduct help you protect your wiring at least first and continuing cost.

**TUBULAR WOVEN FABRIC COMPANY**  
MANUFACTURERS — PAWTUCKET, R. I.  
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THE BLACK DOTTED LINE  
IS THE MARK OF  
DURADUCT



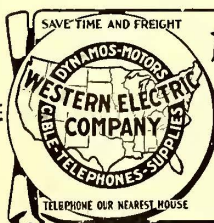
**EVERYTHING THAT YOU NEED—IF  
IT'S ELECTRICAL—IN ONE BOOK—THE**  
*Western Electric*  
**YEAR BOOK**

Keep it within reach when you are making up your estimates and requisitions for new construction and maintenance work.

The one uniform set of list prices—the one basic discount—makes for ease in preparing estimates.

One source, too, for all your supplies means the one uniform, high standard that is characteristic of the line of Western Electric Quality Products.

Consult our Year Book—then our nearest house.

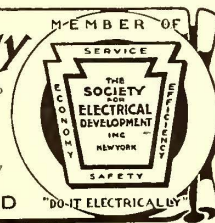


**Western Electric Company**

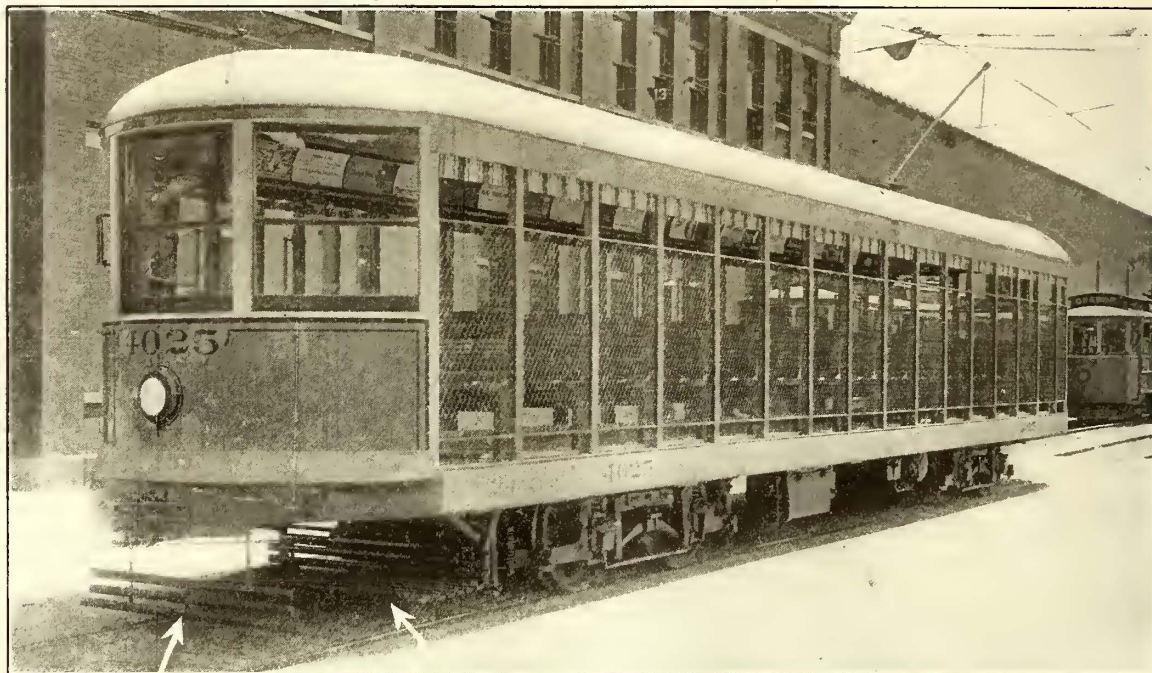
INCORPORATED

- |              |             |              |               |                |
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**EQUIPMENT FOR EVERY ELECTRICAL NEED**



# Like a Flash—



Touch this  
gate—

Down goes  
this guard

## Front End Accidents Are Made Impossible

Touch the gate in front and down comes the guard, picking up the person before the wheels can reach the body.

And Providence Fenders, too, are built on the principle of "instant action." Let us send you more information on this subject.

**The Consolidated Car Fender Co.**

Providence, R. I.

General Sales Agent

**Wendell & MacDuffie Co.**

61 Broadway, N. Y.

# How a big man played an up-hill game and WON!

When E. M. Paget took charge of the Sales Department of the Iliff-Bruff Chemical Company, Chicago, the problem was to market the product of a new concern in an already crowded field and at a time of great business depression.

It was freely predicted that he would fail within six months. But this man's back was to the wall. It was strictly up to him. He had to make good—How?

The determination to win was there all right. But Mr. Paget realized that he had to have a broader business training to carry his determination thru.

An enrolment for the Modern Business Course and Service of the Alexander Hamilton Institute was the answer to this question.

So Mr. Paget enrolled.

With the unfolding of this vast fund of business knowledge, he applied the first principles he thus acquired to his own business needs.

Slowly but surely one and all of the obstacles were overcome.

### *His knowledge was sound*

And, Mr. Paget now says—"I look back at the lean months we had experienced, and when I contrast the wonderful business we are now doing, I know it is not enough to simply have a superior product, a well-managed factory and a loyal organization fired with push and energy.

"One must understand the great business fundamentals. He must know how and why certain methods have led to success, while others, many of which we are prone to almost unconsciously adopt, spell only failure."

He says further: "If the total cost of the Sales Department in any other line were figured against the total cost of my department, it would probably be found that we are operating at a

smaller percentage of expense than the average sales department.

"This is due to methods, a great part of which was gathered from your Course."

### *What results training brings*

Here was one Sales Manager—one of thousands—who won out by absorbing basic facts—by getting down to the bare fundamentals of business and fitting them to the job he had to do.

And, the answer? When Mr. Paget took charge of the Sales Department, his salary was \$3,600 per year. His earnings have now reached a point attained by few Sales Managers.

### *This man only one of many*

The same business information which this man applied so successfully to his business is available, too, to you. If you own a business—if you are an executive—if you hope to be an executive—you need this Course.

The Alexander Hamilton Institute gives you the best thought and experience of thousands of successful business men—brings it to you in the most practical, most interesting, easily readable form for absorption in your leisure time.

In the final analysis you and every other man in business are selling one thing—service.

Every source that can be drawn on for the improvement of self—for the betterment of that product—is worthy of the little time, the little effort, you are obliged to give.

This same material which has helped hundreds of other men to success will be yours to use as a guide to certain business growth.

### *The kind of men enrolled*

Presidents of big corporations are often enrolled for the Modern Business Course and Service



along with ambitious young men in their employ.

Among the 65,000 subscribers are such men as A. T. Hardin, Vice-President of the New York Central Lines; E. R. Behrend, President of the Hamermill Paper Co.; N. A. Hawkins, Manager of Sales, Ford Motor Co.; William C. D'Arcy, President of the Associated Advertising Clubs of the World; Melville W. Mix, President of the Dodge Manufacturing Co., and scores of others equally prominent.

In the Standard Oil Company 291 men are enrolled in the Alexander Hamilton Institute; in the United States Steel Corporation, 450; in the National Cash Register Company, 194; in the Pennsylvania Railroad Company, 108; in the General Electric Company, 300—and so on down the list of the biggest concerns in America.

### **[Advisory Council**

Business and educational authority of the highest standing is represented in the Advisory Council of the Institute.

This Council includes Frank A. Vanderbilt, President of the National City Bank of New York; Judge E. H. Gary, head of the United States Steel Corporation; John Hays Hammond, the eminent engineer; Jeremiah W. Jenks, the statistician and economist, and Joseph French Johnson, Dean of the New York University School of Commerce.

### **"Forging Ahead In Business"**

A careful reading of the interesting 112-page book, "Forging Ahead in Business," which we will send you free, will show you how to prepare for the increasing number of business opportunities that are bound to come during the next few years.

Every man and woman with either a business or a career to guide to bigger, surer success, should read this book. Simply fill out and send the coupon below.

Alexander Hamilton Institute  
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Send me "FORGING AHEAD  
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Name ..... *Print Here*

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# International Fare

On One-

*Make 100 Per Cent Fare Col*

Two of the most pressing things that electric railways must do today is to

Increase the **income** by getting **more fares** and getting **full collection of fares**; and

Lower the **outgo** by cutting platform expense without cutting individual wages—which means the handling of more passengers per operator either with one-man cars or trains.

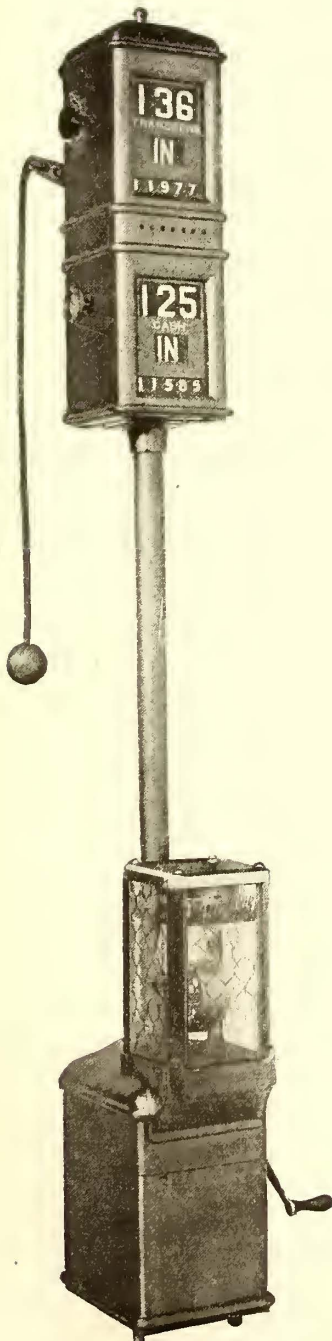
With the coming of odd fares and zone fares it will be harder than ever for the conductor to

## Keep the Car Moving at High Schedule Speed

And yet give proper attention to fare collection, unless he is provided with every available mechanical aid to reduce labor.

For straight 5-cent fares on one-man double-end cars you may like best the International C16 Fare Box if the service is light and a separate register is available for use in connection with the box.

On single-end cars where frequent removal of coin registers from end to end of the car is not required the International C15 Coin Register is preferable, because the operator does not have to work two different machines or worry about consequent discrepancies between Box and Register readings. The C15 furnishes in one machine both visible and audible registration.



Type C21 Combination  
Coin and Transfer  
Register



Type  
C15  
Coin  
Register

**The International Register Company,**



# Collection Devices

## Man Cars

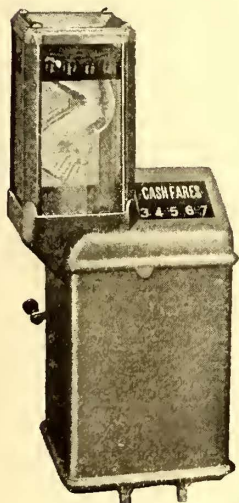
### *Collection a Physical Possibility*

#### For One-Man Cars on Short Headways

The International C26 Coin Register with motor drive, which greatly lightens the duties of the conductor, is still better, as then only will it be possible to combine the collection of all fares with little or no loss of schedule speed. The motor-driven type avoids loss of car hours just as well as it avoids loss of fares.



Type C16 Fare Box



Cash Side Type C17  
Coin and Metal  
Ticket Fare Box

#### For One-Man Cars with Mixed Fares

Such as cash and transfers, or cash and tickets, the International C21, hand-operated, will fill the bill for light service, and the C26, motor-operated, for heavy service.

For one-man cars using cash and metal ticket fares, the International Type C17 Fare Box, or the International Type C14 Metal Ticket and Coin Register is available, either hand or motor-operated, and if transfers are used, the Type C20 International Coin, Metal Ticket and Transfer Register.

Finally, on light runs where a small percentage of paper tickets are received, a combination of counting Fare Box and non-counting ticket receptacle is in use on one-man prepayment and postpayment cars.

The motor-driven machines are especially advantageous on single-end cars (or double-end cars operated over loop terminals); as such cars make unnecessary the duplication of the motor part or the carrying of the equipment by hand when changing ends.



Type C14 Coin and  
Metal Ticket Register

15 South Throop Street, Chicago, Ill.



# International Fare

## On One-Man Cars

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Type C21 Combination Coin and Transfer Register



Type C15 Coin Register

# Collection Devices

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Type C16 Fare Box



Cash Side Type C17 Coin and Metal Ticket Fare Box



Type C14 Coin and Metal Ticket Register

The International Register Company, 15 South Throop Street, Chicago, Ill.

# International Fare Col

## On Two-Man Cars

### *Make 100 Per Cent Fare Collection*

On the electric railway of the early future we may expect to see new two-men cars only on lines which are extremely busy in themselves or which operate in large part over congested routes. Further, wherever possible, such busy lines will be operated in connection with

### Prepayment Stations and Motor-Driven Registers

Because practically perfect fare collection, and enormous saving in time and reduction in track congestion are thus assured, as proved by the Boston Elevated Railway's success with International motor-driven station registers.

It was also Boston that proved that where the fares must be collected on cars of heavy traffic the only satisfactory way to do so is to use International motor-driven coin registers because

### Motor-Driven Registers on the Car Give Maximum Revenue Collection and Maximum Mileage Revenue

Hitherto International motor-driven registers have been available only in the Boston C 25 and 26 coin and transfer types and the cash and metal ticket types named in connection with one-man cars. Now we are prepared to announce the early installation of an entirely new type, the C 29.



Type C20 Coin,  
Metal Ticket and  
Transfer Register



Motor-  
Driven  
Type C25  
Coin  
and Transfer  
Register

**The International Register Company, 15 Sou**

# Collection Devices for Trains *a Physical Possibility*

## Three Hundred International Motor-Driven Registers to Handle Cash, Paper Tickets and Transfers

### Toledo Railways & Light Company

In this International machine specially designed to meet the most exacting demands of efficient fare collection on short headways:

The same hopper receives both cash and paper tickets—hesitation and mistakes by passengers are therefore eliminated.

The cash is counted on the totalizer and registered on the register **automatically** whereupon it is available to the conductor for change.

The tickets are mechanically separated from the coins in a motor-driven drum. An endless belt prevents choking or stoppage no matter how rapidly the tickets are deposited. Tickets are registered by operating a pedal. After mutilation they enter a locked compartment.

The ticket compartment is protected with both a cylinder lock and a glass signature seal. A separate box in this compartment receives any quarters and half dollars that may be deposited by mistake; also all pennies deposited.

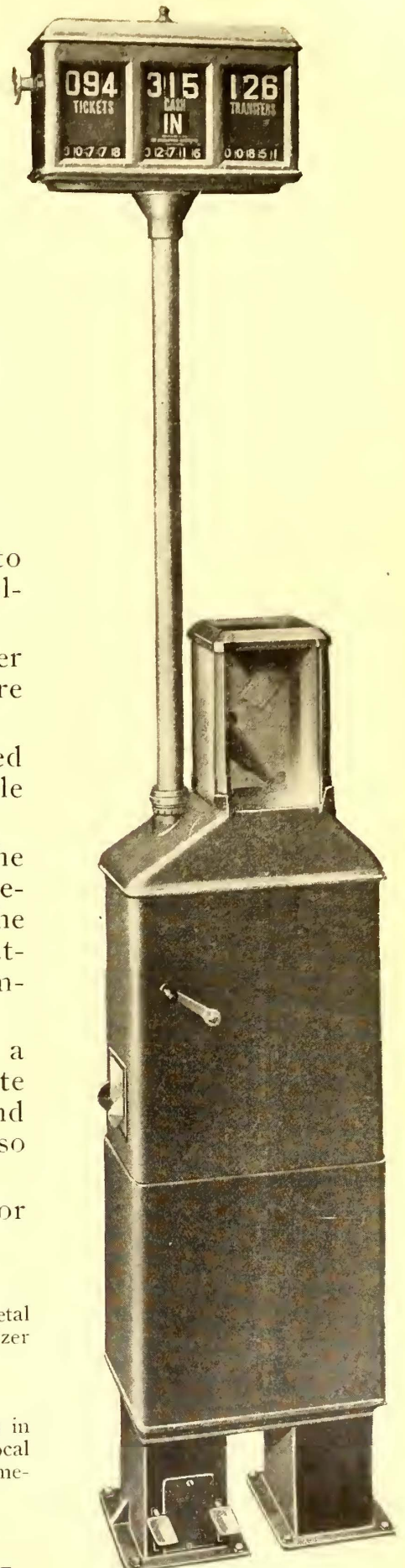
The transfers are collected directly by the conductor and registered by means of a separate pedal.

### Metal Tickets May Also Be Motor-Counted

In this machine by making certain changes whereby all cash and metal ticket fares would be shown on the cash register but a separate totalizer would permit classification.

### From One-Man Car to City Trains

Comprehends a wide range of service, but for practically every step in that range there is an International device which meets exactly your local combination of fare and traffic factors. If not, we are ready to make something that will.



C29 Motor-Driven Coin, Paper  
Ticket and Transfer Register

th Throop Street, Chicago, Ill.



# International Fare Collection Devices

## On Two-Man Cars or Trains

### Make 100 Per Cent Fare Collection a Physical Possibility

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Type C20 Coin, Metal Ticket and Transfer Register



Motor-Driven Type C25 Coin and Transfer Register

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C29 Motor-Driven Coin, Paper Ticket and Transfer Register

The International Register Company, 15 South Throop Street, Chicago, Ill.

See how  
easy it is  
to check the  
war tax  
with the

# Bonham Traffic Recorder

No special war tax checks.

No extra work for conductors.

Less than one minute required by checker to enter and add war tax.

This is only one of the many reasons why you should have Bonham Traffic Recorder Service.

**The Bonham  
Recorder  
Company**

Hamilton, Ohio

Month	Day	Train	Div.	Total Cash	Psgs.	Total Psgs.
12	07	53	3	19557		44398
		On	Off	Miles	Cash	
			45	22	4	44
			45	22	4	44
			45	22		
			61	30		
			71	35		
			71	35	6	70
			71	35	6	70
			21	10		20
			9	4		8
			27	13		26
			27	13		26
			45	22	4	44
			45	22	4	44
		9	61	26	4	52
		9	61	26		
		9	61	26		
		9	71	31		
		9	71	31		
		9	33	12		24
		21	61	20	3	40
		21	61	20	3	40
		21	45	12		
		21	45	12		24
		21	71	25		
		21	71	25	4	50
		21	33	6		12
		21	33	6		12
		27	45	9		
		27	45	9		18
		33	71	19	3	38
		33	61	14	45	28
		33	61	14		
		33	61	14		
		33	45	6		12
		33	45	6		
		33	45	6		
12	07	53	3	19579		44435
				<i>L. S. Harris</i>	22	37
				Miles	685	
				Cash	7.46	
				War Tax	.45	
				Total Charge to Conductor	\$7.91	
				Tickets	6.24	
				Total Revenue	\$ 13.70	





**1 K.W.H. = 4 lbs.**

**Every Kilowatt-Hour of  
Electrical Energy You  
Save Means**

**4 LBS. OF COAL SAVED!**

That means not only FUEL CONSER-  
VATION, but

**\$63.00 SAVED**

**ON EVERY STANDARD CITY  
CAR PER HEATING SEASON**

if the electric heaters are regulated by  
means of UTILITY Thermometer Con-  
trol.

And the saving on smaller cars will be  
in proportion.

WRITE FOR DETAILS

**Railway Utility Company**

151 West 22nd Street

CHICAGO, ILLINOIS

# Eureka

## **Commutators and Controller Parts**

are guaranteed interchangeable with standard design. Commutator segments and controller fingers are made of hard-drawn or drop forged copper. Best grade of Canadian amber mica is used for all commutator insulation. Finger springs are made from our special alloy phosphor bronze. Special parts made to order. All standard parts shipped from stock.

## **Trolley Wheels**

are made from tough, durable bronze—no scrap used. Machined on specially-designed machinery that makes possible a "just right" job. The accurate balance of Eureka wheels insures true running wheel and gives greater mileage with a minimum amount of wear on wire.

## **Line Material**

is made from uniformly tough and durable metal mixed in our own plant. In order to obtain a tight and smooth clinch, Eureka ears for round wire are cast solid. The grooves are milled centrally with practically no variation in thickness of clinching walls. This makes soldering unnecessary when Eureka ears are used. If so ordered, Eureka ears are furnished tinned. All Eureka standard ears for round and figure 8 wire carried in stock for immediate delivery.

**Bulletins on Eureka Controller Parts, Commutators, Brushholders, Trolley  
Wheels and Line Material Gladly Sent on Request.**

**Any or all are yours for the asking.**

**THE EUREKA COMPANY**

**North East, Pennsylvania**



Interior view of one of 26 new cars just put into service by the South Covington & Cincinnati Street Railway. Note the smooth, neat surface of the headlining.

## Nevasplit Headlinings

"Nevasplit" is, first of all, a wood fibre.

It won't warp or shrink, it has no grain, so will not split or "check." Its smooth, even surface takes paint readily.

"Nevasplit" is waterproof and of minimum conductivity. It is absolutely uniform in texture. "Nevasplit" is NOT veneered lumber but wood fibre in the highest form of refinement, possessing constructional features and beauty of appearance that make its use an essential for headlining, insulation roofs and interlining of cars.

To specify "Nevasplit" means a positive saving of money.

Let us send samples of "Nevasplit" so you can see with your own eyes the advantages of this material for YOUR cars.

# The Keyes Products Company

120 Broadway, New York

NEW YORK  
W. R. Kerschner Co., Inc.,  
50 Church St.

CHICAGO  
J. E. Simons  
Fisher Bldg.

SAN FRANCISCO  
Ford & Geirrine  
Merchants' Exchange Bldg.

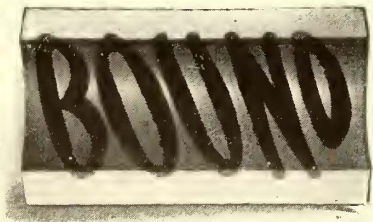
ITALY  
American Traffic Co.  
Via Capuccini, No. 4, Milano, Italy

# ARE YOU GETTING FULL Trade-Mark **BOUND BROOK** Reg. U. S. Pat. Office **OIL-LESS BEARINGS**



Here is a table of the wheel and bushing mileages obtained by various users of Bound Brook Bushings, which shows a most astonishing range of life despite the fact that Bound Brook Graphited Oil-less Bushings are absolutely uniform and are noted for the consistent individual mileage they give for any one combination of service characteristics.

	Wheel Dia., Inches	Wheel Miles	Bushing Miles	Tension Pounds	Amperes Carried	Compositio n, per Cent
Railway No. 1—City	4	8,600	8,600	25	200-250	89 Cu; 10 Tin; 1 Anti.
Sub.	6	8,600	8,600	30	400-500	89 Cu; 10 Tin; 1 Anti.
Railway No. 2.	6	29,000	10,900	22	200-400	Special
Railway No. 3.	....	9,000	98% outlast the wheel	20	500	88 Cu; 10 Tin; 2 Zn.
Railway No. 4.	5	15,000	15,000 or more with better inspection	22-25	400	Special
Railway No. 5.	4½	6,500	Equal with better inspection	20-24	300	Special
Railway No. 6.	4	27,633	27,633	25	.....	Special



## Bound Brook Oil-less Bear

# MILEAGE OUT OF *YOUR* GRAPHITED FOR TROLLEY WHEELS

All of the railways in this table operate at practically the same speeds except where suburban service is noted. Yet observe that

Bushing life ranges from a minimum of 8,600 to a maximum of 27,633 miles or more; and it would seem from the other factors noted that peripheral speeds, currents and tensions are not determining factors.

It seems significant, however, that those railways which are using short-life composition trolley wheels also get a short life for the bushing; while those using long-life wheels find the bushing perfectly capable of lasting as long as the wheels.

Isn't part of the answer to be found in the application of better maintenance of line and of current-carrying equipment on the car? We should be glad to have similar records from you because—

We don't want Bound Brook Oil-less Bearing service to stop with our delivery of the product to you. We want to know just what results you are getting and under what conditions of operation, so that we can help you to get more miles per bushing on your property and perchance improve the bushing for all properties.



ing Co., Bound Brook, N. J.



# ARE YOU GETTING FULL BOUND BROOK OIL-LESS BEARINGS

Trade-Mark

Reg. U. S. Pat. Office



Here is a table of the wheel and bushing mileages obtained by various users of Bound Brook Bushings, which shows a most astonishing range of life despite the fact that Bound Brook Graphited Oil-less Bushings are absolutely uniform and are noted for the consistent individual mileage they give for any one combination of service characteristics.

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Railway No. 1—City	4	8,600	8,600	25	200-250	89 Cu; 10 Tin; 1 Anti.
Sub.	6	8,600	8,600	30	400-500	89 Cu; 10 Tin; 1 Anti.
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ing Co., Bound Brook, N. J.

# V-K



## OILLESS TROLLEY WHEEL AND NON-ARCING HARP

1917 has been a year of unprecedented strain.  
1918 will find every difficulty intensified and new ones heaped upon you.

Are you prepared to meet them?

V-K Trolley Equipment will help mightily. It saves current—saves labor—saves renewal expense—saves overhead.

There's no time to lose. Ask us how and why.

*Write today for catalog and full particulars.*

**More-Jones Brass & Metal Company**

3134 No. Broadway, St. Louis, U. S. A.



# Facts Are Stubborn Things

They refuse to be shoved into the background.

The fact that users of gasoline motor trucks are paying nearly 30 cents a gallon for fuel—

The fact that to this expense must be added the cost of lubricating oil—

The fact that with electrically driven vehicles the cost for propulsive force is nearly nothing because the batteries can be charged at night during low-load periods—

The fact that two dollars' worth of grease (no oil) lubricates a G.V. Electric Truck for a year—

These facts cannot be discounted. They prove conclusively the economies that can be effected by using G.V. Electric Trucks.

Other reasons—facts—why G.V. Electric Trucks should be used, are:

Tires last 25% longer; long life; minimum labor and repair costs; ample mileage per charge; nothing to freeze in cold weather.

Send for catalog J-82 showing our 6 models.

G. V. Electric used by Holyoke Street Railway Company



## General Vehicle Company, Inc.

General Office and Factory:

Long Island City, New York



Make the World **SAFE** for Democracy

**SWAT**

Every Liberty Bond You Buy Helps Win the War.

**MILITARY AUTOCRACY**

BUY MORE **LIBERTY BONDS**

Owners of **LIBERTY LOAN BONDS**  
of the Second Liberty Loan of 1917

Wear this-

**BADGE OF HONOR**

Before Sunset **TO-DAY**

BUY A **LIBERTY BOND**

Every **LIBERTY BOND** is a shot at a **U BOAT**

**FIRE YOUR SHOT TO-DAY**

BUY A **LIBERTY BOND**

"SHALL WE BE MORE TENDER WITH OUR DOLLARS THAN WITH THE LIVES OF OUR SONS?"

*M. J. Mulcahey*  
LAWYER OF THE LIBERTY

BUY A **LIBERTY BOND**

WE DEPEND ON YOU

**"YOU**

Help My Boy Win the War"

BUY A **LIBERTY BOND**

The United States Government desired immediate nationwide publicity in electric cars. The existence of **COLLIER SERVICE** made it possible to meet perfectly this great need of the Government.

*Barron J. Collier*  
INCORPORATED

**Our Boys in the Trenches**

is there anything they need that you would not give them? Every

**LIBERTY BOND**

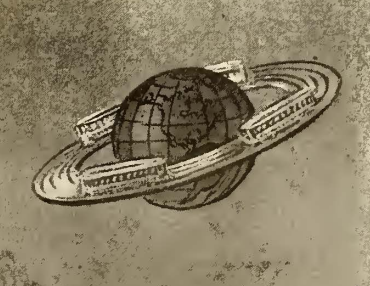
YOU buy helps them WIN the War. Buy more Liberty Bonds!

OWNERS WEAR THIS BADGE OF HONOR

**Make a Sacrifice**

Every man who shouldered a gun risks his all for his country. What are YOU sacrificing to back him up?

Every **LIBERTY BOND** you buy helps win the War!



**STRIKE TWO!**

HELP **STRIKE OUT** MILITARY AUTOCRACY!

Every **LIBERTY BOND** You buy Helps Win the War



# Generous, Substantial Support

is what we enjoy at the hands of the progressive manufacturers of car or maintenance equipment, for whom we are exclusive Eastern agents.

The high standard of their products is a good, solid foundation for the uniform satisfaction of our customers.

We solicit correspondence relative to the products of any of these firms and will be pleased to answer questions relative thereto. Literature on request.

## THE COLUMBIA MACHINE WORKS & MALLEABLE IRON CO.

Brooklyn, New York

Railway Supplies, Shop Machinery and Estimates on Steamship Supplies

## THE CINCINNATI CAR COMPANY

Cincinnati, Ohio

Electric Traction Cars

## THE CATSKILL FOUNDRY & MACHINE WORKS

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High Grade Gears and Pinions

## THE KEYES PRODUCTS COMPANY

New York, N. Y.

Nevasplit Car Headlining and Panels

## C. I. EARLL

New York, N. Y.

Trolley Catchers and Retrievers

## THE ALBANY CAR WHEEL COMPANY

Albany, New York

Chilled Tired, Cast Iron Car Wheels



# W. R. Kerschner Co., Inc.



50 Church Street, New York

# Miller Trolley Shoe

## Adopted by

# Atlantic Shore Line

Add another to the big and growing list of Miller Trolley Shoe users.

The Atlantic Shore Line Railway, the famous Maine Coast Railway south of Portland, has recently purchased thirty shoes, the wearing inserts costing 75 cents each, or

## Half the Cost of Trolley Wheels

Note the accompanying view of a trial shoe photographed after an 18,000-mile run under No. 00 wire—and still good for weeks. A 5-in. trolley wheel under the same conditions averaged only 7000 miles.

Become a user of the Miller Trolley Shoe if you want economy and certainty in overhead collection of current.

# Miller Trolley Shoe Co., West Newton, Mass.

SPECIAL REPRESENTATIVE: Holden & White, Inc., Chicago

SALES REPRESENTATIVES

Alfred Connor,  
Denver, Col.

T. C. White & Co.,  
St. Louis, Mo.

S. I. Wailes,  
Los Angeles, Cal.

F. F. Bodler,  
San Francisco, Cal.

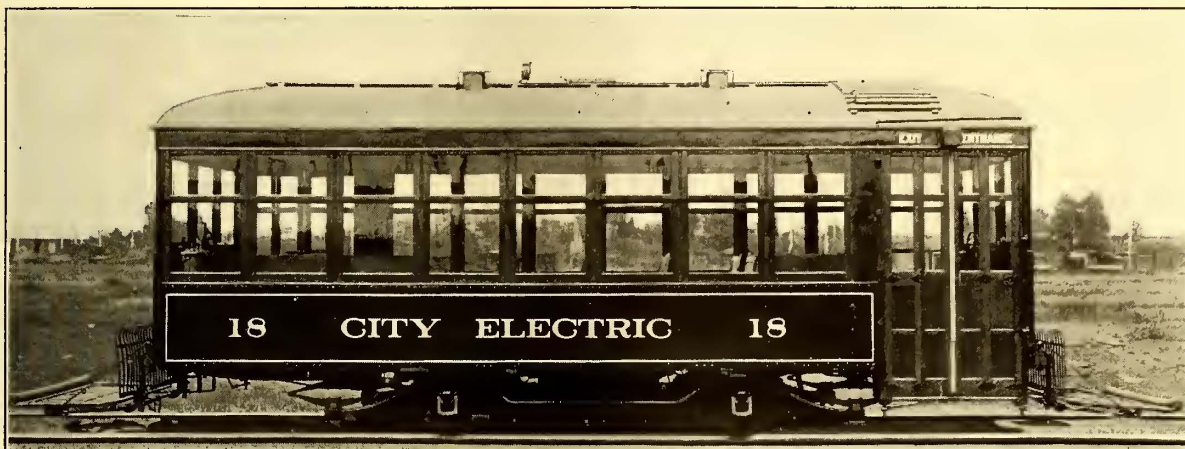
W. F. McKenney,  
Portland, Oregon.

W. M. McClintock,  
St. Paul, Minn.



# Additional Evidence

The merits of the "Light-One-Man" unit are thoroughly recognized: it is superfluous to add any word to what Mr. Roslington says.



CAPITAL \$250,000.00

GEORGE ROSLINGTON, PRESIDENT  
LLOYD STURGES, SECRETARY

ALBUQUERQUE, N.M.,  
December 3rd, 1917.

Mr. Geo. L. Kippenberger,  
Special Sales Agent St. Louis Car Co.,  
Saint Louis, Missouri.

Dear Sir:

Replying to your inquiry regarding the trucks supplied on your last delivery of light weight cars, I beg to advise that these have been in continuous operation since their arrival; and we have had absolutely no trouble or breakages of any kind in connection with them.

The riding qualities are excellent, and I do not think could be improved upon, although our experience very clearly shows that it is absolutely necessary to maintain the track in first class condition, in order to operate light weight cars with any satisfaction either to the Company or its patrons.

I might add that at the time of the delivery of these last cars we had a recruiting camp at one of our terminals, which taxed our capacity to the utmost. Every night for six weeks these cars with a seating capacity of twenty-six, and a weight of not to exceed thirteen thousand pounds, carried from sixty to ninety able bodied men passengers up and down a  $3\frac{1}{2}$  grade -  $1\frac{1}{2}$  miles long. Of course, this traffic only existed from seven to eight and from ten to eleven P.M.

During the last month the camp was in Albuquerque we carried over 150,000 passengers, exclusive of transfers, on our eight miles of track with twelve of your light weight cars and two old green cars, which were in operation not to exceed six hours a week each. During that period we did not have one personal accident, and a very small amount of car repairs was necessary.

Yours very truly,

TRJ.

President.

WE HAVE BUILT THREE  
LOTS OF THIS TYPE FOR  
City Electric Co.,

Albuquerque, N. M.

REPEAT ORDERS

HAVE BEEN EXECUTED

FOR

Aberdeen Ry. Co.,

Aberdeen, S. D.

Kankakee Elec. Ry. Co.,

Kankakee, Ill.

Lewiston-Clarkston T. Co.,

Clarkston, Wash.

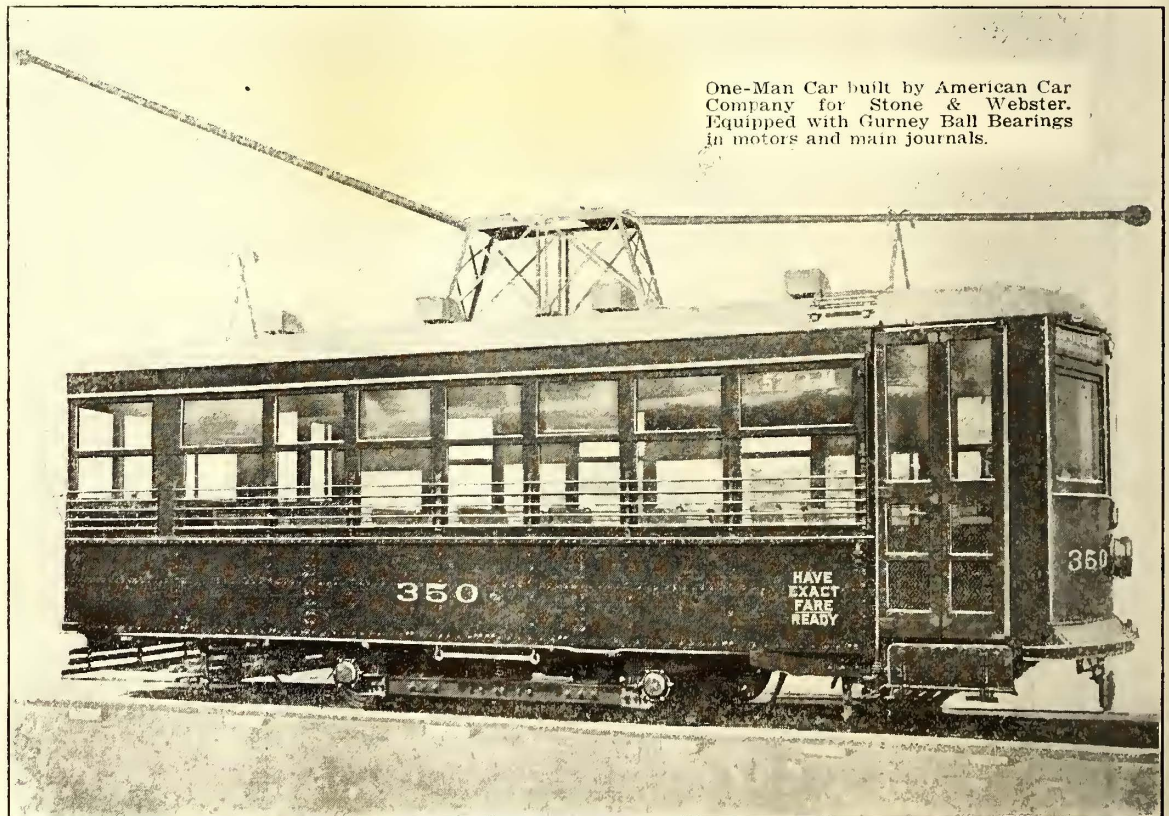
**St. Louis  
Car  
Company**

# Gurney Ball Bearings

## 370 watt-hours = 1 pound of coal

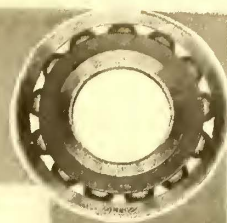
A recent calculation by W. D. Bearce shows that for general purposes it may be assumed that  $2\frac{1}{2}$  lbs. of coal are required to produce 1 kilo-

watt-hour at the bus-bar. Add 10 per cent to cover line losses and you find that every time you can save 370 watts at the motor you save a pound of coal in the boiler room.

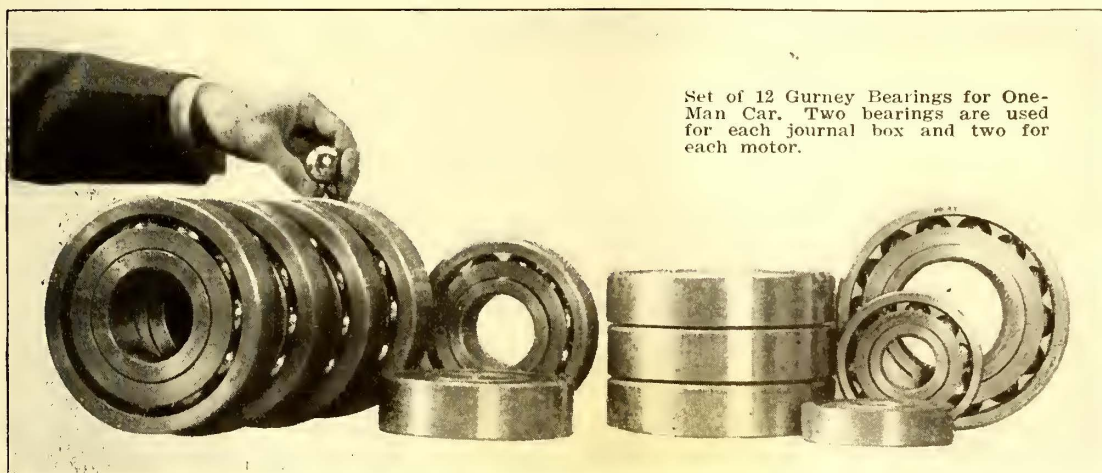


One-Man Car built by American Car Company for Stone & Webster. Equipped with Gurney Ball Bearings in motors and main journals.

***Gurney Ball Bearings are now standard equipment  
on all Stone & Webster Birney Safety Cars***



# Save Coal



Set of 12 Gurney Bearings for One-Man Car. Two bearings are used for each journal box and two for each motor.

## Ball Bearings save at least 10 per cent

It is generally conceded that ball bearings on motors and journals will reduce the power consumption about 14 per cent, and it is certainly safe to assume that the saving will be not less than ten per cent (exclusive of current used for heating and lighting).

On your heavy cars which consume 370 watt-hours per car mile, Gurney Ball Bearings will save a pound of coal for every ten car-miles.

Other advantages of Ball Bearing Journals and Motors are elimination of hot boxes and fallen armatures, perfect alignment of gears, reduced inspection and lubrication expense.

Our Engineers will be glad to recommend suitable bearings for your equipment.

**Gurney Ball Bearing Co.**

Conrad Patent Licensee

Jamestown, N. Y.

241





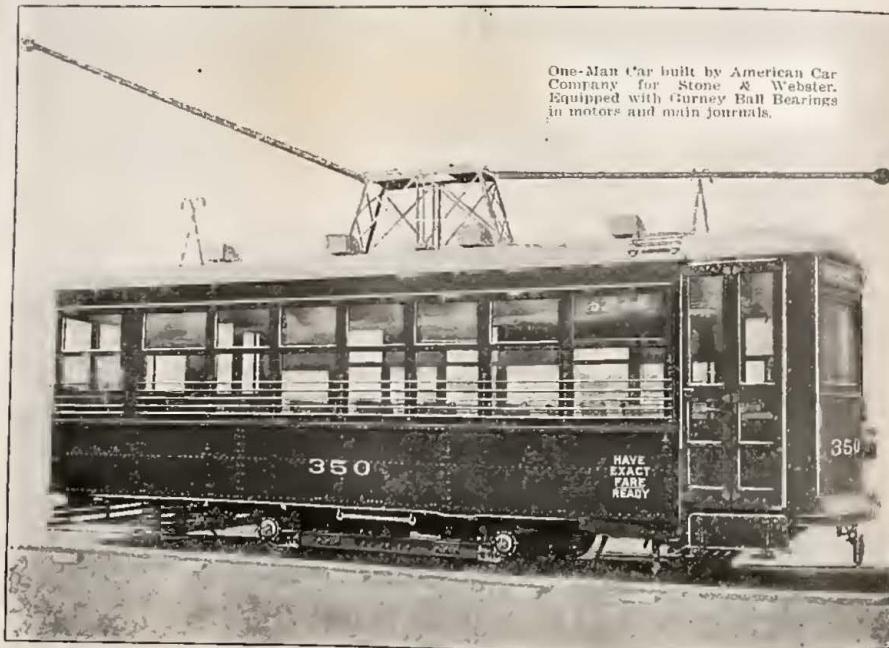


# Gurney Ball Bearings Save Coal

## 370 watt-hours = 1 pound of coal

A recent calculation by W. D. Bearce shows that for general purposes it may be assumed that 2½ lbs. of coal are required to produce 1 kilo-

watt-hour at the bus-bar. Add 10 per cent to cover line losses and you find that every time you can save 370 watts at the motor you save a pound of coal in the boiler room.



One-Man Car built by American Car Company for Stone & Webster. Equipped with Gurney Ball Bearings in motors and main journals.

*Gurney Ball Bearings are now standard equipment on all Stone & Webster Birney Safety Cars*



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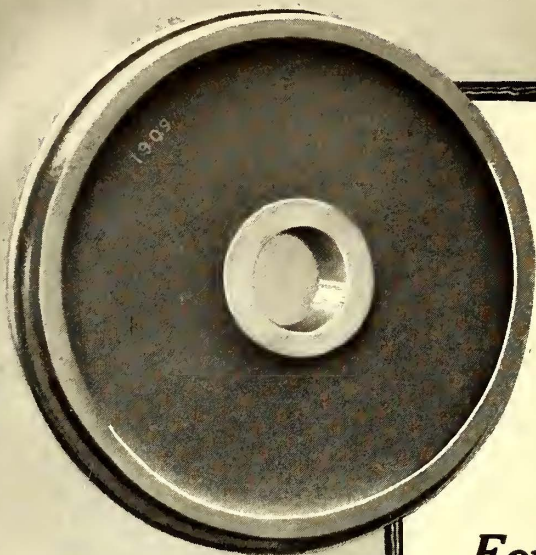
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Our Engineers will be glad to recommend suitable bearings for your equipment.

**Gurney Ball Bearing Co.**  
Conrad Patent Licensee  
Jamestown, N. Y.



## The Wonderful Single-Service Chilled-Iron Wheel

# Standard for 67 Years

The Chilled Iron Wheel has performed its every function at a minimum cost.

### *For Freight Cars*

95% of all cars in this type of service are carried on Chilled Iron Wheels.

### *For Street Cars*

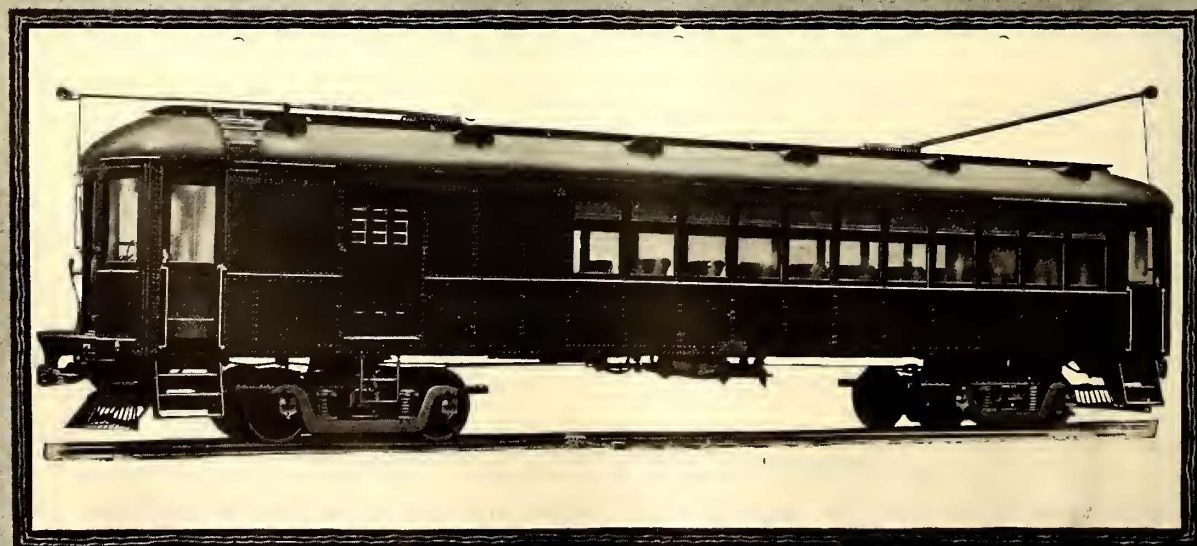
The Chilled Iron Wheel is Standard for Street Car Service in 95 out of 100 cities in the United States and Canada, operating 100 cars or over.

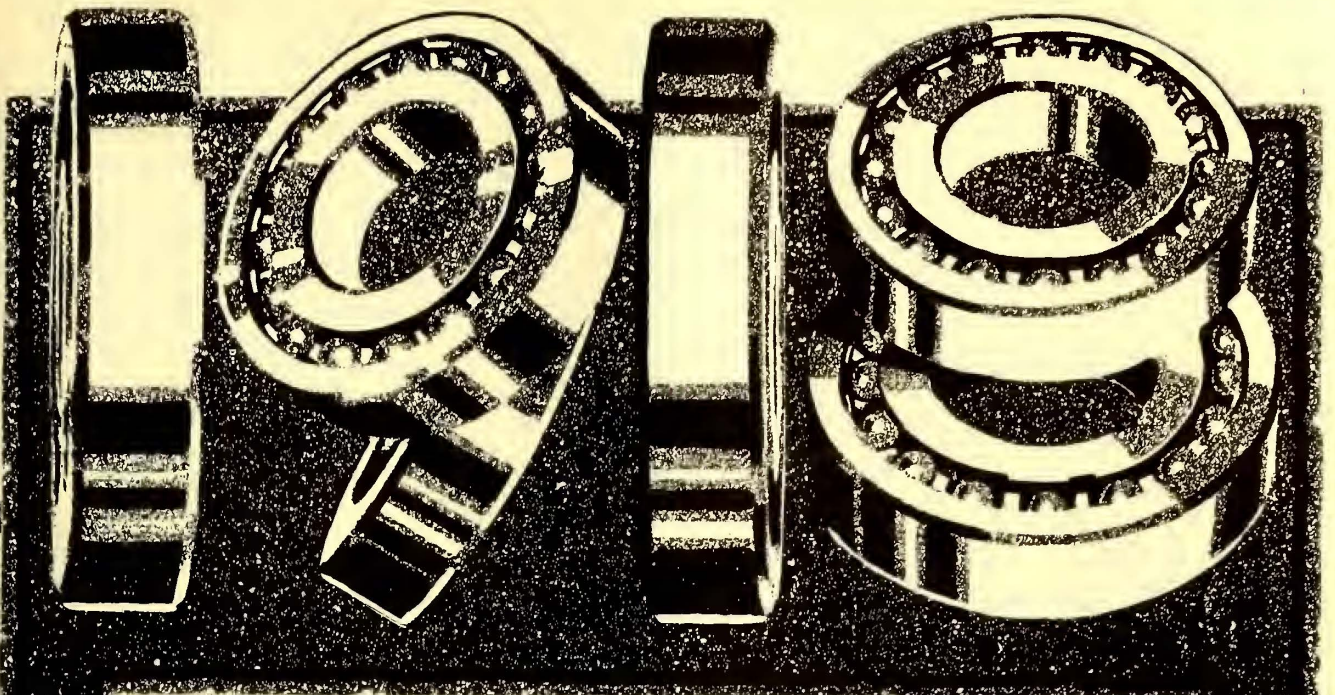
### *The Conclusion*

to be gained from these figures is that the Chilled Iron Wheel gives the Greatest Service for the Lowest Cost.

**Association of Manufacturers of Chilled Car Wheels**  
1228 McCormick Building, Chicago, Ill.

Representing Forty-eight Wheel Foundries Throughout the United States and Canada. Capacity 20,000 Chilled Iron Wheels Per Day.



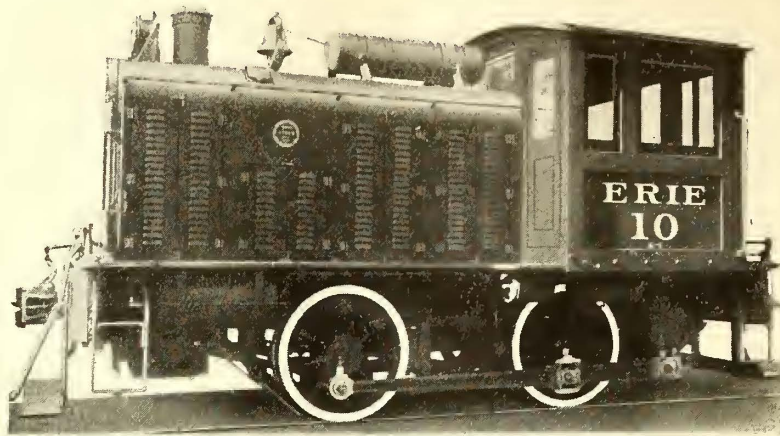


**T**HROUGHOUT the coming year front covers and full-page announcements in this journal will tell the story of increased efficiency in Electric Railway Motors made possible by the use of SKF Ball Bearings. To those who follow the facts to be presented—facts drawn from actual operating service in prominent companies—the year 1918 will most certainly prove a profitable New Year.

**SKF Ball Bearing Co.**

Hartford, Conn.

**SKF**  
**BALL BEARINGS**



# Gasoline Locomotives

can be run wherever a track is laid, provided clearance limits permit. They are dependent upon no external source of power, and to "charge up" it is simply necessary to refill the gasoline tank.

## Electric Railways

can use gasoline locomotives to advantage, especially in and about shops, power plants and terminals. These locomotives can go where it would be unsafe or undesirable to run a third rail or overhead wire, and with reasonably careful handling fire risks are practically eliminated.

## Baldwin Gasoline Locomotives

are strongly built for severe service. There are four standard sizes, weighing respectively  $3\frac{1}{2}$ , 5, 7 and 9 tons, which can be designed for either standard or narrow gauge; and also a 23-ton size, which is built for standard gauge only, and is specially suitable for yard or terminal switching service.

These locomotives are fully described in Baldwin Record No. 85.

## THE BALDWIN LOCOMOTIVE WORKS

Philadelphia, Pa.

REPRESENTED BY

F. W. Weston, 120 Broadway, New York, N. Y.

Charles Riddell, 627 Railway Exchange, Chicago, Ill.

C. H. Peterson, 1210 Boatmen's Bank Bldg., St. Louis, Mo.

George F. Jones, 407 Travelers' Building, Richmond, Va.

A. Wm. Hinger, 512 Northwestern Bank Bldg., Portland, Ore.

Williams, Dimond & Co., 310 Sansome St., San Francisco, Cal.



## It's Heavy— Glazed Porcelain

And that's one of the reasons why the White Trolley Hanger doesn't have cracked insulation troubles. This porcelain is tough and will stand the knocks if the trolley hits it.

# WHITE'S Porcelain Trolley Hanger

is so simple to adjust and align on the span wire that it is a big time-saver in installation work.

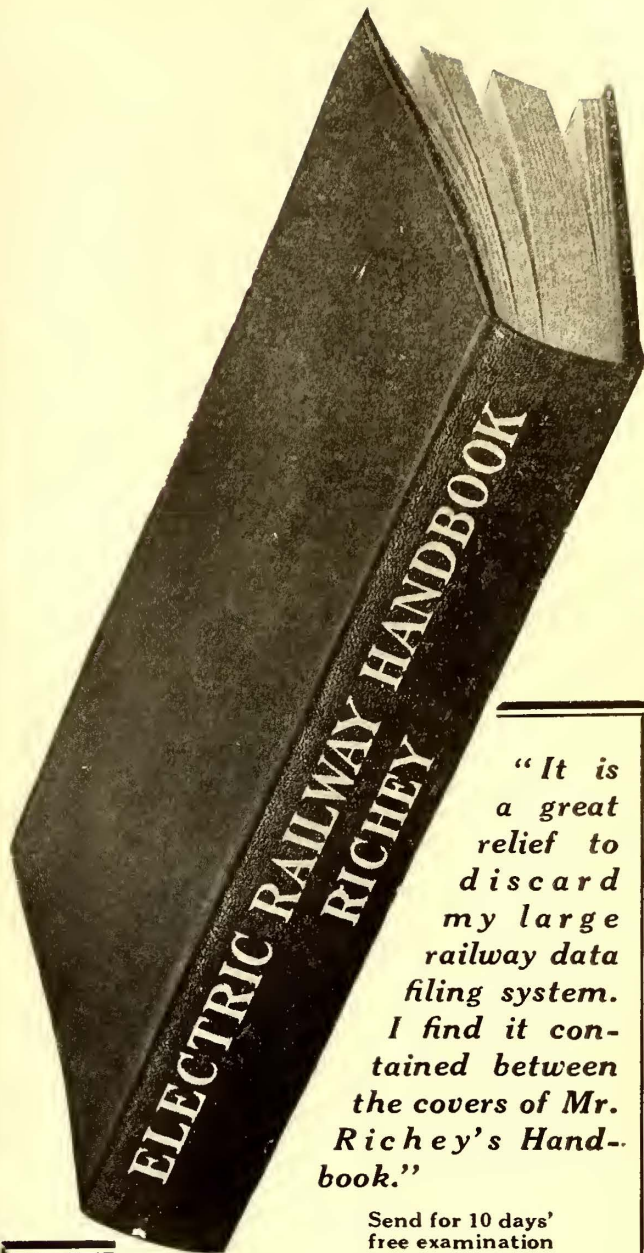
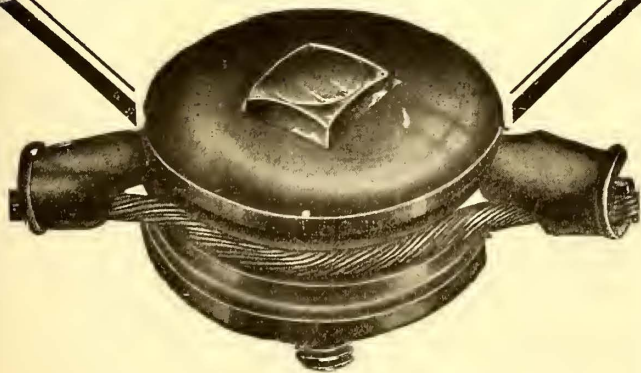
The yoke is sherardized malleable iron, and that doesn't rust; the bolt is a standard, furnished sherardized or in bronze. Those are the three simple parts of this hanger, and they mean economy for you.

Let us send you a sample with quotations on complete hangers or parts which we have in stock for

*Immediate Delivery*

## T. C. White Electrical Supply Co.

1122 Pine Street, St. Louis, Mo.



*"It is a great relief to discard my large railway data filing system. I find it contained between the covers of Mr. Richey's Handbook."*

Send for 10 days' free examination

*Richey's*

## Electric Railway Handbook

BY ALBERT S. RICHEY, Electric Railway Engineer,

Professor of Electric Railway Engineering, Worcester Polytechnic Institute, 332 pages, flexible leather, full-gilt edges, 4 x 7 inches, pocket size, with over 600 illustrations.

\$4.00 (Eng. price 17s) net postpaid.

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**Electric Railway Handbook, \$4.00 net.**

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TRADE MARK  
REG. U. S. PATENT OFFICE.

## The Standard for Rubber Insulation

Railway Feed Wires insulated with OKONITE are unequalled for flexibility, durability, and efficiency and are in use by the leading Electric Street Railway Companies. OKONITE is preferred above any other insulation for Car Wiring, Telegraph and Telephone Purposes.

OKONITE WIRES—OKONITE TAPE  
MANSON TAPE—CANDEE WEATHERPROOF WIRES  
CANDEE PATENTED POTHEADS

*Samples and Estimates on Application*

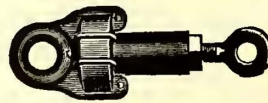
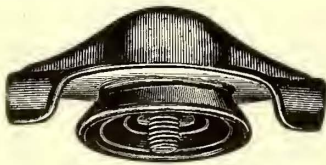
THE OKONITE COMPANY, 501 Fifth Ave., cor. 42nd St., New York

CENTRAL ELECTRIC CO., Chicago, Ill., General Western Agents

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and successfully cut maintenance costs if you turn to

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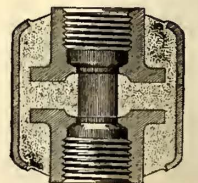
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This pair tested and passed for  
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on the insulation of plier to  
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We guarantee all "RIMCO"  
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Cheaper than plain pliers with detachable  
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Ask for prices.



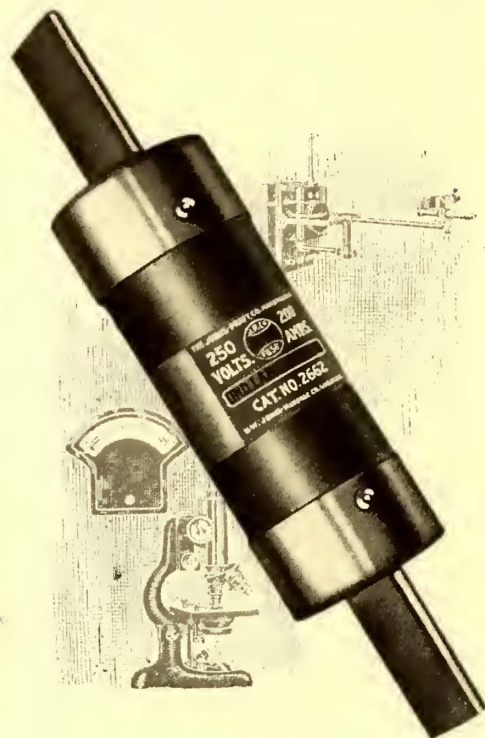
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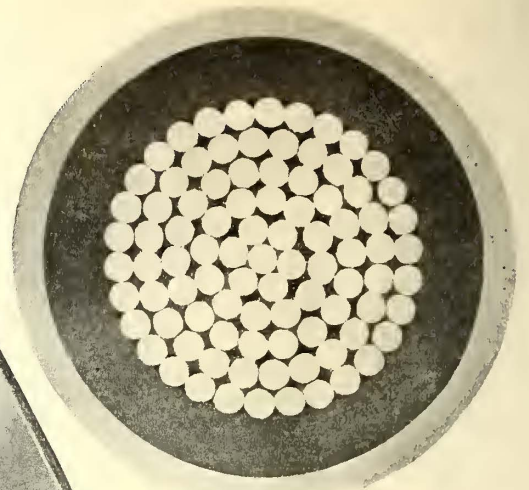
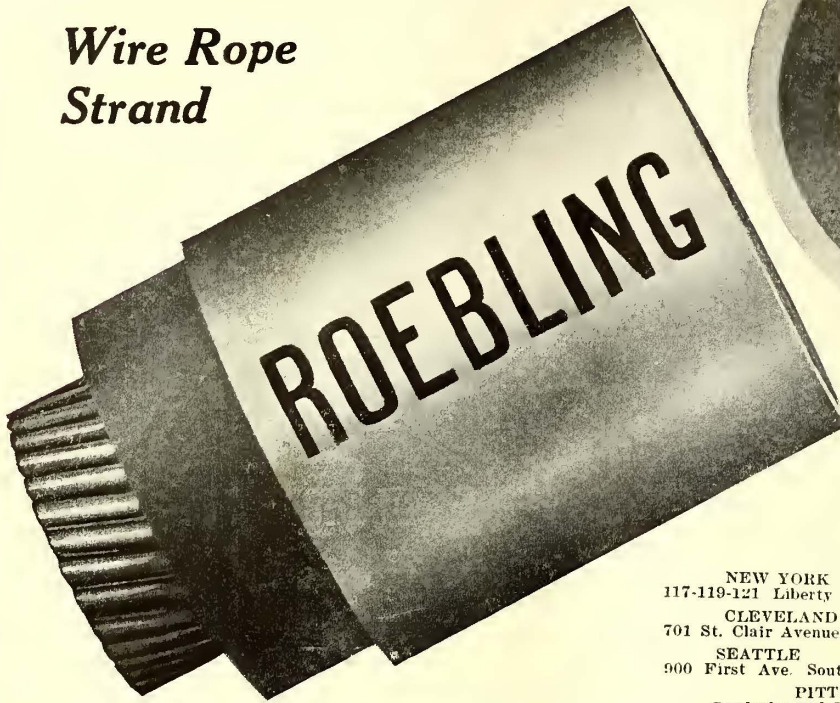
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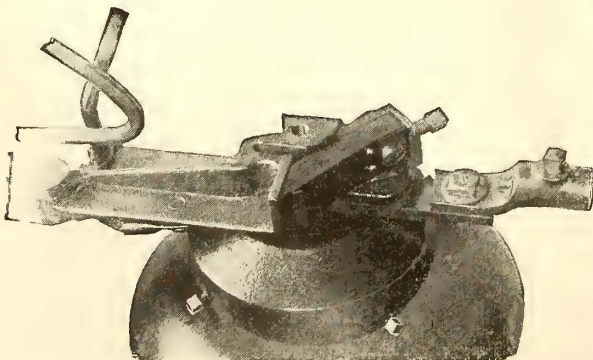
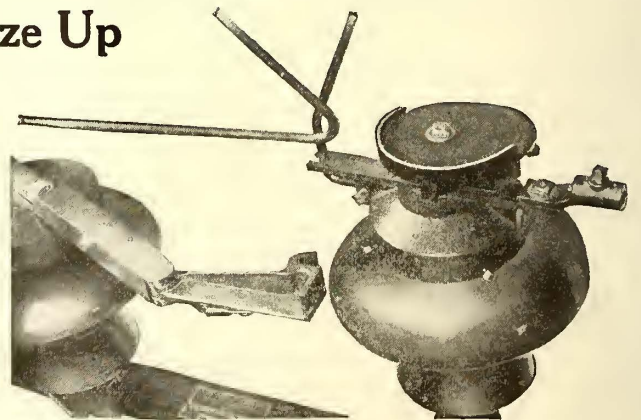
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Sleet hood completely covers flexible leaf brush contact, toggle joint in arm gives increased reliability of break.



These two cuts show the main contact of the Burke Horn Gap Switch. The lower cut shows the contact closed—Sleet Hood removed.

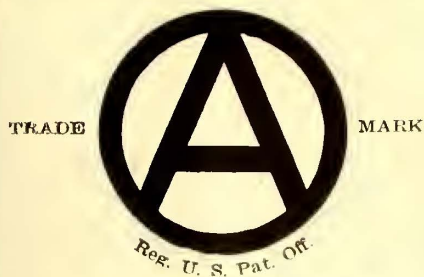
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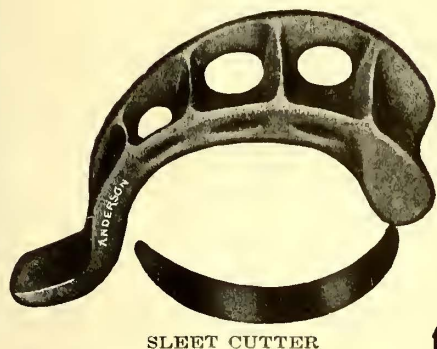
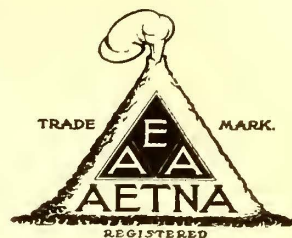
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These Trademarks mean utmost excellence when you see either on your overhead line material, Trolley Bases, Poles, Harps, and wheels, Section Switches, Quick Break Switches, etc.

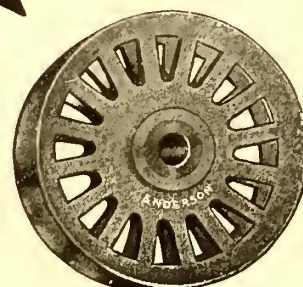


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Sleet Time  
Is  
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Use the **ANDERSON** Line

Be  
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to Meet It



SLEET WHEEL

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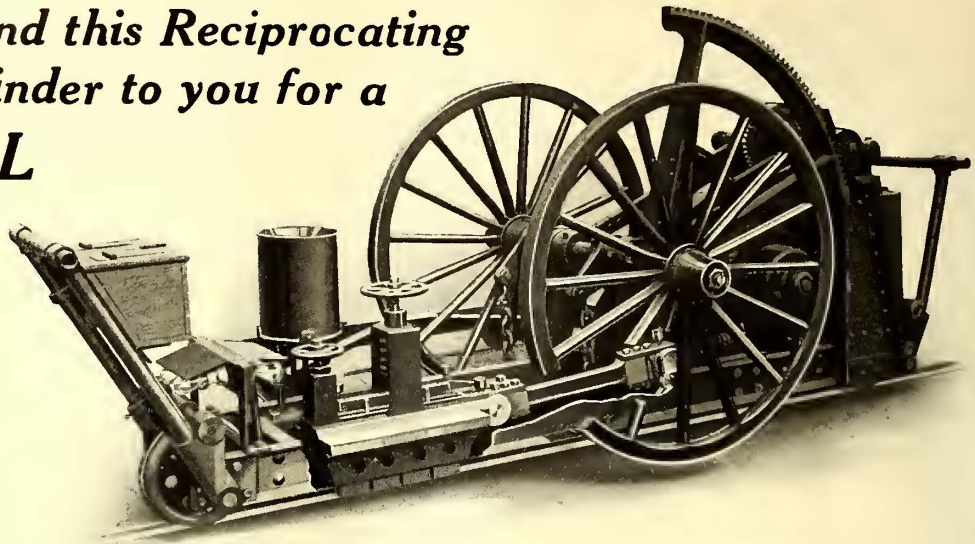
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## Let Us send this Reciprocating Track Grinder to you for a TRIAL

No  
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to You

We have shipped machines to scores of electric railways, at our risk and expense.

*A trial convinces.*



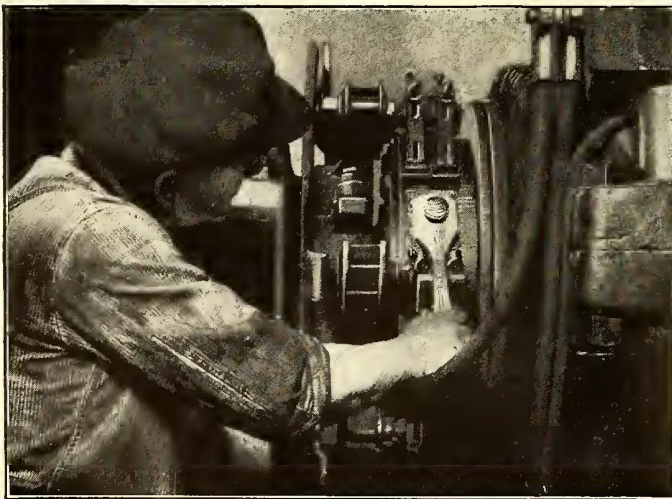
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1. Removes corrugations and cupped joints from rails.
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4. Can be placed on track and removed in less than one minute.
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Quick—Efficient—Inexpensive.*

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## Stop turning down your Commutators— Re-surface them the "Ideal" way with the machine in service

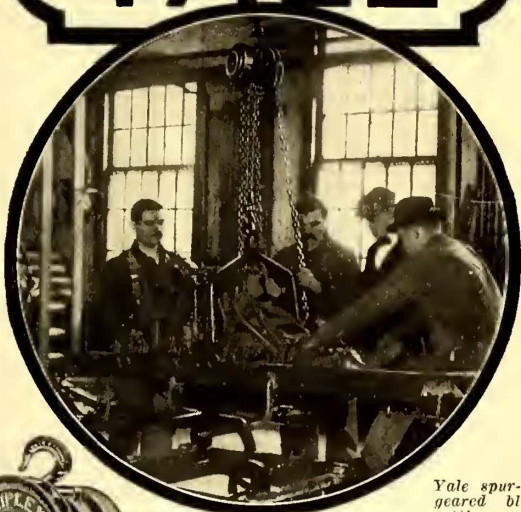
The Ideal Commutator Resurfacer is a remarkable abrasive composition (non-copper collecting, and non-metallic) which will enable you to put your commutators in smooth, excellent working condition and keep them so.

Inexpensive and conveniently applied with the machine in operation, it is helping hundreds of users to obtain *maximum efficiency* constantly from their electrical machinery at *minimum expense*.

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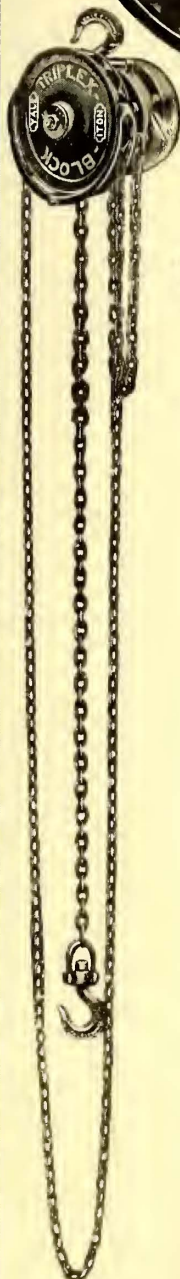
Ideal Resurfacers are obtainable in all sizes and in a fine and coarse grade. Convenient handles are attached to assist in their application to the rotating commutator surface. Write for complete information and prices.

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Tell us the R.P.M., face width, clearance between sets of brushes and condition of your most troublesome commutator and we will forward an Ideal Resurfacer on ten days' trial. Should it fail to satisfy you in every way, return it at our expense; if satisfactory, pay for it.



Yale spur-gear block setting gaso-line motor

Courtesy Edison Co.



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At no time is the value of the Yale Spur-gear Block so evident as *now* when maximum output is demanded from labor and machines.

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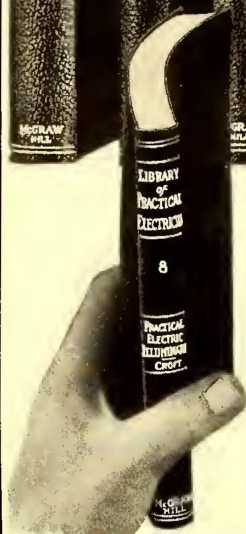
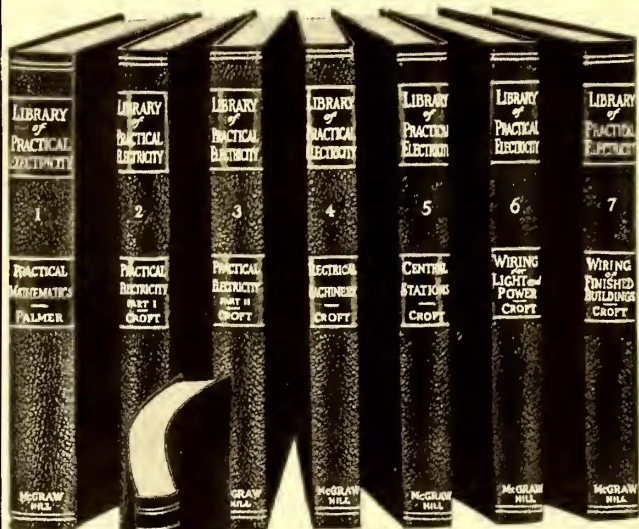
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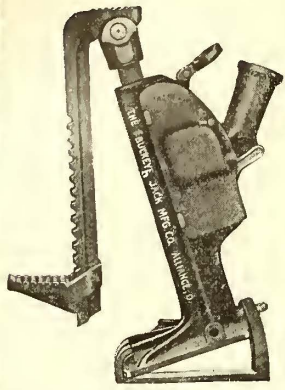
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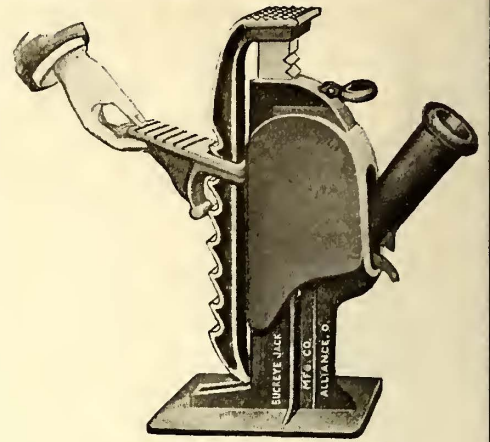
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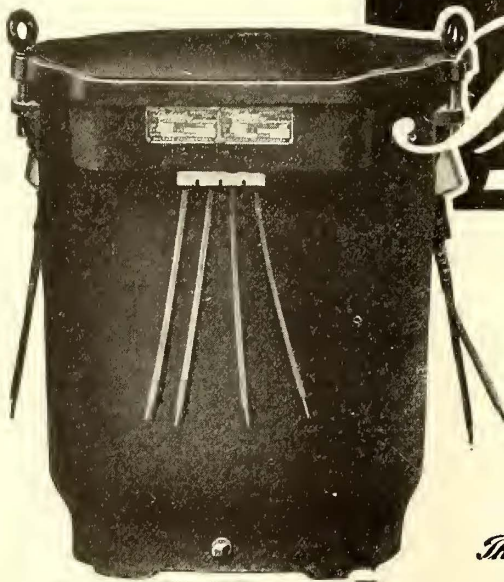


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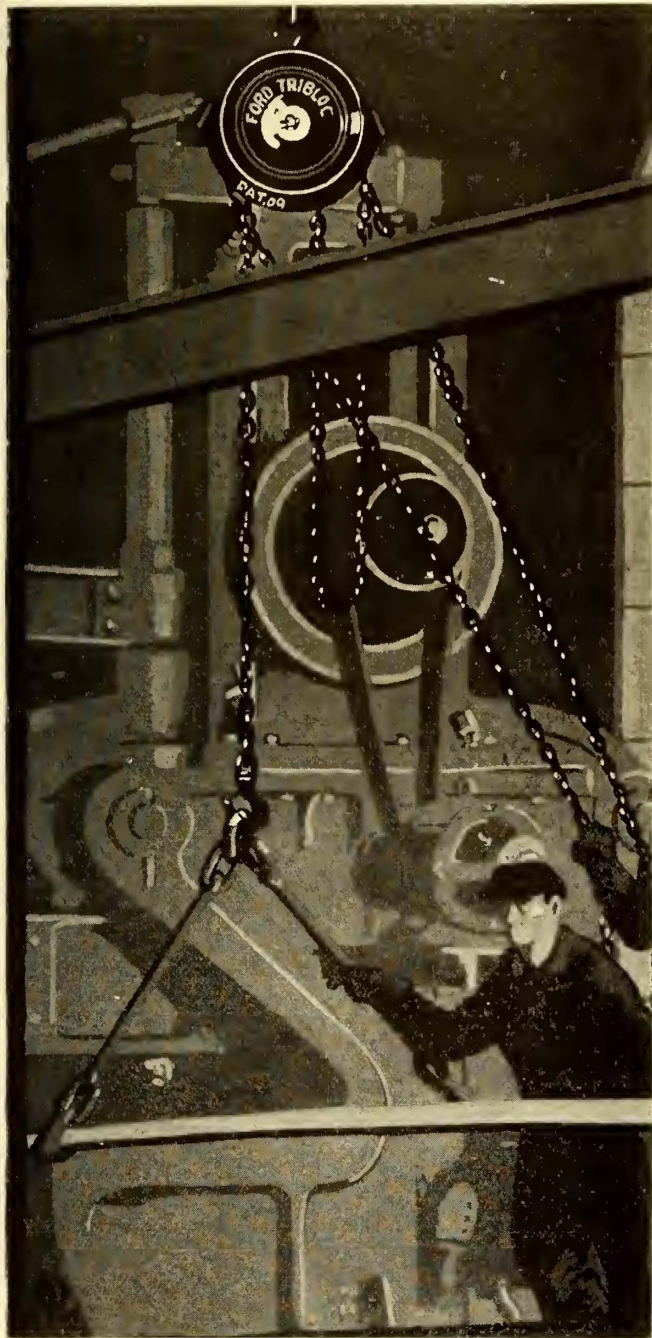
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A chain hoist must be something more than a mere lifting tool, because its adaptability leads it into so many classes of work.

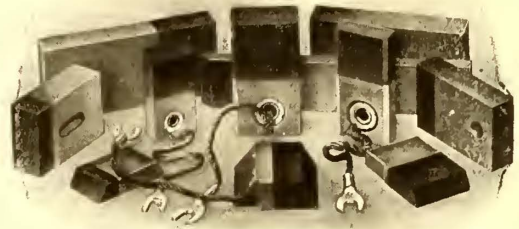
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# DIXON'S Graphite Brushes

The use of these non-abrasive brushes results in highly finished commutator surfaces and freedom from scoring and destructive sparking. This means increased operating efficiency. Let our Electrical Service Department send you booklet and data sheet No. 108-M.

Made in JERSEY CITY, N. J., by the

## Joseph Dixon Crucible Company

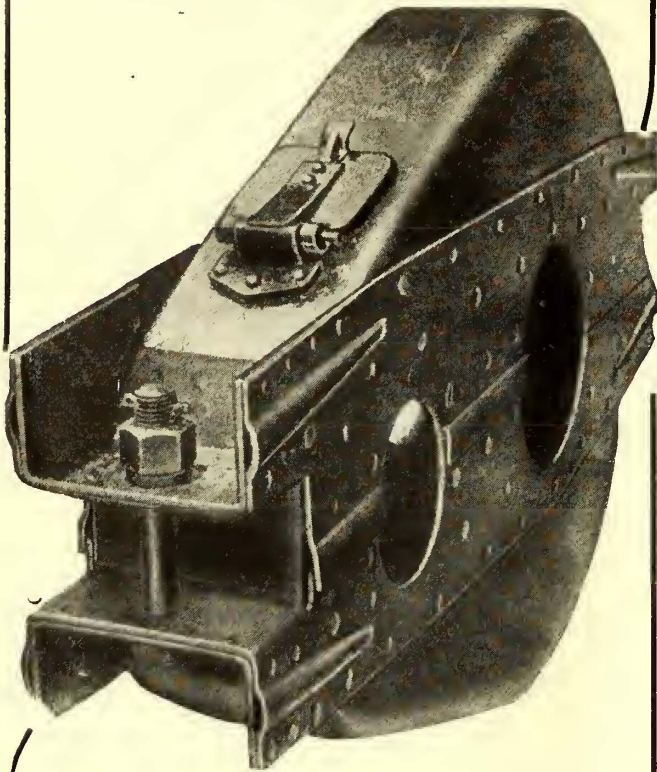


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## Seamless

This feature protects your gears and pinions from water, mud, etc., and prevents oil leakage.

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This feature defies vibration, which is a great menace to rivets.

## Lightweight

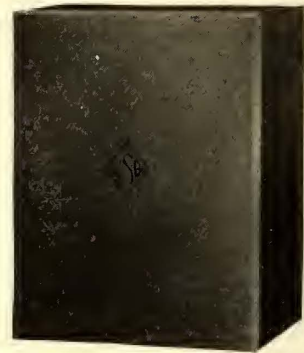
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are particularly adapted for service in Railway Motors, Central Stations and all other types of electrical machines.

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They are made from Mexican Graphitic Carbon properly compounded with low resistance carbons and reduce to a minimum the wear on commutator and brush, and practically eliminate power losses in commutation.

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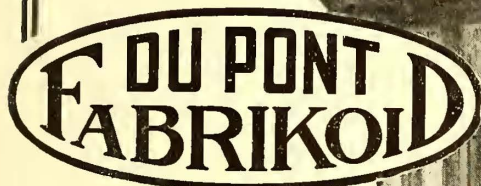
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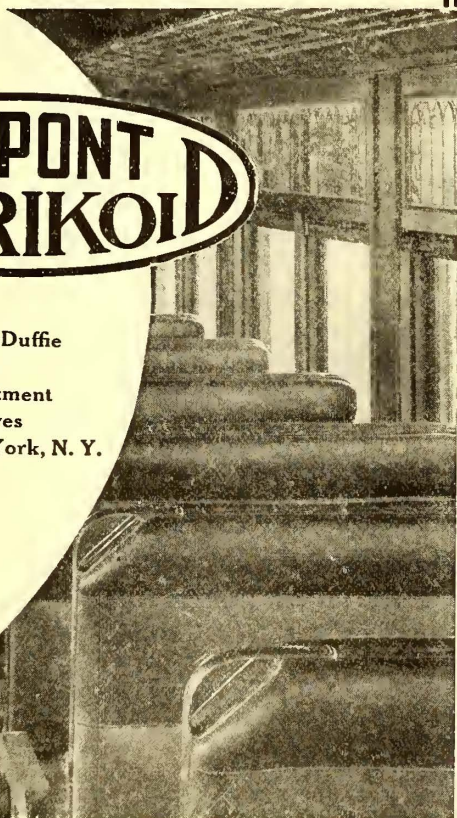
Easily applied—very little waste in cutting.

*Samples on request. Try them.*

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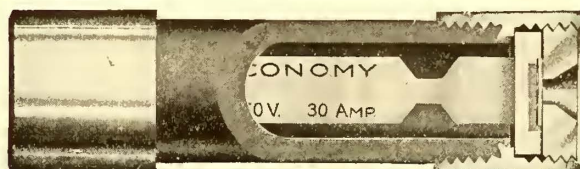


## Protect Cars and Power-plant

Don't trust to your more limited facilities for refilling fuses. As fuse specialists, we furnish reliable and carefully *tested Renewal Links* all ready to insert in

### ECONOMY renewable cartridge FUSES

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GRINDING WHEELS**

will take care of all your work.  
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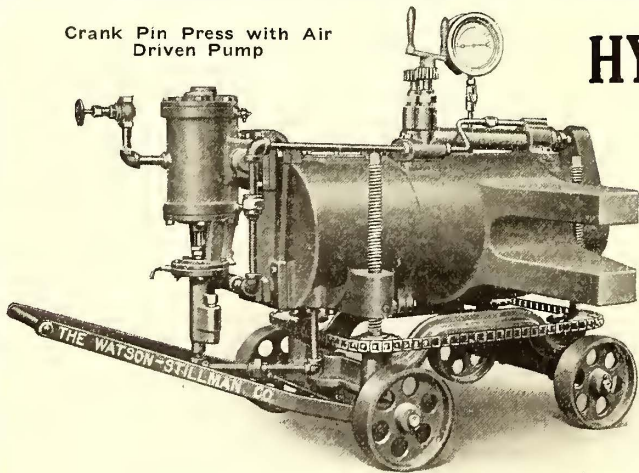
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879



Crank Pin Press with Air Driven Pump



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**LABOR SAVING—POWERFUL—EFFICIENT  
FOR MODERN RAILWAY-SHOP  
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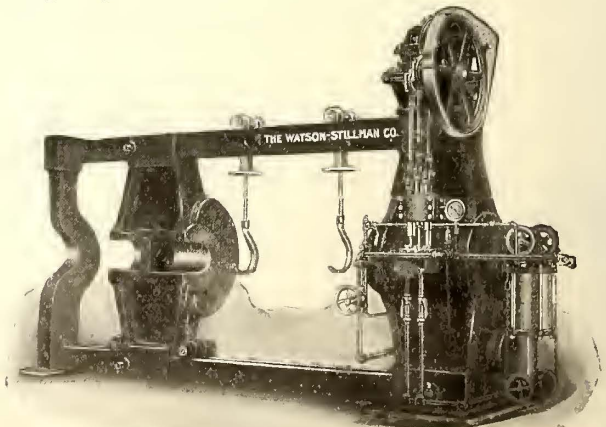
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**The Watson-Stillman Co.**

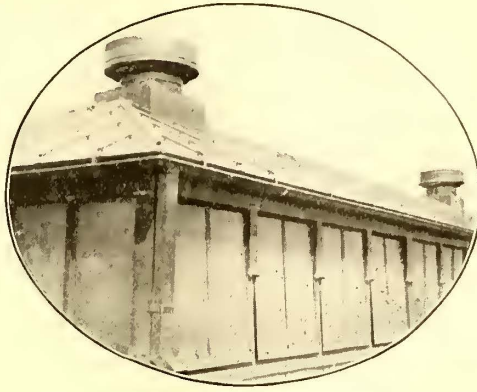
96 Church Street, New York  
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600 Ton Hydro-Pneumatic Wheel Press



**"ANTI-PLUVIUS"**  
(Trade Mark)  
**Puttyless Skylights**  
Patented



**B. R. T.**  
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*What is the ratchet-winding feature?*

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*What is the free-winding tension spring?*

How is it that the Earll Tension Springs are adjusted from the front without taking catcher or retriever from car?

How is it that the Earll Catchers and Retrievers weigh only about half as much as other makes?

**C. I. EARLL**

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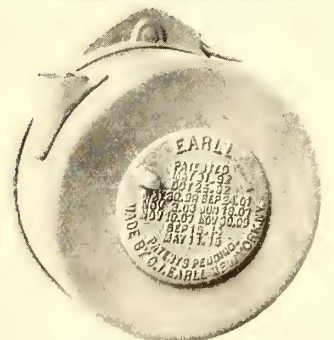
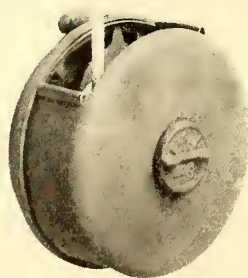
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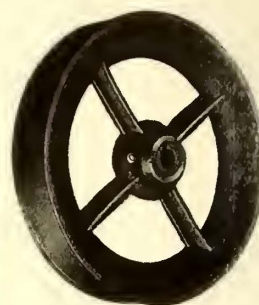
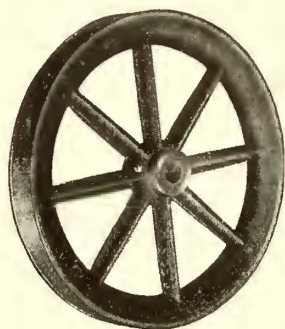
Kierulff & Co.,  
757 So. Los Angeles St., Los Angeles, Cal.



Send for Bulletin M or for trial samples.

# For High Speed Operation

## —Large Diameter Kalamazoo Trolley Wheels



As a solution to arcing and short wheel life on high speed electric railway work, two new Kalamazoo Wheels have been designed.

They are (No. 20) 11½ inches and (No. 21) 10 inches in diameter. An ample increase of width, depth of groove and length of hub insures a well-balanced wheel in each case.

Tests covering considerable mileage at high speeds show that these two new "Kalamazoos" greatly decrease sparking, while offering longer wheel life. There is more bearing on the wire, with consequent greater contact and current carrying capacity.

The patented Kalamazoo Harps have been enlarged to carry these wheels.

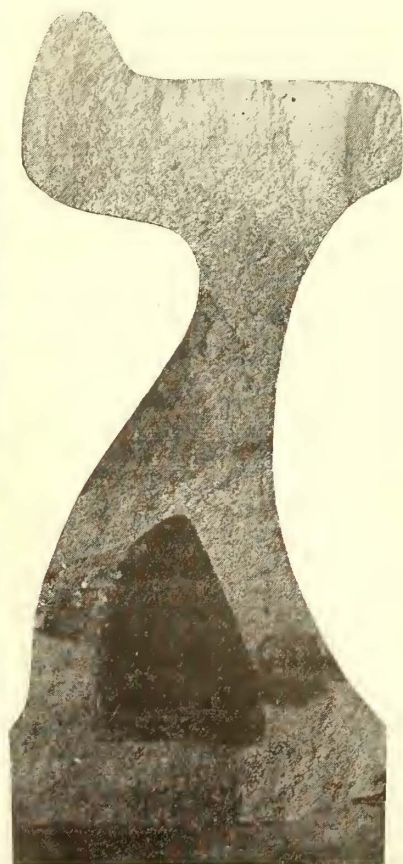
Try several on your lines. Compare their service with that of smaller wheels.

*Write Today.*



### STAR BRASS WORKS

KALAMAZOO, MICHIGAN



## This is the Griffin F. C. S. Wheel

The surface of tread and flange contains three and one-half per cent carbon white iron, harder than tool steel, insuring long wear.

The softer hub permits easy machining.

It is a wheel where the metal is so distributed that each part is particularly adapted to the requirements demanded of it.

The arched face plate gives additional strength.

Over 200,000 F. C. S. wheels are in use under city and interurban electric railway cars throughout the country.

The low friction between rail and flange keeps the flange wear and danger of derailment down to a minimum.

### GRIFFIN WHEEL COMPANY

McCormick Building, Chicago, Ill.

FOUNDRIES

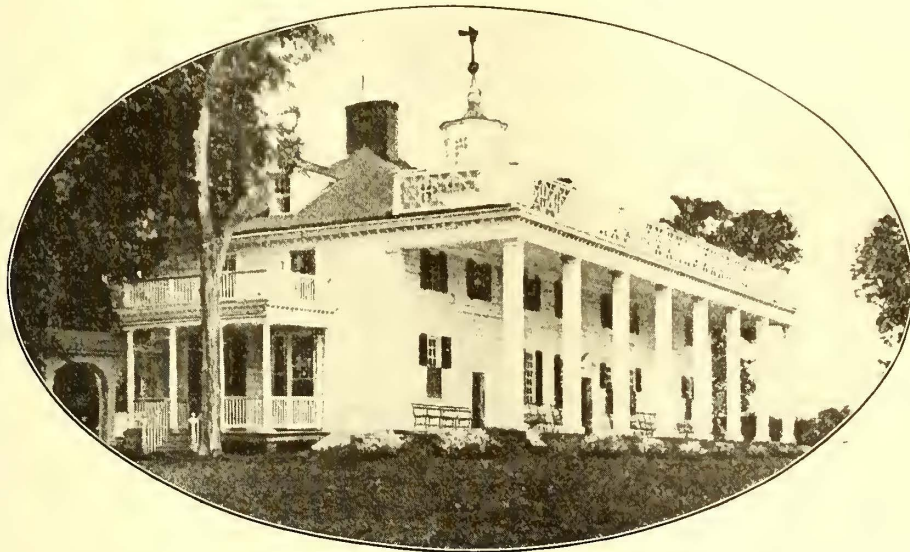
- |         |             |        |             |          |
|---------|-------------|--------|-------------|----------|
| Chicago | Detroit     | Boston | Denver      | St. Paul |
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The Road to Mt. Vernon is

# BOYERIZED

The Washington-Virginia Railway, which operates a high-speed train service to Mt. Vernon is another thoroughly Boyerized road.

It bushes everything that can be bushed. And uses Boyerized pins and Boyerized brake-hanger holders as well. Some Boyer bushings have been in service more than two years.



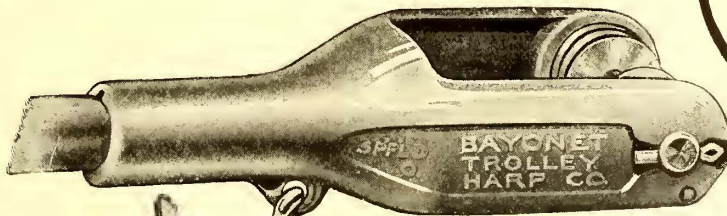
**Boyerized Products  
are Standard  
on Scores and Scores  
of Railways**

**Bemis  
Car Truck Co.  
Springfield, Mass.**

## High Speed!



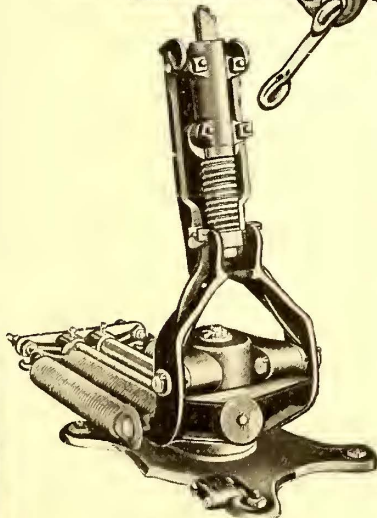
**10  
Seconds**



Bayonet Trolley Harps and Sleet Cutters are our pride. We have spared no effort in experiment and improved manufacture to produce Trolley Harps that are superior in durability, conductivity and time saving convenience.

**Self-Lubricating. Non-Breakable. Poles Changed in One Minute.**

**Bayonet Anti-Friction Base has all wearing parts bushed.**



Ten seconds only required to change complete Bayonet, Trolley harp and wheel by hand. Repairs made at the bench instead of on the pole.

**The Bayonet Trolley Harp Co., Springfield, Ohio**

Please send me particulars of your Trolley Equipment, which I would like to try out on one of my company's cars in accordance with your 60 days' approval plan.

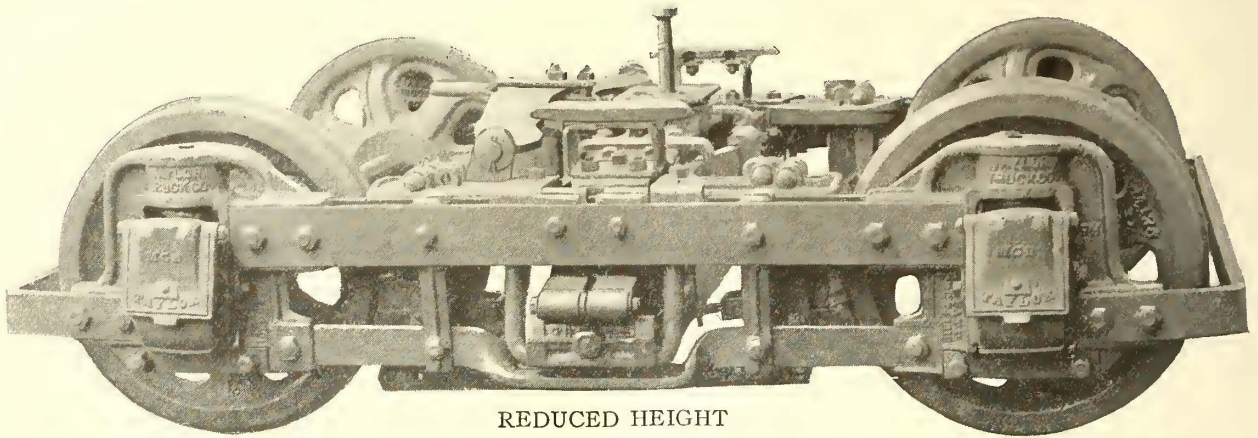
Name .....

Address .....

Company .....

Date .....

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REDUCED HEIGHT

## TAYLOR R. H. TRUCK

Mounted on 26 Inch Wheels With Springs Over Journal Boxes  
Designed to Mount Centre and End Entrance Cars Low Down

SWING MOTION AND FULL ELLIPTIC SPRINGS

Wheel Base 5 ft. 2 in. For Car  
Bodies weighing 16,000 to 22,000  
lbs. Motors Inside Hung.

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RIDING

Journals  $3\frac{3}{4} \times 7$  M.C.B. Type.  
Height from Rail to Body Bolster,  
 $22\frac{3}{4}$ ". Brakes Inside Hung.

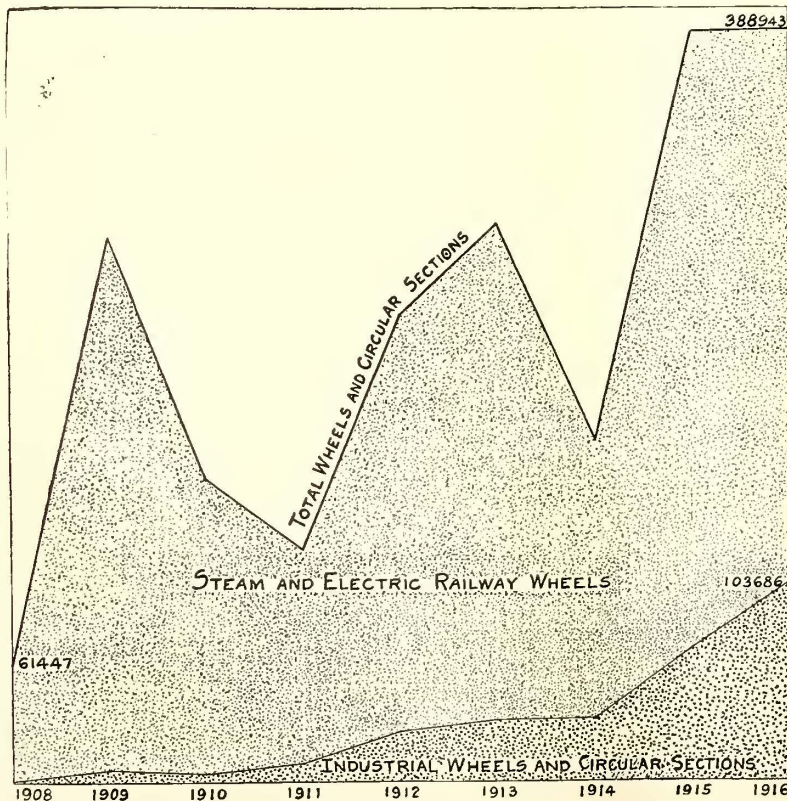
## TAYLOR ELECTRIC TRUCK CO., TROY, N. Y.

Established 1892

SPECIFICATIONS ON REQUEST

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That the Solid Rolled Steel Wheel has made its place in modern steam, electric and industrial railway service is graphically illustrated in the chart which shows, by years, rolled steel wheels made by this company.

The total contour line indicates that while in the main sales of solid steel wheels have followed and been affected by the peaks and valleys of the car buying movements, there has been a progressive increase in the number manufactured. The number of steam and electric railway wheels purchased in any year is somewhat commensurate with the number of cars purchased in that year.

So far as industrial wheels are concerned, the lower area shows a continuous increase, which in the last three years has been decidedly marked. The experimental stage has, therefore, been passed, and the solid steel wheel for industrial purposes may be considered as firmly established in the confidence of users.

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### Carnegie Steel Company

General Offices: Pittsburgh, Pa.

The new high speed interurban cars recently placed in service by the Jamestown, Westfield & North-western Railroad are fitted with Standard No. 1062 rolled steel wheels mounted on Standard axles.

—Representative practice

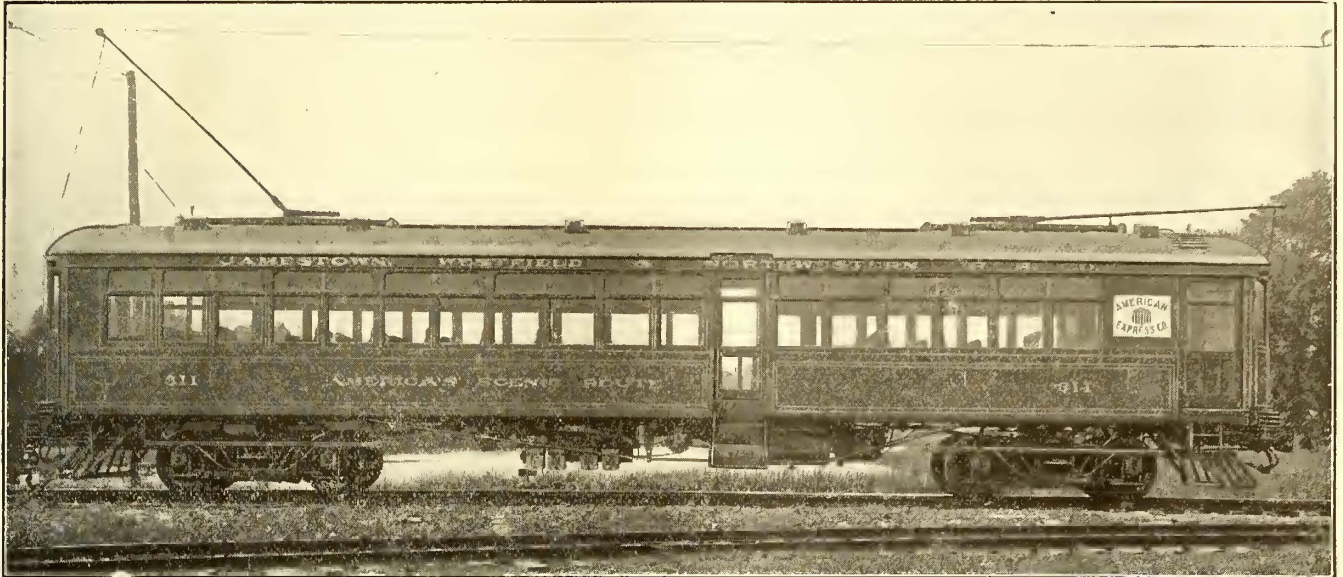


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Special Attention Given to Traction Insurance

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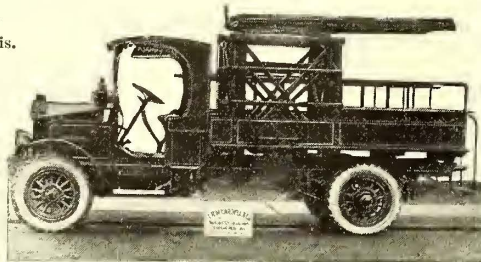
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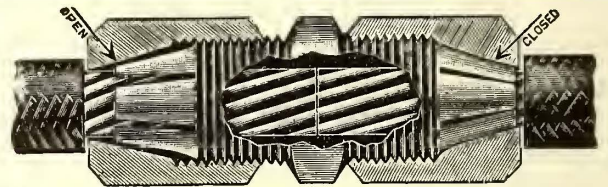
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outfits for any  
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 Make a low,  
 well-balanced  
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NORTHERN WHITE CEDAR    WESTERN RED CEDAR  
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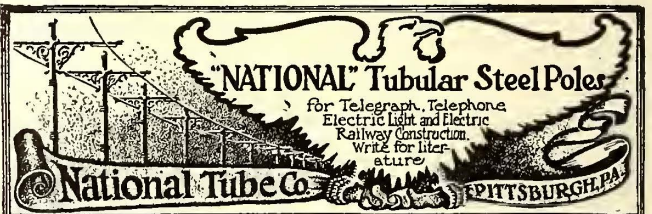
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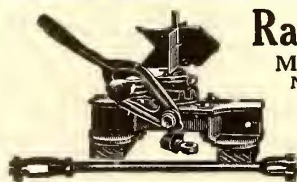
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transmission structures on 12 mile 66,000 volt line of Keene Gas & Electric Co., from Keene to Marlboro and Dublin, N. H.

Three No. 2 stranded copper conductors with 7/16 steel ground wire.

Standard span, 400 ft.  
Maximum, 600 ft.  
38 ft. to low wire.

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Strongest STEEL POLE of like weight in the world.  
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Most artistic STEEL POLE in the world for any service.  
We make the lowest prices.  
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A full line of convenient malleable fittings.  
*Our steel pole TREATISE tells a big story. Ask for it.*

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Our guarantee consists of over 35 years of successful manufacturing experience and a long list of satisfied customers.


We will welcome an opportunity to serve you.

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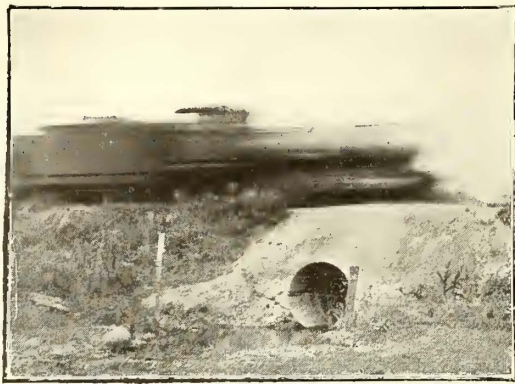
Branches in all principal cities.  
For Canada: Standard Underground Cable Co. of Canada, Limited, Hamilton, Ont.

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Illinois Traction System



**KERITE INSULATED WIRE & CABLE COMPANY**  
NEW YORK CHICAGO



ACME  
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stand up  
under the  
pounding  
weight of  
trains  
running at  
high speed.

**More Than 100 Steam Roads**

as well as innumerable electric railways the country over are using

**"ACME" (NESTABLE)**

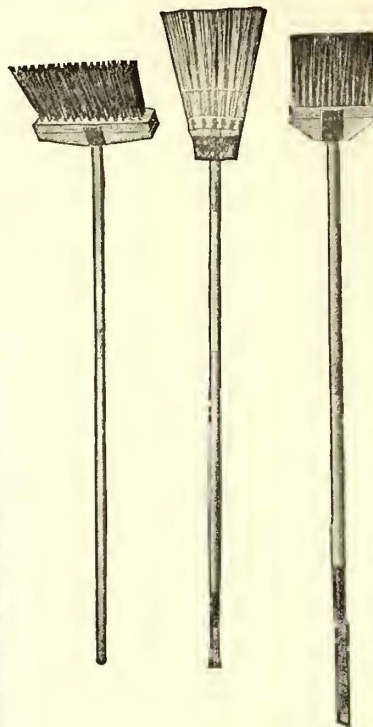
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as standard material. This is not to be wondered at when you consider the "ACME" strength, permanence, economy and ease and speed in handling.

If you are a user won't you tell us about your experience with "ACME" Culverts. If you don't know about "ACMES" let us send you our Catalog M-3.

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MANUFACTURERS  
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No. 1 to sweep crossings.

No. 2 to handle light dirt and snow in the frogs, switches, and curves.

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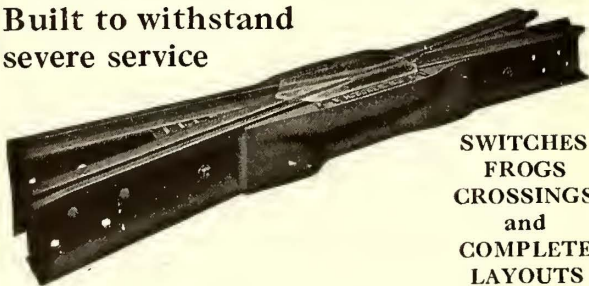
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SWITCHES  
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The subject is one that cannot be dealt with adequately in the limited space of an advertisement.

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We believe a study of the booklet will also convince you that we are capable of dealing with the proposition in the most effective manner, and we hope that you will fill out the card at the back of the booklet and send to us with a gallon sample of your boiler feed supply for our analysis and proposition.

*Let us have your address and the booklet will be forwarded at once.*

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and worked for the English market

**Messrs. G. D. Peters & Co., Ltd.**

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The MODERN  
WAY of handling  
ASHES is by the

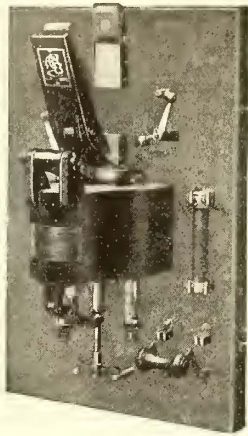


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Bulletin No. 1 Green Chain Grate Stokers.  
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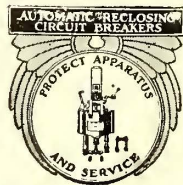


If Uncle Sam should draft all the sub-station operators off their jobs it would certainly put a lot of railway power plants down and out. But *not those*

Equipped With  
**AUTOMATIC RECLOSING CIRCUIT BREAKERS**

These remarkable protective devices open in case of overload or short circuit, and reclose automatically upon removal of same. They can also be arranged to automatically shut down the machine in case of hot bearings, Hot Transformers, A. C. Voltage Failure, Reverse Current overspeed, etc.

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Works: BARBERTON, OHIO—BAYONNE, N. J.

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**Electric Railway Journal**

10th Avenue at 36th Street

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For truing commutators a flat abrasive stone is better than sandpaper.

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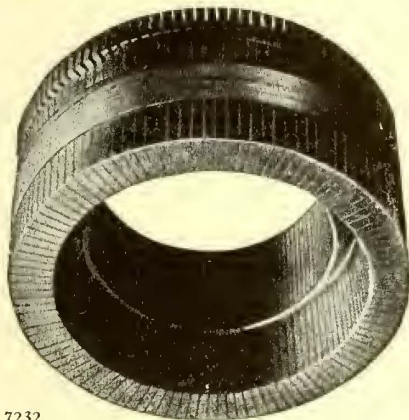
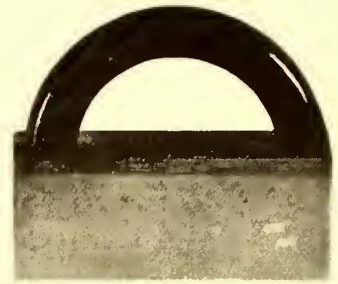
Stones last several years and are cheaper in the end. Many big roads are using Commutator

# STONES

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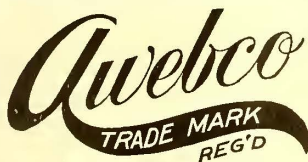
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Because of the Cameron ideal of quality—and the painstaking inspection that guarantees it in every job we turn out.  
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are produced according to the specifications laid down by Railway Motor Manufacturers. Popular with manufacturers of motors because always right as to width and thickness of material, breaking strength, yarns, warp ends, and other standard requirements. The prices and material invariably satisfactory.



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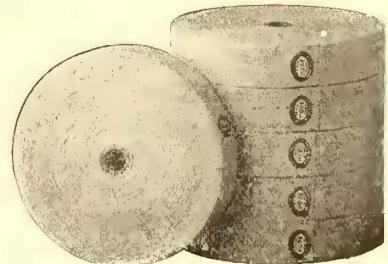
Mill & Office: 300 Brook St., Pawtucket, R.I.

Representatives: Chicago—E. P. Bartlett, 1368 Grand Ave.  
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Webbings and Tapes made from the best raw materials—made with the most up-to-date machinery and most reasonably priced. That's what you get in Hope Products.

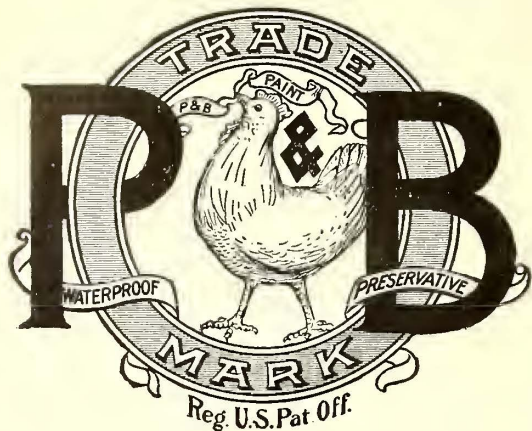
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Retains its flexibility.  
Will not dry out.  
High in insulating qualities.  
The most durable tape made.

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Linseed oil treated Cambric, Linen, Silk, Canvas, Duck and Papers. High puncture voltage, long life.

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## "FASTEJ" TAPE

*Never Unravels*



The Safety of an insulation sometimes depends on the edge of the tape.

### "FASTEJ" Tape

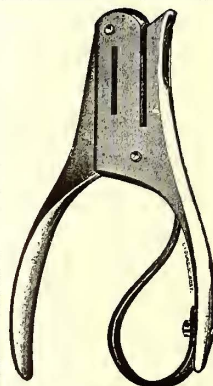
Has a Dependably Fast Edge—Is Fully as Satisfactory under All Conditions of Service as the Very Best Woven Tape; yet Costs Considerably Less and Is Always Readily Obtained.

Particularly Adapted for

### Armature and Field Coils

In rolls from 72 yds. to 500 yds.; in any width from 7/16" up—ready for impregnation. Immediate delivery—at reasonable prices.

Freyberg Bros., Inc.  
51 West 18th Street, New York, N. Y.



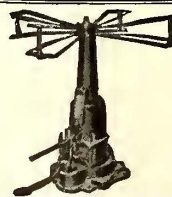
Our forty years of successful punch making are well demonstrated in the perfection of our product, which is Standard throughout the world.

These punches prove the most efficient, because they operate quickest and easiest, and the most economical because they wear longest.

Let us show you WHY. Punchmakers since '72.

R. Woodman Mfg. & Supply Co. |  
82 Sudbury St., Boston, Mass.

E. G. Long Co., 50 Church St., New York City  
Eastern Electrical and Export Representatives.



### Use them in your terminals— PEREY TURNSTILES or PASSIMETERS

*Faster than the ticket seller*

Perey Manufacturing Co., Inc.  
30 Church Street, New York City



### "Everything in Insulation"

Mica Waxes  
Vulcanized Fibre Asphalts  
Varnished Cloth Compounds  
Insulating Tapes Insulating Varnish

The above are only a few of our products. Write us for anything in this line you may require.

MITCHELL-RAND M'FG CO.  
103 John St., New York City

## The MOST EFFECTUAL and INEXPENSIVE

method of reducing delays due to "frozen air," "air failed," "no brakes," "stiff valves," "slow brakes," "brakes failed to release," is with an

# RECTIFIER

*Descriptive matter and prices upon request.*

**National Safety Device & Man'f'g Co.**

3046 Logan Blvd., Chicago, Ill.

HOLDEN & WHITE, INC.,

36 W. Van Buren St., Chicago, Ill.

*Distributor for*

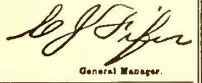
Ohio, Michigan, Indiana, Illinois, Iowa, Wisconsin and Nebraska

## The Cleveland, Alliance & Mahoning Valley R. R. Co. CASH FARE RECEIPT.

Good for one continuous passage between stations notched and for this day and train only.

A tax of eight per cent in addition to the regular fare in excess of 35 cents will be collectible after November 1st, 1917.

Retain this receipt until you leave the car, otherwise you may be called upon to pay an additional fare.



General Manager.

PATENTED THE MACDONALD TICKET & TICKET BOX CO. CLEVELAND, O.

ALLIANCE	ALLIANCE	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
VINE ST.	VINE ST.	.05	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
LEXINGTON RD.	LEXINGTON RD.	.10	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
LIMAVILLE	LIMAVILLE	.15	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
HENRY'S	HENRY'S	.15	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
ATWATER	ATWATER	.20	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
MOFF	MOFF	.25	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
EDINBURG	EDINBURG	.30	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
ROOTSTOWN	ROOTSTOWN	.35	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
WATER WORKS	WATER WORKS	.40	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
RAVENNA	RAVENNA	.45	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
N. MILFORD RD.	N. MILFORD RD.	.50	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
KNAPP ST.	KNAPP ST.	.55	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
CHARLESTON	CHARLESTON	.60	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
SEIGEL	SEIGEL	.65	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
WAYLAND	WAYLAND	.70	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
EVANS	EVANS	.75	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
WILCOX	WILCOX	.80	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
NEWTON FALLS	NEWTON FALLS	.85	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
McCLURES	McCLURES	.90	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
STOP 26	STOP 26	.95	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
LEWIS RD.	LEWIS RD.	1.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
LEAVITTSBURG	LEAVITTSBURG	1.05	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
AUSTIN AVE.	AUSTIN AVE.	1.10	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
WARREN	WARREN	1.10	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
DOG	DOG	1.10	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
BAGGAGE	BAGGAGE	EXCESS FARE	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00
EXCESS FARE	EXCESS FARE	EXCESS FARE	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00	ALLEN	ALLEN	.00

## WE CAN CUT YOUR COST OF HEATING CURRENT

Write for THERMOSTATIC CONTROL INFORMATION

**ELECTRIC HEATERS** Cut Installation and Maintenance Charge.

**VENTILATORS** Also Ventilate in Stormy Weather.

**THERMOSTATS** Save Current.

ORIGINATED the use of **NON-CORROSIVE** Wire for Electric Car Heaters.

ORIGINATED The Ventilated Coil Support.

# GOLD

LET US FIGURE ON YOUR NEXT REQUIREMENTS  
**Gold Car Heating & Lighting Co., 17 Battery Pl., New York**

## War Tax Collections

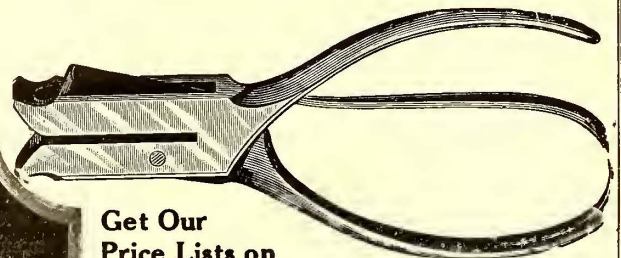
are taken care of automatically where the Macdonald Cash Fare Receipts are used.

The illustration tells the simple story. Issuing these receipts with Macdonald boxes is as simple as tearing a piece of paper.

*Send for Sample Holder.*

**The Macdonald Ticket & Ticket Box Co.**

Cleveland, Ohio



Get Our Price Lists on  
**BADGES** and  
**PUNCHES**

**AMERICAN RAILWAY SUPPLY CO., 134-136 Charles St., NEW YORK**

## UNIVERSAL ANTI-SLIP TREADS

cars and station steps.

**Universal Safety Tread Company**  
Waltham, Mass.

## The Best Shade Rollers for Cars

**SPECIAL** shade rollers for cars, that will last and give satisfaction for years, and yet cost but little more than the poorest you can buy, are made by the Stewart Hartshorn Co., E. Newark, N. J. This company is by far the largest shade roller manufacturer in the world. It is able to give high quality at lower prices because of the enormous output. Write for catalog, stating wants. You are always protected when you buy shade rollers if they bear the signature *Stewart Hartshorn*



You will buy

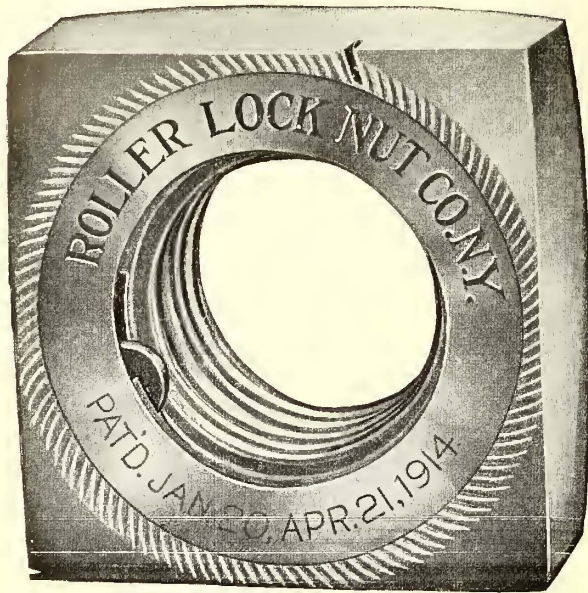
## CLEVELAND Fare Boxes

Eventually—

Why not now?

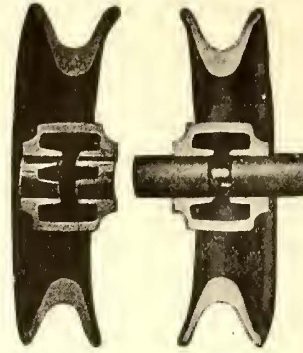
**Cleveland Fare Box Co.**  
CLEVELAND, OHIO

It's Safe if You Used a  
**ROLLER LOCK NUT**



It's the only self-tightening nut on the market. Use it as often as you like, but be sure you always use a *Roller Lock Nut*.

**ROLLER LOCK NUT CO.**  
61 Broadway, New York



**30  
Times  
Each  
Second**

—that's the rate of speed at which a trolley wheel revolves around its axle, when the car runs at 30 miles an hour.

Do you wonder that it needs lubrication?  
And, yet, the

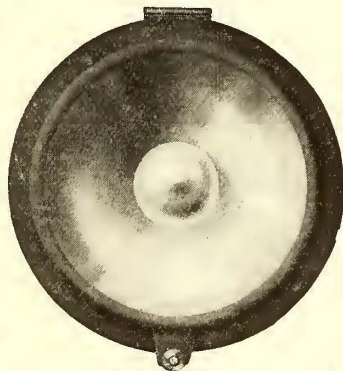
**Hensley Trolley Wheel**

is the only wheel manufactured which is lubricated by force-feed.

Oiled twice-a-week and only three seconds needed to do it thoroughly.

*Ask for the Hensley Catalog.*

**Hensley Trolley & Mfg. Co.**  
Detroit, Mich.



**The McLain No. 25 Headlight**

gives powerful road illumination, at the same time eliminating glare. It is an extended dash type light made of Pressed Steel throughout, assuring light weight without any sacrifice in strength or durability. It is absolutely waterproof, weather proof and solid.

Concentrated filament type using either a 23 or 36 watt lamp.

It's the **LIGHTEST, BRIGHTEST, TIGHTEST** headlight on the market and it doesn't cost any more than the others.

**The Trolley Supply Co., Canton, Ohio**



**MASON SAFETY TREADS**—prevent slipping and thus obviate damage suits.

**KARBOLITH CAR FLOORING**—for steel cars is sanitary, fireproof and light in weight.

**STANWOOD STEPS**—are non-slipping and self-cleaning. Above products are used on all leading railways. For details address

**AMERICAN MASON SAFETY TREAD CO.**

Main Offices: Lowell, Mass. Branch Offices: Boston, New York City, Chicago, Philadelphia, Kansas City, Cleveland, St. Louis.

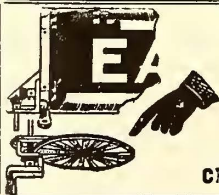
**What Sherman Said of War**

Also applies to snow on your tracks

**ROOT SPRING SCRAPERS**

are the proper tools for fighting snow and we are in shape to make prompt deliveries. Order now.

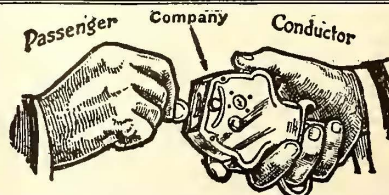
**Root Spring Scraper Co., Kalamazoo, Mich.**



See the Crank of the  
**CREAGHEAD DESTINATION SIGN**

By means of it, conductor or motorman can change sign without leaving platform. All that has to be done is to turn the crank. Better investigate.

**CREAGHEAD ENGINEERING CO., CINCINNATI, O.**



**Direct  
Automatic  
Registration  
By the  
Passenger  
Rooke Automatic  
Register Co.  
Providence, R. I.**

# STANDARD STREET RAILWAY AXLES

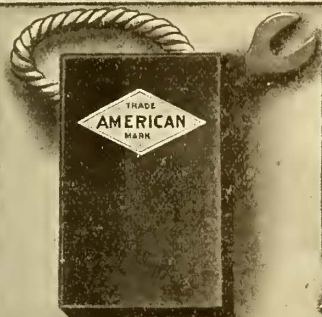
ROUGH OR FINISHED TURNED

## DIE BLOCKS

MADE FROM ELECTRIC FURNACE STEEL HYDRAULIC PRESS FORGED

*Prompt Delivery*

**GENERAL STEEL COMPANY, Milwaukee, Wis.**



AMERICAN CARBON AND GRAPHITE MOTOR AND GENERATOR BRUSHES are selected according to operating conditions. We know brush material—you know your machine. Our combined knowledge will solve your brush problems.

**AMERICAN CARBON & BATTERY WORKS** E. ST. LOUIS, ILL.  
OF NATIONAL CARBON CO., INC.

## STUCKI SIDE BEARINGS

are truly frictionless. The roller instead of turning on a pin rolls freely like a rolling pin.

**A. Stucki Co.**  
Oliver Bldg.  
Pittsburgh, Pa.

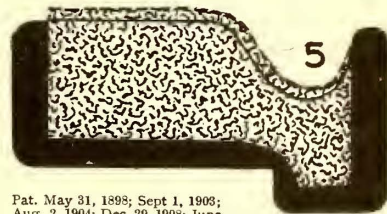
## Wheel Condition No. 5

*Especially for Removing Flat Spots*

When the tread and flange both need grinding you can do it without removing the car from service by using this type of wheel Truing Brake Shoe.

There are 500 different styles of patterns.

Write for the list of roads using them.



Pat. May 31, 1898; Sept 1, 1903;  
Aug. 2, 1904; Dec. 29, 1908; June 15, 1909; April 21, 1914.

**Wheel Truing Brake Shoe Co.**  
DETROIT, MICHIGAN

## UNION SPRING & MFG. CO. SPRINGS

COIL AND ELLIPTIC

M. C. B. Pressed Steel Journal Box Lids

General Office: First Nat'l Bank Bldg.  
PITTSBURGH, PA.

Works: New Kensington, Pa.

50 Church St., New York. 1204 Fisher Bldg., Chicago, Ill.  
Missouri Trust Bldg., St. Louis, Mo.

## S-W Shim Slack Adjusters Save Brakeshoes and Labor

SMITH-WARD BRAKE COMPANY, Inc.  
17 Battery Place, New York



Saved from the Ashes as many tickets are, means nickels loss to you. Avoid the risk.

Patten Ticket Destroyer is used right in the office under the eyes of trustworthy employees.

It mutilates beyond redemption.

Scrap sold will pay for the machines.

Ask us for Circular J.

**PAUL B. PATTEN CO.**

78 Lafayette St., Salem, Mass. U.S.A.

## BEACH OIL ELECTRIC CAR

A self-propelled car of the latest type, embodying new and practical features.

Our engineers can help you turn branch line losses into profits.

**ELECTRIC CAR & LOCOMOTIVE CORPORATION**

Ralph H. Beach, Pres.

165 Broadway, New York, N. Y.

# SEARCHLIGHT SECTION

## MISCELLANEOUS WANTS

### Wanted at Once

For immediate shipment any quantity of battery lead plates, sediment, scrap copper and wire, brass and all other grades of scrap material. Write to us today for our prices. National Metal & Rubber Co., 31 India Wharf, Boston, Mass.

## POSITIONS WANTED

**ELECTRICAL** and mechanical engineer, graduate, 20 years' experience with railway manufacturing and operating companies, 10 years as engineer of car equipment large electric railway system, desires position as chief or sales engineer in New York City. PW1802, Elec. Rwy. Journal.

**ENGINEER**, graduate 1909, experienced in the construction, operation and management of electric railway, lighting, power and ice plants and transmission systems, desires position as manager or superintendent. PW-1803, Elec. Rwy. Journal.

**SUPERINTENDENT** of current distribution, with 25 years' experience in this line, desires change. In present position has for several years supervised expenditures exceeding \$100,000 annually for aerial and underground construction and maintenance. Thoroughly familiar with most phases of power distribution work, including accounting, on electric railroad. PW1801, Elec. Rwy. Journal.

**TRAFFIC** manager, 17 years' electric and steam line experience, desires change. Now employed. Best of references. At present handling one of the largest electric properties in the United States. Thoroughly familiar with every detail of traffic work. PW1761, Elec. Ry. Journal, San Francisco.

## General Auditor

Efficient executive, employed by large Middle West public service corporation, solicits change.

Seventeen years' experience (12 years electric railways); age 35, married; references.

Only position with high class public utility considered. P. W., 1795, ELECTRIC RAILWAY JOURNAL, Chicago.

## POSITIONS VACANT

**CHIEF** engineer wanted to take charge of power station consisting of 18—500-hp. Edgemoor boilers served with Green grates, 4—1500-kw. cross compound engines, 1—2500-kw. low-pressure turbine, 1—7500-kw. high-pressure turbine. Salary, \$175 per month, with early advancement. P1793, Elec. Rwy. Journal, Chicago.

**DRAFTSMEN** wanted experienced in detailing street railway special track work. State experience and salary expected in first letter. Address chief engineer, Buda Co., Harvey, Ill.

**DRAFTSMAN** wanted in office of engineer maintenance of way. One with railroad experience preferred. Apply at once. The Northern Ohio Traction & Light Co., 224 Hamilton Building, Akron, Ohio.

## POSITIONS VACANT

**DRAFTSMAN** wanted. Man capable of designing, computing and laying out special trackwork for electric and steam railroads. Must be quick, accurate and experienced in this line. Give full particulars with reply and state salary expected. New York Switch & Crossing Co., 15th & Madison Streets, Hoboken, New Jersey.

**GENERAL** storekeeper—Large railway and lighting company has an opening for a "live wire" man, who can efficiently and economically handle stores proposition, familiarity with market and railroad conditions necessary, and applicant must possess executive ability and force. Exempt men only. Reply should give age, experience, salary required and references. Mahoning & Shenango Railway & Light Co., Youngstown, Ohio.

**GENERAL** foreman wanted to supervise work in the inspection barn. Will have charge of 19 men and 35 cars, mostly K control and GE-57 and Westinghouse 68 equipment. P1794, Elec. Rwy. Journal, Chicago.

**GENERAL** superintendent wanted on Southern road. An experienced man of good executive ability; send full information first letter, copies only of recommendations. Must be able to supervise shop and power station operation, track maintenance, and to take charge of transportation department. P1781, Elec. Rwy. Journal.

**MAN** having experience in way and structure and shop accounting wanted to fill like position with large traction line. Application should state experience, present occupation, age and salary desired. P1800, Elec. Rwy. Journal.

**MASTER** mechanic wanted by up-to-date street railway system in southwest town of 20,000 population. State age, salary and experience first letter. P-1798, Elec. Rwy. Journal, Chicago.

**MASTER** mechanic wanted for street railway operating 30 cars. Must be an organizer and systematizer with initiative, familiar with inspection system. Prefer man having experience with W. H.-A. B. control. References required. P-1799, Elec. Rwy. Journal, San Francisco.

**SUPERINTENDENT** wanted for an electric light and power plant serving several towns with a population of about fifty thousand, who fully understands dealing with the public. Permanent position and good salary to right party. P1792, Elec. Rwy. Journal.

## Your Advancement

is largely in  
your own hands—it is  
doubtful if anyone  
else is worrying over it

Better positions are constantly being secured through small advertisements in the "Positions Wanted" Columns

60 cents for 20 words

## EMPLOYMENT AGENCIES

### Correspondence Service

The undersigned provides a confidential service designed to locate openings through correspondence for men earning not less than \$2,500 and up to \$25,000; all lines. Not an employment service, covering individual negotiations. Established 1910. Complete privacy assured; present connections in no way jeopardized. Send name and address only for explanatory details. R. W. Bixby, 111 Niagara Square, Buffalo, N. Y.

Two Fairbanks-Morse No. 28

## GASOLINE SPEEDERS

FOR SALE

The Aurora, Elgin & Chicago R. R. Co.,  
Aurora, Ill.

FOR SALE

## Electric Locomotive

Weight, 88,000 lbs. 4 G.E.-55, 100 H.P. motors, Type M control, straight and automatic air brake, M.C.B. trucks.

ALBANY [SOUTHERN RAILROAD  
Rensselaer, N. Y.



## Armature Coil Taping Machine

Saves Time,  
Labor and Money

A boy can tape 40 coils for Westinghouse 12A Armature in an hour. Further particulars gladly furnished.

Geo. M. Griswold Machine Co.  
New Haven, Conn.

## CAR BARGAINS

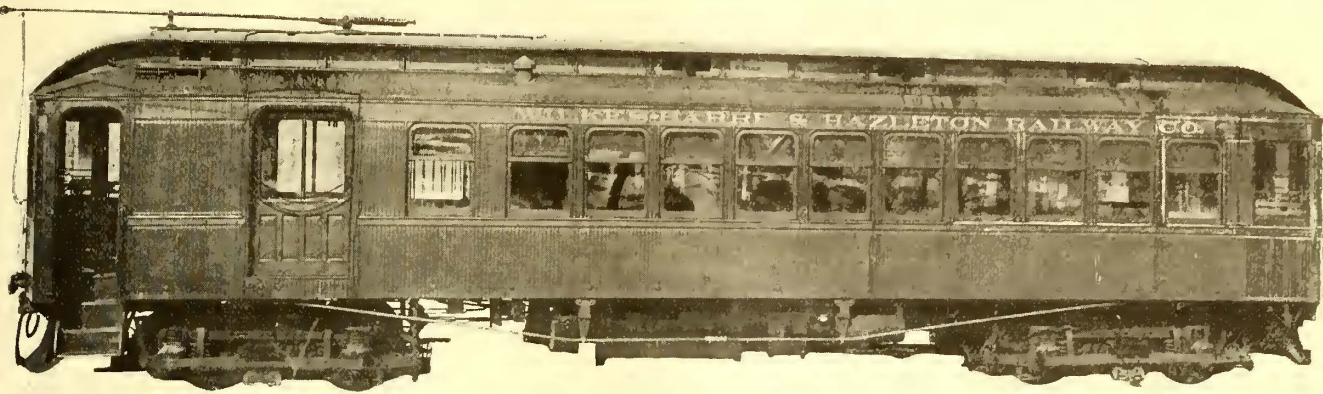
OPEN and CLOSED  
MOTOR and TRAIL

Write for Price and Full Particulars to

ELECTRIC EQUIPMENT Co.  
601 Commonwealth Bldg. Phila. Pa.



# Five Interurban Cars



For Sale by

## THE C. E. A. CARR COMPANY

56 Imperial Bank Building, TORONTO, Canada

### *Brill High Speed Interurbans with Baggage and Smoker*

52' 5" over all x 9' 4" over main sills, 10' over grab handles, 13' 10" over trolley board.

Seats: H&K high back walkover, rattan; can be reupholstered, and with paint and varnish cars will be as good as new and look new.

Can be readily converted into straight passenger, seating 60 to 64 passengers, by installing seats in the present baggage compartment.

All wood work, underframing, sheathing roof, ceiling and interior (which is mahogany) in perfect condition. No repairs needed.

TRUCKS: Brill 27E, 6' 6" wheel base, 6" axles, 36" MCB dropped forged steel wheels; most of them new; balance good as new. Special steel axles new. All first class operating condition.

AIR BRAKES: Westinghouse, both automatic and straight air for trailer or train control: can be used as locomotives. GE CP22 25' compressor herring bone tooth type.

WEIGHT: Bodies only 22½ tons.

COUPLERS: MCB Janney passenger or freight; unlocking device in vestibule.

Interchangeable with and can be operated on steam roads.

Equipped with two trolleys and third rail shoes.

Full vestibules each end, steam coach monitor roof Pullman type, flush platforms with trap doors both ends and in the rear on both sides. Underframing composite heavily reinforced with steel.

The type "M" control is practically new in all details, having been installed about four years ago. Balance of equipment is a little over ten years old, but has been kept in the very best of condition. Ready for immediate shipment and service.

*This is a  
Real  
Bargain.  
Write us  
at once.*

NOTE—We also have available 10 cars now in service with a seating capacity of 42; G. E. 74 Motors, mounted on Brill 27 E Trucks. These can be released within two weeks. WRITE US FOR FURTHER PARTICULARS.



**Wanted:  
G-E  
Sixty-Six B  
Armatures  
Second-hand,  
but in good  
condition.**

# SEARCHLIGHT SECTION

Three 300 KW., 60 Cycle, 600/1200 Volt

## General Electric Rotary Converters

with

### Transformers and Switchboards

#### FOR PROMPT SHIPMENT

- 3—300 KW. General Electric Rotary Converters, type TC, 3 phase, 60 cycle, 6 pole, 600/1200 volts, 1200 RPM., with speed limit device and starting rheostats.
- 3—300 KW. type HST oil cooled transformers, 3 phase, 12,000/24,000 volts primary, 370/185 volts secondary.
- 3—300 KW., 1200 volt D.C. rotary panels.
- 3—Transformer Panels.
- 2—1200 volt, 500 amp., feeder panels.
- 3—600 volt, 500 amp., feeder panels.
- 3—A.C. starting panels.

Complete with necessary instruments, bus copper, etc.

*We have on hand all classes of Power Machinery*

**MACGOVERN & COMPANY, Inc.**

114 Liberty Street, New York City

## IMMEDIATE SHIPMENT

### TURBINES

- 2—1000 K.W. Westinghouse Horizontal Turbo Generating, sets wound for 2 or 3 phase, 60 cycle, 2300 volts, 1800 R.P.M. Condensing Duty.
- 1—500 KW. General Electric Curtis steam turbine, 3 ph., 60 cy., 1800 rpm., 2300 volts, 150 lb. steam pressure, vertical type.
- 1—500 KW. Westinghouse Horizontal Turbo Generating Unit wound for 3 phase, 60 cy., 2300 volts, speed 3600 rpm., condensing duty.

### DIRECT CONNECTED ALTERNATING UNIT

- 1—800 KW. Allis-Chalmers, 2300 v., 3 ph., 60 cy., 90 rpm. generator, direct connected to 22 and 44 x 48" Reynolds Corliss engine.

### 60 CYCLE ROTARY CONVERTERS

- 1—300 KW. West. rotary converter, 3 ph., 60 cy., 370 v., A.C., 575 v., D.C., 600 rpm., with 3—185 KVA. Gen. Elec., 60 cy. transformers, 2200-370 volts.
- 1—200 KW. Westg. 3 ph., 60 cy., 720 rpm., Rotary Converter, 575 volts D.C., 360/370 volts A.C.
- 1—150 KW. West. 3 ph., 60 cy. rotary converter, 550 v., 720 rpm., with two Scott connected transformers.

**ARCHER & BALDWIN, Inc.**

114-118 Liberty Street, New York City Telephone 4337-4338 Rector

## Simplex Car and Track Jack

### Templeton, Kenly & Co., Ltd.

Chicago, Ill.

## THE SEARCHLIGHT SECTION

will find } } you want  
The man  
The position  
The plant

PUT YOUR AD IN THE SEARCHLIGHT

### FOR SALE

16 Peter Smith No. C-1

## Hot Water Heaters

with or without piping. Heaters and pipe in first-class condition. Property now using these heaters to be operated entirely by water power is reason for sale.

**ATLANTIC SHORE RAILWAY**  
Kennebunk, Maine

### FOR SALE

Through plate girder

## BRIDGE

designed for 60-ton interurban cars, made up of two plate girders, length 53 ft., depth 4 ft., with suitable floor system.

**Indiana Railways & Light Company**  
Kokomo, Indiana

## Rails

- 600 tons 60-lb. A.S.C.E. with angles.
- 250 tons 67½-lb. 5 in. high with angles.
- 100 tons 70-lb. A.S.C.E. with angles.
- 350 tons 75-lb., New, with angles.
- 150 tons 80-lb. A.S.C.E. with con. angles.
- Good as new.**
- 150 tons 90-lb. 9 in. Grooved Girder Relay.
- 600 tons 100-lb. Standard with angles.
- 400 tons 105-lb. 7 in. Grooved Girder. New.

## Interurban Cars

- 1—55 ft. passenger and baggage, 4 GE 57 motors, 55 h.p., seats 58 passengers. **Practically new.**
- 1—46 ft. 8 in. passenger trailer. Seats 50 passengers. **Practically new.**

## Street Cars

- 4—30 ft. single-truck, P.A.Y.E.; one-man operation. Seat 28 and 32 passengers. GE 80 motors.
- 7—30 ft. 8 in. single truck. P.A.Y.E. Seat 32 passengers GE 80 motors, 550 to 600 volts

All First-class

## Ballast Cars

- 25 Side Dump Cars, 23 yds. cap. Length 22 ft. Standard MCB equipment. Short couplers. Will take 45 ft. radius curve. **Strictly first-class.**

**ZELNICKER IN ST. LOUIS**

GET BULLETIN 230—68 BARGAIN PAGES

## 85 lb. A. S. C. E. Relayers

16,000 tons—with Angle Bars to match. Available immediate shipment and centrally located.

We positively own these Rails and offer same in carload lots and over. 25,000 tons—Relayers—sizes 25 lb. to 100 lb., in stock our Pittsburgh yards and vicinity.

Immediate shipment guaranteed and prices very attractive.

Carload and less than carload inquiries and orders solicited.

Rails cut to length for structural purposes.

Frogs, Switches, Bolts, Nuts, Spikes and all Accessories.

**L. B. FOSTER COMPANY**  
Park Bldg. Pittsburgh, Pa.

## CLEVELAND ARMATURE WORKS

Cleveland, Ohio

### Everything in the Line of Repairs to Electrical Machinery

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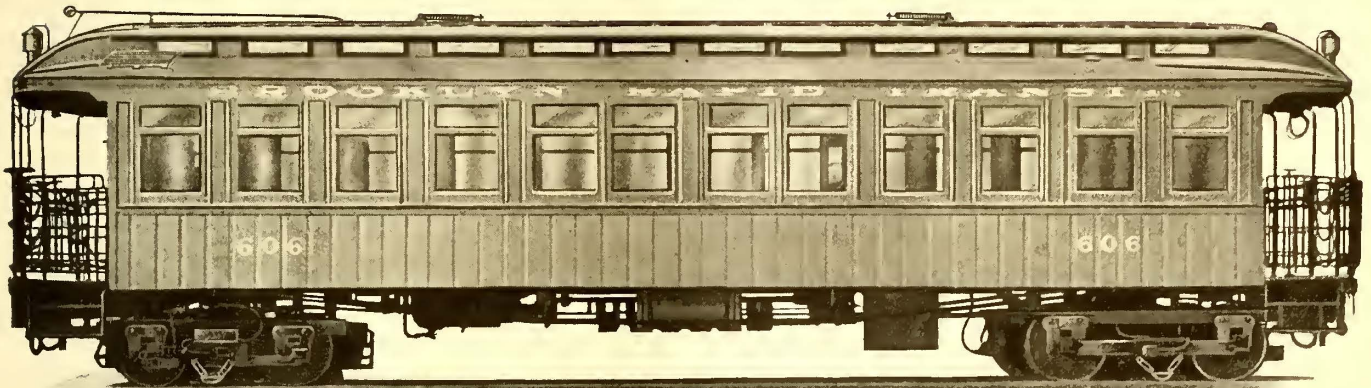
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 Du Pont Fabrikoid Co.  
 Duraduct (Export Dept.)  
 Harrison's, Inc., Paints  
 Russell Cars and Snow Plows  
 Upson Wall Board

**Wendell  
 &  
 MacDuffie Co.**

61 Broadway  
 New York

# WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry  
with Names of Manufacturers and Distributors

## Acetylene Service and Apparatus.

Oxweld Acetylene Co.

## Advertising, Street Car.

Collier, Inc., Barron, G.

## Air Cleaners.

Horne Mfg. Co.

## Air Rectifiers.

Holden & White, Inc.  
National Safety Devices & Mfg. Co.

## Alloys, Steel & Iron (See also Bearings and Bearing Metals.)

Titanium Alloy Mfg. Co.

## Ammeters.

Weston Electrical Instrument Co.

## Anchors, Gny.

Electric Service Supplies Co.  
Holden & White, Inc.  
Johns-Manville Co., H. W.  
Ohio Brass Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

## Anti-Climbers.

Railway Improv. Co.

## Arc Lamp Cord.

Sanson Cordage Works.

## Automobiles and Buses.

Brill Co., The J. G.  
General Vehicle Co.

## Axle Straighteners.

Columbia M. W. & M. I. Co.

## Axles.

Bemis Car Truck Co.  
Brill Co., The J. G.  
Carnegie Steel Co.  
General Steel Co.  
National Railway Appliance Co.  
St. Louis Car Co.  
Standard Steel Works Co.  
Taylor Electric Truck Co.  
Westinghouse Elec. & M. Co.

## Babbitting Devices.

Columbia M. W. & M. I. Co.

## Badges and Buttons.

American Railway Supply Co.  
Electric Service Supplies Co.  
International Register Co., The.  
Western Electric Co.  
Woodman Mfg. & Supply Co., R.

## Bankers and Brokers.

Coal & Iron National Bank.  
National City Co.

## Batteries, Dry.

Johns-Manville Co., H. W.  
Western Electric Co.

## Batteries, Storage.

Electric Storage Battery Co.  
Western Electric Co.

## Bearings and Bearing Metals.

Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Eureka Co.  
General Electric Co.  
Kerschner Co., Inc., W. R.  
Long Co., E. G.  
More-Jones Brass & M. Co.  
St. Louis Car Co.  
Taylor Elec. Truck Co.  
Westinghouse Elec. & M. Co.

## Bearings, Center and Roller Side.

Baldwin Locomotive Works.  
Holden & White, Inc.  
Stackl Co., A.

## Bearings, Oil-less, Graphite, Bronze and Wood.

Bound Brook Oil-less Bearing Co.

## Bearings, Roller and Ball.

Gurney Ball Bearing Co.  
Railway Roller Bearing Co.  
SKF Ball Bearing Co.

## Bells and Gongs.

Brill Co., The J. G.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
St. Louis Car Co.  
Western Electric Co.

## Benders, Rail.

Niles-Bement-Pond Co.  
Watson-Stillman Co.  
Zelnicke Supply Co., W. A.

## Boiler Cleaning Compounds.

Dearborn Chemical Co.  
Johns-Manville Co., H. W.

## Boiler Coverings.

Johns-Manville Co., H. W.

## Boiler Graphite.

Dixon Crucible Co., Joseph.

## Boiler Tubes.

National Tube Co.

## Boilers.

Babcock & Wilcox Co.

## Bond Testers.

American Steel & Wire Co.

## Bonding Apparatus.

Electric Railway Improv. Co.  
Lincoln Bonding Co.  
Ohio Brass Co.  
Oxweld Acetylene Co.

## Bonding Tools.

American Steel & Wire Co.  
Electric Railway Improv. Co.  
Electric Service Supplies Co.  
Ohio Brass Co.

## Bonds, Rail.

American Steel & Wire Co.  
Electric Railway Improv. Co.  
Electric Service Supplies Co.  
General Electric Co.  
Johns-Manville Co., H. W.  
Lincoln Bonding Co.  
Ohio Brass Co.  
Westinghouse Elec. & M. Co.

## Book Publishers.

McGraw-Hill Book Co., Inc.

## Boring Tools, Car Wheel.

Niles-Bement-Pond Co.

## Braces, Rail.

Kilby Frog & Switch Co.

## Brackets and Cross Arms. (See also Poles, Ties, Posts, Piling and Lum- ber.)

Bates Expanded Steel Truss Co.  
Creaghead Engrg. Co.  
Electric Railway Equipment Co.  
Electric Service Supplies Co.  
Hubbard & Co.  
Linsley Bros. Co.  
Ohio Brass Co.  
Western Electric Co.

## Brake Adjusters.

Holden & White, Inc.  
Smith-Ward Brake Co.

## Brake Shoes.

American Brake S. & Fdy. Co.  
Barbour-Stockwell Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Columbia M. W. & M. I. Co.  
Long Co., E. G.  
St. Louis Car Co.  
Taylor Elec. Truck Co.  
Wheel Truing Brakeshoe Co.

## Brakes, Brake Systems and Brake Parts.

Bemis Car Truck Co.  
Brill Co., The J. G.  
Br. Westinghouse Elec. & Mfg. Co.  
Columbia M. W. & M. I. Co.  
General Electric Co.  
Holden & White, Inc.  
Horne Mfg. Co.  
Long Co., E. G.  
National Brake Co.  
National Safety Devices & Mfg. Co.  
St. Louis Car Co.  
Safety Car Devices Co.  
Taylor Elec. Truck Co.  
Westinghouse Trac. Brake Co.

## Brooms, Track, Steel or Rattan.

Paxson Co., J. W.  
Western Electric Co.  
Zelnicke Supply Co., W. A.

## Brushes, Carbon.

American Carbon & Battery Co.  
General Electric Co.  
Jeandron, W. J.  
Morgan Crucible Co.  
United States Graphite Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

## Brushes, Graphite.

Dixon Crucible Co., Jos.

## Brush Holders.

Anderson Mfg. Co., A. & J. M.  
Eureka Co.

## Bushings, Case Hardened Manganese.

Bemis Car Truck Co.

## Bushings, Fibre.

Diamond State Fibre Co.

## Bushings, Graphite & Wooden.

Bound Brook Oil-less Bearing Co.

## Business Instruction.

Alexander Hamilton Institute.

## Cables. (See Wires and Cables.)

## Car Equipment. (For Feeders, Heaters, Registers, Wheels, etc., see those Headings.)

## Car Trimmings. (For Curtains, Doors, Seats, etc., see those Headings.)

## Cars, Dump.

Differential Car Co.

## Cars, Oil-Electric.

Electric Car & Loco. Corp.

## Cars, Passengers, Freight, Express, etc.

American Car Co.  
Brill Co., The J. G.  
Kuhlman Car Co., G. C.  
St. Louis Car Co.  
Wason Mfg. Co.

## Cars, Second Hand.

Carr Co., C. E. A.  
Electric Equipment Co.  
Kerschner Co., Inc., W. R.  
Wendell & MacDuffie Co.

## Cars, Self-Propelled.

Br. Westinghouse Elec. & Mfg. Co.  
Electric Storage Battery Co.  
General Electric Co.

## Castings, Brass, Composition or Copper.

Anderson M. Co., A. & J. M.  
Columbia M. W. & M. I. Co.  
Eureka Co.  
Frankel Connector Co.  
Horne Mfg. Co.  
More-Jones Brass & M. Co.

## Castings, Gray Iron & Steel.

American B. S. & Fdry. Co.  
American Steel Foundries.  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Horne Mfg. Co.  
Long Co., E. G.  
St. Louis Car Co.  
Standard Steel Works Co.  
Union Spring & Mfg. Co.

## Castings, Malleable and Brass.

American Brake S. & Fdry. Co.  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Horne Mfg. Co.  
Long Co., E. G.  
St. Louis Car Co.

## Catchers and Retrievers, Trolley.

Earl, C. I.  
Electric Service Supplies Co.  
Holden & White, Inc.  
Horne Mfg. Co.  
Kerschner Co., Inc., W. R.  
Long Co., E. G.  
Ohio Brass Co.  
Trolley Supply Co.  
Wood Co., C. N.

## Ching, Car.

Keyes Products Co.

## Certified Public Accountant.

Swan, James T.

## Checks, Employees.

American Railway Supply Co.

## Chemists.

Little, Inc., Arthur D.

## Circuit Breakers.

Automatic Reclosing Circuit Breaker Co.  
Cutter Electrical & Mfg. Co.  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

## Clamps and Connectors, for Wires and Cables.

Anderson Mfg. Co., A. & J. M.  
Dossert & Co.  
Electric Service Supplies Co.  
Frankel Connector Co.  
General Electric Co.  
Hubbard & Co.  
Klein & Sons, M.  
Ohio Brass Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

## Cleaners & Scrapers, Track (See also Snow-Plows, Sweepers and Brooms.)

Brill Co., The J. G.  
Ohio Brass Co.  
Root Spring Scraper Co.  
Western Electric Co.

## Clinsters and Sockets.

General Electric Co.

## Coal and Ash Handling, (See Conveying and Hoisting Machinery.)

## Coasting Recorders.

Railway Improv. Co.

## Coil Banding and Winding Machines.

Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
Western Electric Co.

## Coils, Armature and Field.

Cleveland Armature Works.  
Coil Mfg. & Repair Co.  
Columbia M. W. & M. I. Co.  
D & W Fuse Co.  
General Electric Co.  
Independent Lamp & Wire Co.  
Westinghouse Elec. & M. Co.

## Coils, Choke and Kicking.

Electric Service Supplies Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.

## Coin-Counting Machines.

Electric Service Supplies Co.  
International Register Co.  
Johnson Fare Box Co.

## Commutator Slotters.

Electric Service Supplies Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.  
Wood Co., C. N.

## Commutator Slotting Files.

Handy Supply Co.

## Commutator Stones.

Handy Supply Co.

## Commutator Truing Devices.

General Electric Co.

## Commutators or Parts.

Cameron Elec'l Mfg. Co.  
Cleveland Armature Works.  
Coil Mfg. & Repair Co.  
Columbia M. W. & M. I. Co.  
Eureka Co.  
General Electric Co.  
Long Co., E. G.  
Mica Insulator Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

## Compounds, Commutator.

Ideal Commutator Dresser Co.

## Compressors, Air.

General Electric Co.  
Westinghouse Trac. Brake Co.

## Condensers.

General Electric Co.  
Westinghouse Elec. & M. Co.



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One of the Portable Electrodynamometer Group, which also includes Model 310 Single Phase and D.C. Wattmeter, Model 329 Polyphase Wattmeter and Model 341 A.C. and D.C. Voltmeter.

The characteristics of the group are extreme accuracy (guaranteed within a fraction of 1% full scale value), adaptability for use on circuits of any commercial frequency and any wave form, great overload capacity, low moment of inertia, effective damping and shielding, and the legibility and remarkable uniformity of the hand calibrated scales.

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## Indicating Instruments

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Weston Indicating Instruments include a great variety of groups for portable or switchboard service on A. C. or D. C. Circuits, Instruments designed expressly for testing and laboratory use, for motor car and boat electrical systems, and many others for special purposes. Write for Bulletins or Catalogs describing those which interest you.

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Eastern & Southern Agents for VALLEY STEEL CO.

## WHAT AND WHERE TO BUY

**Conduits, Flexible.**  
Tubular Woven Fabric Co.

**Conduits, Underground.**  
Johns-Manville Co., H. W.  
Standard Underground Cable Co.

**Connectors, Solderless.**  
Dossert & Co.  
Frankel Connector Co.

**Controller Regulators.**  
Electric Service Supplies Co.

**Controllers or Parts.**  
Br. Westinghouse Elec. & Mfg. Co.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
General Electric Co.  
Horne Mfg. Co.  
Johns-Manville Co., H. W.  
Kerschner Co., Inc., W. R.  
Westinghouse Elec. & M. Co.

**Controlling Systems.**  
General Electric Co.  
Westinghouse Elec. & M. Co.

**Converters, Rotary.**  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Conveying and Hoisting Machinery.**  
Columbia M. W. & M. I. Co.  
Green Eng'g Co.

**Cooling System.**  
Spray Engineering Co.

**Cordage.**  
Samson Cordage Works.

**Cord, Bell, Trolley, Register, etc.**  
Brill Co., The J. G.  
Electric Service Supplies Co.  
International Register Co., The.  
Long Co., E. G.  
Roehling's Sons Co., John A.  
Samson Cordage Works.  
Trolley Supply Co.

**Cord Connectors and Couplers.**  
Electric Service Supplies Co.  
Samson Cordage Works.  
Wood Co., C. N.

**Couplers, Car.**  
Brill Co., The J. G.  
Long Co., E. G.  
Ohio Brass Co.  
Van Dorn Coupler Co.  
Westinghouse Trac. Brake Co.

**Couplings, Conduit.**  
Horne Mfg. Co.

**Cranes. (See also Hoists.)**  
Niles-Bement-Pond Co.  
Thew Automatic Shovel Co.

**Crossing. (See Wood Preservatives.)**

**Cross Arms. (See Brackets.)**

**Crossing Foundations.**  
Balkwill Manganese Crossing Co.  
International Steel Tie Co.

**Crossing Signals. (See Signals, Crossing.)**

**Crossings, Track. (See Track, Special Work.)**

**Culverts.**  
American Rolling Mill Co.  
Bark River B. & Culvert Co.  
California Cor. Culvert Co.  
Canada Ingot Iron Co., Ltd.  
Canton Culvert & Silo Co.  
Coast Culvert & Flume Co.  
Corrugated Culvert Co.  
Delaware Metal Culvert Co.  
Dixie Culvert & Metal Co.  
Hardesty Mfg. Co., R.  
Illinois Corrugated Metal Co.  
Independence Culvert Co.  
Iowa Pure Iron Culvert Co.  
Kentucky Culvert Mfg. Co.  
Lone Star Culvert Co.  
Lyle Corrugated Culvert Co.  
Michigan Bridge & Pipe Co.  
Montana Culvert Co.  
Nebraska Culvert & Mfg. Co.  
Nevada Metal Mfg. Co.  
New England Metal Cul. Co.  
North East Metal Co.  
Northwestern Sheet & I. Wks.  
O'Neill Co., W. O.  
Ohio Corrugated Culvert Co.  
Pennsylvania Metal Cul. Co.  
Road Supply & Metal Co.  
Sioux Falls Metal Cul. Co.  
Spokane Cul. & Tank Co.  
Tennessee Metal Culvert Co.  
Utah Cor. Cul. & Flume Co.  
Virginia Metal & Culvert Co.  
Western Metal Mfg. Co.  
Wyatt Mfg. Co.

**Curtains and Curtain Fixtures.**

Brill Co., The J. G.  
Du Pont Fabrikoid Co.  
Electric Service Supplies Co.  
Hartshorn Company, Stewart.  
St. Louis Car Co.

**Cutting Apparatus, Oxy-Acetylene.**  
Oxweld Acetylene Co.

**Derailing Devices.**  
Cleveland Frog & Crossing Co.

**Destination Signs.**  
Columbia M. W. & M. I. Co.  
Creaghead Engng. Co.  
Electric Service Supplies Co.

**Detective Service.**  
Wisch Service, P. Edward.

**Die Blocks.**  
General Steel Co.

**Door Operating Devices.**  
Consolidated Car Heating Co.  
National Pneumatic Co.  
Safety Car Devices Co.

**Doors, Asbestos.**  
Johns-Manville Co., H. W.

**Doors and Door Fixtures.**  
Brill Co., The J. G.  
Hale & Kilburn Co.

**Doors, Folding Vestibule.**  
National Pneumatic Co.

**Draft Rigging. (See Couplers, Car.)**

**Drills, Track.**  
American Steel & Wire Co.  
Electric Service Supplies Co.  
Long Co., E. G.  
Niles-Bement-Pond Co.  
Ohio Brass Co.

**Dryers, Sand.**  
Electric Service Supplies Co.  
Zelnicke Supply Co., W. A.

**Engineers, Consulting, Contracting and Operating.**

Archbold-Brady Co.  
Arnold Co., The.  
Beeler, John A.  
Byllesby & Co., H. M.  
Ford, Bacon & Davis.  
Hunt & Co., Robert W.  
Jackson, D. C. & Wm. B.  
Little, Inc., Arthur D.  
Richey, Albert S.  
Sanderson & Porter.  
Sargent & Lundy.  
Scofield Engineering Co.  
Sloan, Huddle, Feustel & Freeman.  
Stone & Webster Eng'g Corp.  
White Companies, The J. G.  
Woodmansee & Davidson Engineering Co.

**Engines, Gas and Oil.**  
Westinghouse Elec. & M. Co.

**Engines, Steam.**  
Westinghouse Elec. & M. Co.

**Fare Boxes.**  
Brill Co., The J. G.  
Cleveland Fare Box Co.  
International Register Co., The.  
Johnson Fare Box Co.  
Ohmer Fare Register Co.

**Fences, Woven Wire and Fence Posts.**  
American Steel & Wire Co.  
Page Steel & Wire Co.

**Fenders and Wheel Guards.**  
Brill Co., The J. G.  
Cleveland Fare Box Co.  
Consolidated Car Fender Co.  
Electric Service Supplies Co.  
Root Spring Scraper Co.  
Star Brass Works.  
Trolley Supply Co.  
Western Electric Co.  
Wood Co., Charles N.

**Fibre and Fibre Tubing.**  
Diamond State Fibre Co.  
Johns-Manville Co., H. W.  
Westinghouse Elec. & M. Co.

**Fibre Insulation.**  
National Ry. Appliance Co.

**Field Coils. (See Coils.)**

**Filters, Water.**  
Scaife & Sons Co., Wm. B.

**Fire Extinguishing Apparatus.**  
Johns-Manville Co., H. W.

**Fire-Proofing Materials.**  
Johns-Manville Co., H. W.

**Flooring, Composition.**  
American Mason Safety T. Co.  
Johns-Manville Co., H. W.  
Western Electric Co.

**Forgings.**  
Columbia M. W. & M. I. Co.  
Eureka Co.  
Standard Steel Works Co.

**Frequency Meters.**  
Weston Electrical Instruments Co.

**Fuses and Fuse Boxes.**  
Chicago Fuse Mfg. Co.  
Columbia M. W. & M. I. Co.  
D & W Fuse Co.  
General Electric Co.  
Johns-Manville Co., H. W.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Fuses, Refillable.**  
Columbia M. W. & M. I. Co.  
Economy Fuse & Mfg. Co.  
General Electric Co.  
Horne Mfg. Co.

**Gages, Oil and Water.**  
Ohio Brass Co.

**Gaskets.**  
Diamond State Fibre Co.  
Johns-Manville Co., H. W.  
Power Specialty Co.

**Gas-Electric Cars.**  
General Electric Co.

**Gas Producers.**  
Westinghouse Elec. & M. Co.

**Gates, Car.**  
Brill Co., The J. G.

**Gear Blanks.**  
Carnegie Steel Co.  
Diamond State Fibre Co.  
Standard Steel Wks. Co.

**Gear Cases.**  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
Kerschner Co., Inc., W. R.  
National Ry. Appliance Co.  
Thayer & Co., Inc.  
Westinghouse Elec. & M. Co.

**Gears and Pinions.**  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Diamond State Fibre Co.  
Electric Service Supplies Co.  
General Electric Co.  
Kerschner Co., Inc., W. R.  
Long Co., E. G.  
National Ry. Appliance Co.  
Nuttall Co., R. D.

**Generating Sets, Gas-Electric.**  
General Electric Co.

**Generators.**  
Dick, Kerr & Co.  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Gongs. (See Bells and Gongs.)**

**Graphite.**  
Dixon Crucible Co., Joseph.  
Morgan Crucible Co.

**Grates, Chain.**  
Green Eng'g Co.

**Greases. (See Lubricants.)**

**Grinders and Grinding Supplies.**  
General Electric Co.  
Goldschmidt Thermit Co.  
Railway Track-work Co.

**Grinding Blocks & Wheels.**  
Norton Co.

**Guards, Trolley.**  
Electric Service Supplies Co.  
Ohio Brass Co.

**Harps, Trolley.**  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Electric Service Supplies Co.  
Hensley Trolley & Mfg. Co.  
More-Jones Brass & M. Co.  
Nuttall Co., R. D.  
Star Brass Works.  
Western Electric Co.

**Headlights.**  
Electric Service Supplies Co.  
General Electric Co.  
Long Co., E. G.  
Ohio Brass Co.  
St. Louis Car Co.  
Trolley Supply Co.

**Headlinings.**  
Kerschner Co., Inc., W. R.  
Keys Products Co.

**Heaters, Car, Electric.**  
Consolidated Car Heating Co.  
Gold Car Heating & Lighting Co.  
Smith Heater Co., Peter.

**Heaters, Car, Hot Air and Water.**  
Cooper Heater Co.  
Smith Heater Co., Peter.

**Heaters, Car, Stove.**  
Electric Service Supplies Co.  
Smith Heater Co., Peter.

**Hoists and Lifts.**  
Columbia M. W. & M. I. Co.  
Duff Manufacturing Co.  
Ford Chain Block & Mfg. Co.  
Niles-Bement-Pond Co.  
Yale & Towne Mfg. Co.

**Hose Bridges.**  
Ohio Brass Co.

**Hose, Pneumatic and Fire.**  
Johns-Manville Co., H. W.

**Hydraulic Machinery.**  
Niles-Bement-Pond Co.  
Watson-Stillman Co.

**Hydrogrounds.**  
Horne Mfg. Co.

**Inspection.**  
Elec'l Testing Laboratories.  
Hunt & Co., Robert W.

**Instrument Transformers.**  
Weston Electrical Instrument Co.

**Instruments, Measuring, Testing and Recording.**  
Economy Electric Devices Co.  
General Electric Co.  
Johns-Manville Co., H. W.  
Westinghouse Elec. & M. Co.  
Weston Elec'l Instrument Co.

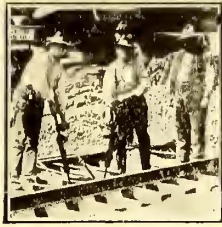
**Insulating Cloths, Paper and Tape.**

Anchor Webbing Co.  
Diamond State Fibre Co.  
Freyberg Bros., Inc.  
General Electric Co.  
Hope Webbing Co.  
Horne Mfg. Co.  
Johns-Manville Co., H. W.  
Mechanical Rubber Co.  
Mica Insulator Co.  
Mitchell-Rand Mfg. Co.  
Okonite Co.  
Packard Electric Co.  
Standard Paint Co.  
Standard Underground Cable Co.  
Standard Woven Fabric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Insulation. (See also Paints.)**  
Anderson M. Co., A. & J. M.  
Diamond State Fibre Co.  
Electric Service Supplies Co.  
General Electric Co.  
Horne Mfg. Co.  
Johns-Manville Co., H. W.  
Mechanical Rubber Co.  
Mitchell-Rand Mfg. Co.  
Okonite Co.  
Standard Varnish Works.  
Western Electric Co.  
Westinghouse Elec. & M. Co.



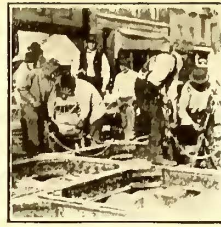
Albany



Oakland



Boston



Chicago



Newark

# From Users All Over The Country

come reports that Imperial Tie Tampers are more than equalizing the shortage of track labor.

# “Imperial” Tie Tampers

are being used in construction and maintenance work not only for tamping ballast but for cutting asphalt and breaking up concrete

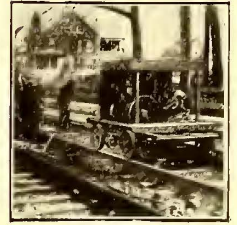
pavement as well. They have established a new basis of maintenance costs — and a new standard of well ballasted track.

*Bulletin 9023 tells the story—ask for a copy*

## INGERSOLL-RAND COMPANY

11 Broadway, New York    Offices The World Over    165 Q. Victoria St., London

77-TT



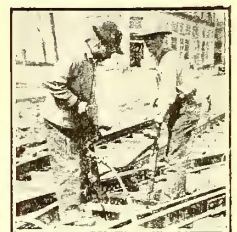
Atlanta



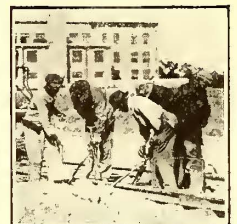
Baltimore



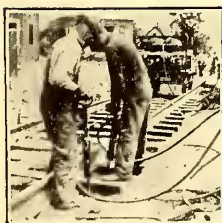
Kansas City



Elmira



Denver



Indianapolis



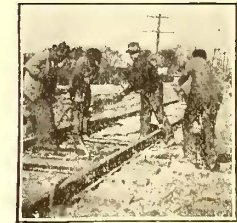
Cleveland



St. Paul



New York



Rochester

## WHAT AND WHERE TO BUY

### Insulators. (See also Line Material.)

Anderson M. Co., A. & J. M.  
Craghead Engrg. Co.  
Drew Elec. & Mfg. Co.  
Electric Railway Equipment Co.  
Electric Service Supplies Co.  
General Electric Co.  
Horne Mfg. Co.  
Johns-Manville Co., H. W.  
Locke Insulator Mfg. Co.  
Macallen Co.  
Ohio Brass Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.  
White Elec. Supply Co., T. C.

### Insulator Pins.

Hubbard & Co.

### Insurance, Fire.

Marsh & McLennan.

### Inventions, Developed and Perfected.

Peters & Co., G. D.

### Jacks. (See also Cranes, Hoists and Lifts.)

Brill Co., The J. G.  
Buckeye Jack Mfg. Co.  
Columbia M. W. & M. I. Co.  
Duff Manufacturing Co.  
National Ry. Appliance Co.  
Templeton, Kenly Co., Ltd.  
Watson-Stillman Co.

### Joints, Rail.

Atlantic Welding Co.  
Carnegie Steel Co.  
Rail Joint Co.  
Zelnicker Supply Co., W. A.

### Journal Boxes.

Bemis Car Truck Co.  
Brill Co., The J. G.  
Gurney Ball Bearing Co.  
Long Co., E. G.  
Railway Roller Bearing Co.

### Junction Boxes.

Johns-Manville Co., H. W.  
Standard Underground Cable Co.

### Laboratories.

Elec'l Testing Laboratories.  
Little, Inc., Arthur D.

### Lamp Guards and Fixtures.

Anderson M. Co., A. & J. M.  
Electric Service Supplies Co.  
General Electric Co.  
Westinghouse Elec. & M. Co.

### Lamps, Arc and Incandescent.

Anderson M. Co., A. & J. M.  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

### Lamps, Signal and Marker.

Ohio Brass Co.

### Lathes, Car Wheel.

Niles-Bement-Pond Co.

### Lighting Regulators, Car.

Holden & White, Inc.

### Lightning Arresters.

Horne Mfg. Co.  
Railway & Ind. Eng. Co.

### Lightning Protection.

Anderson M. Co., A. & J. M.  
Electric Service Supplies Co.  
General Electric Co.  
Ohio Brass Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

### Line Material. (See also Brackets, Insulators, Wires, etc.)

Anderson M. Co., A. & J. M.  
Archbold-Brady Co.  
Columbia M. W. & M. I. Co.  
Craghead Engrg. Co.  
Diamond State Fibre Co.  
Dick, Kerr & Co.  
Dossert & Co.  
Drew Elec. & Mfg. Co.  
Electric Railway Equipment Co.  
Electric Service Supplies Co.  
Eureka Co.  
General Electric Co.  
Holden & White, Inc.  
Hubbard & Co.  
Johns-Manville Co., H. W.  
Locke Insulator Mfg. Co.  
Macallen Co.  
More-Jones Brass & M. Co.  
Ohio Brass Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.  
White Elec. Supply Co., T. C.

### Locks.

Yale & Towne Mfg. Co.

### Locomotives, Electric.

Baldwin Locomotive Works.  
Brill Co., The J. G.  
General Electric Co.  
Westinghouse Elec. & M. Co.

### Lubricating Engineers.

Galena-Signal Oil Co.

### Lubricants, Oil and Grease.

Borne, Scrymser Co.  
Dearborn Chemical Co.  
Dixon Crucible Co., Jos.  
Galena-Signal Oil Co.

### Lumber. (See Poles, Ties, Posts, etc.)

### Machine Work.

Columbia M. W. & M. I. Co.  
Holden & White, Inc.  
Horne Mfg. Co.

### Machine Tools.

Columbia M. W. & M. I. Co.  
Niles-Bement-Pond Co.  
Watson-Stillman Co.

### Manganese Parts.

Bemis Car Truck Co.

### Mats.

Johns-Manville Co., H. W.

### Meters, Car, Watthour.

Economy Electric Devices Co.

### Meters. (See Instruments.)

### Mica.

Long Co., E. G.  
Macallen Co.  
Mechanical Rubber Co.

### Mirrors for Motormen.

Drew Electric Mfg. Co.

### Motormen's Seats.

Electric Service Supplies Co.  
Wood Co., C. N.

### Motor Generator, Bonding and Welding.

Lincoln Bonding Co.

### Motor Leads.

Dossert & Co.

### Motor Trucks, Gas and Electric.

General Vehicle Co.

### Motors and Generators Sets.

General Electric Co.

### Motors, Electric.

Br. Westinghouse Elec. & Mfg. Co.  
Dick, Kerr & Co.  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

### Nuts and Bolts.

Barbour-Stockwell Co.  
Bemis Car Truck Co.  
Columbia M. W. & M. I. Co.  
Hubbard & Co.  
Long Co., E. G.  
National Ry. Appliance Co.  
Roller Lock Nut Co.

### Oils. (See Lubricants.)

### Overhead Equipment. (See Line Material.)

### Oxy-Acetylene. (See Cutting Apparatus, Oxy-Acetylene.)

### Packing.

Diamond State Fibre Co.  
Electric Service Supplies Co.  
Johns-Manville Co., H. W.  
Mechanical Rubber Co.  
Power Specialty Co.

### Packing Rings.

Johns-Manville Co., H. W.

### Paints and Varnishes. (See Enslating.)

General Electric Co.  
Holden & White, Inc.  
Johns-Manville Co., H. W.  
Long Co., E. G.  
Mica Insulator Co.  
Mitchell-Rand Mfg. Co.  
Packard Electric Co.  
Standard Paint Co.  
Standard Varnish Works.

### Paints and Varnishes. (Preservative.)

Dixon Crucible Co., Jos.  
Johns-Manville Co., H. W.  
Long Co., E. G.  
National Ry. Appliance Co.  
Standard Paint Co.

### Paints and Varnishes for Woodwork.

National Railway Appliance Co.

### Paving Material.

American B. S. & Fdy. Co.  
Barrett Co., The.

### Paving Pitch.

Barrett Co., The.

### Pickups. (Trolley Wire.)

Electric Service Supplies Co.  
Ohio Brass Co.

### Pinion Pullers.

Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
General Electric Co.  
Wood Co., C. N.

### Pinions. (See Gears.)

### Pins, Case Hardened, Wood and Iron.

Bemis Car Truck Co.  
Electric Service Supplies Co.  
Long Co., E. G.  
Ohio Brass Co.

### Pipe.

National Tube Co.

### Pipe Fittings.

Power Specialty Co.  
Standard Steel Works Co.  
Watson-Stillman Co.

### Pliers, Insulated.

Rubber Ins. Metals Corp.

### Pole Sleeves.

Drew Electric & Mfg. Co.

### Poles, Metal Street.

Bates Expanded Steel Truss Co.  
Electric Railway Equipment Co.  
Hubbard & Co.  
National Railway Appliance Co.

### Poles, Ties, Posts, Piling and Lumber.

Carney & Co., B. J.  
Lindsay Bros. Co.  
Page & Hill Co.  
Valentine-Clark Co.  
Western Electric Co.

### Poles and Ties, Treated.

Lindsay Bros. Co.  
Page & Hill Co.  
Valentine-Clark Co.  
Western Electric Co.

### Poles, Trolley.

Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
Long Co., E. G.  
National Tube Co.  
Nuttall Co., R. D.

### Pole Reinforcing.

Hubbard & Co.

### Poles, Tubular Steel.

National Tube Co.

### Pothead.

Okonite Co.

### Power Factor Meters.

Weston Electrical Instrument Co.

### Power Saving Devices.

Arthur Power-Saving Recorder Co.

### Pressure Regulators.

General Electric Co.  
Ohio Brass Co.

### Pumps.

Watson-Stillman Co.

### Punches, Ticket.

American Railway Supply Co.  
Bonney-Vehlage Tool Co.  
Horne Mfg. Co.  
International Register Co., The.  
Wood Co., C. N.  
Woodman Mfg. & Supply Co., R.

### Punching Machinery.

Watson-Stillman Co.

### Purifiers, Feed Water.

Scaife & Sons Co., Wm. B.

### Rail Grinders. (See Grinders.)

### Rails, Relaying.

Zelnicker Supply Co., W. A.

### Rail Welding. (See Welding Processes and Apparatus.)

### Rattan.

Brill Co., The J. G.  
Electric Service Supplies Co.  
Hale & Kilburn Co.  
St. Louis Car Co.

### Recorders, Power Saving.

Arthur Power-Saving Recorder Co.

### Registers and Fittings.

Bonham Recorder Co.  
Brill Co., The J. G.  
Electric Service Supplies Co.  
International Register Co., The.  
Long Co., E. G.  
Ohmer Fare Register Co.  
Rooke Automatic Register Co.

### Reinforcing Concrete.

American Steel & Wire Co.

### Repair Shop Appliances. (See also Coil Banding and Winding Machines.)

Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.

### Repair Work. (See also Coils, Armature and Field.)

Cleveland Armature Works.  
Coil Mfg. & Repair Co.  
Columbia M. W. & M. I. Co.  
General Electric Co.  
Independent Lamp & W. Co.  
Westinghouse Elec. & M. Co.

### Replacers, Car.

Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.

### Resistance, Grid.

Columbia M. W. & M. I. Co.

### Resistance, Wire and Tube.

General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

### Retrievers, Trolley. (See Catchers and Retrievers, Trolley.)

### Rheostats.

General Electric Co.  
Mica Insulator Co.  
Westinghouse Elec. & M. Co.

### Roofing, Building.

Barrett Co., The.  
Johns-Manville Co., H. W.  
Standard Paint Co.

### Roofing, Car.

Johns-Manville Co., H. W.  
Keyes Products Co.  
Pantasote Co., The.

### Rubber Specialties of all Kinds.

Mechanical Rubber Co.

### Sand Blasts.

National Ry. Appliance Co.

### Sanders, Track.

Brill Co., The J. G.  
Cleveland Fare Box Co.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
Holden & White, Inc.  
Horne Mfg. Co.  
Ohio Brass Co.  
St. Louis Car Co.



# Longwear Bushings

Made of Hardened Steel.

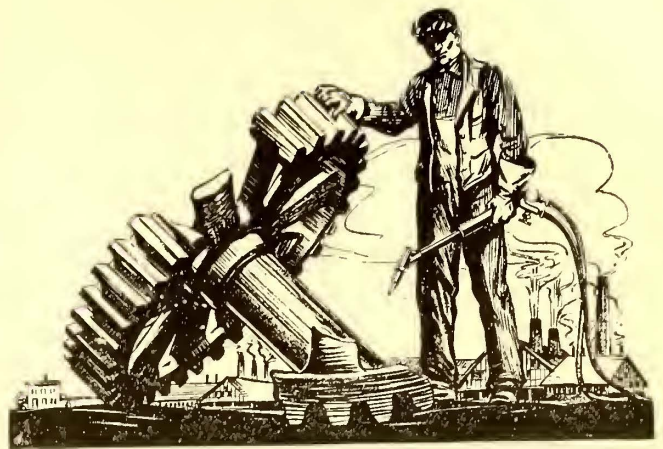
Accurate and Uniform.

Do not forget our "Longwear" Brake Pins

**E.G. Long Company**

50 Church Street

New York



## Not As Serious As It Looks

An appalling accident, yes—but it took place in an up-to-date shop where all broken machine parts are quickly repaired with an

**Oxweld Blowpipe**

It took the welder, on the job, less than six hours to make this big gearwheel as good as new.

With his Oxweld Blowpipe and equipment, built for the purpose, he saved hundreds and possibly thousands of dollars that would have been lost waiting for a new casting to come from the foundry.

Such accidents are common in shops or factories of all sorts. Your turn may be next.

## When It Comes Will You Be Prepared?

Why not write and ask us today for Bulletin Series 300, a compilation of facts and figures covering the earnings of Oxweld equipment in shops.

### Oxweld Acetylene Company

Newark Chicago Los Angeles

World's Largest Manufacturers of Oxy-Acetylene Apparatus and Supplies

THE OXWELD INJECTOR TYPE BLOWPIPE is the only type which syphons all the gas from the cylinders—other types waste from five to ten per cent.

OXWELD SERVICE HELP—means the co-operation of our big staff of experts in the work of making your welding and cutting equipment earn what it should.

## The Coal & Iron National Bank of the City of New York

Capital, Surplus & Profits \$1,635,000  
Resources Nearly \$10,000,000

Offers to dealers every facility of a New York Clearing House Bank.

"DUSTOOR HAI"  
*It is the custom*

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adelphia; Electrical Engineering & Mfg.  
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Engineering Co., Seattle, Wash.; Charles J. R.  
Hendry, Los Angeles, Cal.

- to use

**MORGANITE Brushes**

## Sloan, Huddle, Feustel & Freeman

Consulting Engineers

Analytical Studies of financial and operating conditions, appraisals and rate adjustments of electric railway and all public utility properties.

BOSTON, 14 Kilby Street

CHICAGO, Conway Bldg.

# JACKS

Barrett Track and Car Jacks  
Barrett Emergency Car Jacks  
Duff Ball Bearing Screw Jacks  
Duff Motor Armature Lifts

The Duff Manufacturing Co., Pittsburgh, Pa.

## WHAT AND WHERE TO BUY

**Sash Cord.**  
Samson Cordage Works.

**Sash Fixtures, Car.**  
Brill Co., The J. G.

**Sash, Metal, Car Windows.**  
Hale & Kilburn Co.

**Sash Operators.**  
Drouvé Co., The G.

**Scales, Weights, Balances and Dynamometers.**  
Horne Mfg. Co.

**Seating Material. (See also Rattan.)**  
Brill Co., The J. G.  
Du Pont Fabrikoid Co.

**Seats, Car.**  
Brill Co., The J. G.  
Hale & Kilburn Co.  
Peters & Co., G. D.  
St. Louis Car Co.

**Second-Hand Equipment. (See also pages 152-155.)**  
Archer & Baldwin.  
Kerschner Co., Inc., W. R.  
MacGovern & Co.

**Shade Rollers.**  
Hartshorn Co., Stewart.

**Shades, Vestibule.**  
Brill Co., The J. G.  
Electric Service Supplies Co.

**Shovels.**  
Hubbard & Co.

**Shovels, Power, Steam, Gas and Electric.**  
Thew Automatic Shovel Co.

**Signal Cord.**  
Samson Cordage Works.

**Signals, Car Starting.**  
Consolidated Car Heating Co.  
National Pneumatic Co.

**Signals, Highway Crossing.**  
Electric Service Supplies Co.  
Nachod Signal Co., Inc.  
U. S. Electric Signal Co.

**Signal Systems, Block.**  
Electric Service Supplies Co.  
Federal Signal Co.  
Nachod Signal Co., Inc.  
Union Switch & Signal Co.  
U. S. Electric Signal Co.  
Western Electric Co.  
Wood Co., C. N.

**Skylights, Steel, Puttyless.**  
Drouvé Co., The G.

**Slack Adjusters. (See Brake Adjusters.)**

**Sleet Wheels and Cutters.**  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Bonney-Vehslage Tool Co.  
Columbia M. W. & M. I. Co.  
Drew Electric & Mfg. Co.  
Holden & White, Inc.  
More-Jones Brass & M. Co.  
Nuttall Co., R. D.

**Snow-Plows, Removers, Sweepers, etc.**  
Brill Co., The J. G.  
Columbia M. W. & M. I. Co.  
Consolidated Car Fender Co.

**Soldering and Brazing Apparatus. (See Welding Proc. & App.)**

**Speed Indicators.**  
Johns-Manville Co., H. W.  
Wood Co., C. N.  
Woodman Mfg. & Supply Co., R.

**Spikes.**  
American Steel & Wire Co.

**Splicing Compounds.**  
Johns-Manville Co., H. W.  
Mechanical Rubber Co.  
Standard Woven Fabric Co.  
Westinghouse Elec. & M. Co.

**Splicing Sleeves. (See Clamps and Connectors.)**

**Springs, Car & Truck.**  
American Steel Foundries.  
American Steel & Wire Co.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Long Co., E. G.  
Standard Steel Works Co.

Taylor Elec. Truck Co.  
Union Spring & Mfg. Co.

**Sprinklers, Track and Road.**  
Brill Co., the J. G.  
St. Louis Car Co.

**Step, Car.**  
American Mason S. T. Co.  
Universal Safety Tread Co.

**Stokers, Mechanical.**  
Babcock & Wilcox Co.  
Green Engrg. Co.  
Murphy Iron Works.  
Westinghouse Elec. & M. Co.

**Storage Batteries. (See Batteries, Storage.)**

**Straps, Car, Sanitary.**  
Holden & White, Inc.  
Railway Improvement Co.

**Structural Iron. (See also Bridges.)**

**Sub-Stations, Portable.**  
Railway & Ind. Eng. Co.

**Superheaters.**  
Babcock & Wilcox.  
Power Specialty Co.

**Sweepers, Snow. (See Snow-Plows, Sweepers and Brooms.)**

**Switchboard Mats.**  
Western Electric Co.

**Switches, Automatic.**  
Western Electric Co.

**Switchstands.**  
Kilby Frog & Switch Co.  
Ramapo Iron Works.

**Switches, Track. (See Track, Special Work.)**

**Switches and Switchboards.**  
Anderson M. Co., A. & J. M.  
Cutter Electrical & Mfg. Co.  
Electric Service Supplies Co.  
General Electric Co.  
U. S. Electric Signal Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Synoscopes.**  
Weston Electrical Instrument Co.

**Tampers, Tie.**  
Ingersoll-Rand Co.

**Tapes & Cloth. (See Insulating Cloths, Paper and Tape.)**

**Telephones and Parts.**  
Electric Service Supplies Co.  
Western Electric Co.

**Terminals.**  
Frankel Connector Co.

**Terminal Cables.**  
Standard Underground Cable Co.

**Testing Clips.**  
Frankel Connector Co.

**Testing, Commercial and Electrical.**  
Electrical Testing Laboratories.  
Hunt & Co., Robert W.

**Testing Instruments. (See Instruments, Electrical, Measuring, Testing.)**

**Thermostats.**  
Consolidated Car Heating Co.  
Gold Car Heating & Lighting Co.  
Railway Utility Co.  
Smith Heater Co., Peter.

**Ticket Boxes.**  
Macdonald Ticket & Ticket Box Co.

**Ticket Choppers and Destroyers.**  
Electric Service Supplies Co.  
Patten Co., Paul B.

**Tickets and Transfers.**  
American Railway Supply Co.

**Ties, Mechanical.**  
Dayton Mechanical Tie Co.

**Ties and Tie Rods, Steel.**  
Barbour-Stockwell Co.  
Carnegie Steel Co.  
International Steel Tie Co.

**Ties, Wood. (See Poles, Ties, etc.)**

**Tools, Track and Miscellaneous.**  
American Steel & Wire Co.  
Columbia M. W. & M. I. Co.  
Electric Service Supplies Co.  
Johns-Manville Co., H. W.  
Klein & Sons, M.  
Railway Track-work Co.

**Torches, Acetylene. (See Cutting Apparatus, Oxy-Acetylene.)**

**Towers and Transmission Structures.**  
Archbold-Brady Co.  
Bates Expanded Steel Truss Co.  
Westinghouse Elec. & M. Co.

**Tower Wagons and Auto-Trucks.**  
General Vehicle Co.  
McCardell & Co., J. R.

**Track, Special Work.**  
American Frog & Switch Co.  
Barbour-Stockwell Co.  
Cleveland Frog & Crossing Co.  
Columbia M. W. & M. I. Co.  
Kilby Frog & Switch Co.  
New York Switch & Crossing Co.  
Ramapo Iron Works.

**Transfers. (See Tickets.)**

**Transfer Issuing Machines.**  
Ohmer Fare Register Co.

**Transfer Tables.**  
Archbold-Brady Co.

**Transformers.**  
General Electric Co.  
Packard Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Treads, Safety Stair Car Step.**  
American Mason Safety Tread Co.  
Universal Safety Tread Co.

**Trolley Bases.**  
Anderson M. Co., A. & J. M.  
Electric Service Supplies Co.  
General Electric Co.  
Holden & White, Inc.  
Horne Mfg. Co.  
More-Jones Brass & M. Co.  
Nuttall Co., R. D.  
Ohio Brass Co.  
Trolley Supply Co.

**Trolley Bases, Retrieving.**  
Holden & White, Inc.

**Trolley Cord.**  
Samson Cordage Works.

**Trolley Shoes.**  
Holden & White, Inc.  
Miller Trolley Shoe Co.

**Trolleys and Trolley Systems.**  
Ford Chain Block & Mfg. Co.

**Trucks, Car.**  
American Steel Foundries.  
Baldwin Locomotive Works.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Long Co., E. G.  
St. Louis Car Co.  
Taylor Elec. Truck Co.

**Tube, Steel.**  
National Tube Co.

**Tabular Webbing.**  
Tabular Woven Fabric Co.

**Turbines, Steam.**  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.

**Turnstiles.**  
Percy Mfg. Co., Inc.

**Valves.**  
Ohio Brass Co.

**Varnishes. (See Paints, etc.)**

**Ventilator, Building.**  
Drouvé Co., The G.

**Ventilators, Car.**  
Brill Co., The J. G.  
Globe Ventilator Co.  
Holden & White, Inc.  
Railway Utility Co.  
St. Louis Car Co.

**Volt Meters. (See Instruments.)**  
Atlantic Welding Co.

**Washers.**  
Bound Brook Oil-less Bearing Co.  
Diamond State Fibre Co.

**Water Softening and Purifying Systems.**  
Scaife & Sons Co., Wm. B.

**Wattmeters.**  
Weston Electrical Instrument Co.

**Welders, Portable Electric.**  
Electric Railway Improv. Co.

**Welding Processes and Apparatus.**  
Electric Railway Improvement Co.  
General Electric Co.  
Goldschmidt Thermit Co.  
National Ry. Appliance Co.  
Oxweld Acetylene Co.  
Westinghouse Elec. & M. Co.

**Wheel Grinders.**  
Wheel Truing Brake Shoe Co.

**Wheel Guards. (See Fenders and Wheel Guards.)**

**Wheels, Car, Cast Iron.**  
American Steel & Wire Co.  
Association of Mfrs. of Chilled Car Wheels.  
Bemis Car Truck Co.  
Griffin Wheel Co.  
Long Co., E. G.

**Wheels, Car. (Steel and Steel Tired.)**  
American Steel Foundries.  
Bemis Car Truck Co.  
Carnegie Steel Co.  
Standard Steel Works Co.

**Wheels, Trolley.**  
Anderson M. Co., A. & J. M.  
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Bound Brook Oil-less Bearing Co.  
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Electric Service Supplies Co.  
Eureka Co.  
General Electric Co.  
Hensley Trolley & Mfg. Co.  
Holden & White, Inc.  
Johns-Manville Co., H. W.  
Long Co., E. G.  
More-Jones Brass & M. Co.  
Nuttall Co., R. D.  
Star Brass Works.

**Whistles, Air.**  
General Electric Co.  
Ohio Brass Co.

**Window Operators.**  
Drouvé Co., The G.

**Wire Rope.**  
American Steel & Wire Co.  
Roebling's Sons Co., John A.

**Wires and Cables.**  
Aluminum Co. of America.  
American Electrical Works.  
American Steel & Wire Co.  
Bridgeport Brass Co.  
D & W Fuse Co.  
General Electric Co.  
Kerite Insulated Wire & Cable Co.  
Okonite Co.  
Packard Electric Co.  
Page Steel & Wire Co.  
Roebling's Sons Co., John A.  
Standard Underground Cable Co.  
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It's yours on request.

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5166  
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*The Locke  
Insulator  
Mfg. Co.  
Rochester N.Y.*



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Let us demonstrate to you how we can heat and ventilate your cars at the lowest possible cost.

**The Cooper Heater Company**  
Carlisle, Pa.

**HEATING AND VENTILATING YOUR CARS** is the problem to-day. Let us show you how to do both with one equipment. Now is the time to consider this change before you start your cars through the shops for overhauling. Kill two birds with one stone.

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Lord Screenless Air Cleaners for Compressors	Air Hose and Rubber Specialties

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**Globe Ventilator Co., Troy, N. Y.**

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You get more than simply **BRAKE SHOES** when you use our Product.

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All of which means increased efficiency and decreased cost of Brake Maintenance.

**American Brake Shoe & Foundry Co.**  
30 Church St., New York

McCormick Bldg., Chicago

Chattanooga, Tenn.

ALPHABETICAL INDEX TO ADVERTISEMENTS

**A**

Alexander Hamilton Institute...103  
 Aluminum Co. of America...129  
 Amer. Brake Shoe & Fdry. Co...163  
 American Car Co...166, 167  
 American Carbon & Battery Wks...151  
 American Electrical Works...42  
 American Frog & Switch Co...145  
 American Mason S. T. Co...150  
 American Ry. Supply Co...149  
 American Rolling Mill Co...71  
 American Steel Foundries...33  
 American Steel & Wire Co...145  
 Anchor Webbing Co...147  
 Anderson Mfg. Co., A. & J. M...129  
 Archbold-Brady Co...143  
 Archer & Baldwin, Inc...154  
 Arnold Co., The...60  
 Arthur Power-Saving Recorder Co...40  
 Ass'n of Mfrs. of Chilled Car Wheels...122  
 Atlantic Welding Co...76, 77  
 Automatic Reclosing Circuit Breaker Co...146

**B**

Babcock & Wilcox Co...146  
 Baker Co., Wm. M...71  
 Baldwin Locomotive Works, The...124  
 Balkwill Manganese Crossing Co. 84  
 Bark River Bridge & Cul. Co...71  
 Barbour-Stockwell Co...144  
 Barrett Co., The...61  
 Bates Expanded Steel Truss Co...143  
 Bayonet Trolley Harp Co...138  
 Beeler, John A...60  
 Bemis Car Truck Co...139  
 Bonham Recorder Co...108  
 Bonney-Vehslage Tool Co...96  
 Borne, Scrymser Co...145  
 Bound Brook Oil-less Bear, Co...112, 113  
 Bridgeport Brass Co...Front Cover  
 Brill Co., The J. G...166, 167  
 Br. Westinghouse Elec. & Mfg. Co...B  
 Buckeye Jack Mfg. Co...132  
 Byllesby & Co., H. M...60

**C**

California Cor. Cul. Co...71  
 Cameron Electrical Mfg. Co...147  
 Canada Ingot Iron Co., Ltd...71  
 Canton Culvert & Silo Co...144  
 Carnegie Steel Co...140  
 Carney & Co., B. J...142  
 Carr Co., C. E. A...153  
 Chicago Fuse Mfg. Co...146  
 Cleveland Armature Works...154  
 Cleveland Fare Box Co...149  
 Cleveland Frog & Crossing Co...144  
 Coal & Iron National Bank...161  
 Coast Culvert & Flume Co...71  
 Coil Mfg. & Repair Co...146  
 Collier, Inc., Barron G...116  
 Columbia M. W. & M. I. Co...90  
 Consolidated Car Fender Co...102  
 Consolidated Car Heating Co...93  
 Cooper Heater Co., The...163  
 Creaghead Engineering Co...150  
 Cutter Co., The...86

**D**

D & W Fuse Co...91  
 Dayton Mechanical Tie Co...82  
 Dearborn Chemical Co...145  
 Delaware Metal Cul. Co...71  
 Diamond State Fibre Co...142  
 Dick, Kerr & Co., Ltd...A  
 Differential Car Co...42  
 Dixie Culvert & Metal Co...71  
 Dixon Crucible Co., Joseph...133  
 Dossert & Co...85  
 Drew Electric & Mfg. Co...65  
 Drouvé Co., The G...137  
 Duff Manufacturing Co., The...161  
 Du Pont Fabrikoid Co...135

**E**

Earll, C. I...137  
 Economy Electric Devices Co...34, 35  
 Economy Fuse & Mfg. Co...135  
 Electric Car & Loco. Corp...151  
 Electric Equipment Co...152  
 Electric Railway Equipment Co...28  
 Electric Railway Improv. Co...31  
 Electric Railway Journal...69, 70  
 Electric Service Supplies Co...27  
 Electric Storage Battery Co...66  
 Elec'l Testing Laboratories...60  
 Eureka Co...110

**F**

Federal Signal Co...142  
 Ford, Bacon & Davis...60  
 Ford Chain Block & Mfg. Co...133  
 "For Sale" Ads...152-155  
 Frankel Connector Co...142  
 Freyberg Bros., Inc...148

**G**

Galena-Signal Oil Co...41  
 General Electric Co...43-54, Back Cover  
 General Vehicle Co...115  
 General Steel Co...151  
 Globe Ventilator Co...163  
 Gold Car Heating & Lighting Co...149  
 Goldschmidt Thermit Co...72-75  
 Green Eng'g Co...145  
 Griffin Wheel Co...139  
 Griswold Machine Co., G. M...152  
 Gurney Ball Bearing Co...120, 121

**H**

Hale & Kilburn Co...94, 95  
 Handy Supply Co...147  
 Hardesty Mfg. Co., R...71  
 Hartshorn Co., Stewart...149  
 "Help Wanted" Ads...152  
 Hensley Trolley & Mfg. Co...150  
 Holden & White, Inc...32  
 Hope Webbing Co...147  
 Horne Mfg. Co...163  
 Hubbard & Co...142  
 Hunt & Co., Robert W...60

**I**

Ideal Commutator Dresser Co...130  
 Illinois Cor. Metal Co...71  
 Independence Culvert Co...71  
 Independent Lamp & Wire Co...157  
 Ingersoll-Rand Co...159  
 International Register Co., The...104-107  
 International Steel Tie Co., The...18  
 Iowa Pure Iron Cul. Co...71

**J**

Jackson, D. C. & Wm. B...60  
 Jeandron, W. J...141  
 Johns-Manville Co., H. W...127  
 Johnson Fare Box Co...97

**K**

Kentucky Culvert Co...71  
 Kerite Insulated Wire & Cable Co...143  
 Kerschner Co., Inc., W. R...117  
 Keys Products Co...111  
 Kilby Frog & Switch Co...144

**L**

Lincoln Bonding Co...80, 81  
 Lindsley Bros. Co...142  
 Little, Inc., Arthur D...60  
 Locke Insulator Mfg. Co...163  
 Long Co., E. G...161  
 Lyle Cor. Culvert Co...71

**M**

Macallen Co...126  
 McCardell & Co., J. R...142  
 Macdonald Ticket & Ticket Box Co...149  
 McGraw-Hill Book Co., Inc...125, 131  
 MacGovern & Co., Inc...154  
 Marsh & McLennan...142  
 Mica Insulator Co...148  
 Michigan Bridge & Pipe Co...71  
 Miller Trolley Shoe Co...118  
 Mitchell-Rand Mfg. Co...148  
 Montana Culvert Co...71  
 More-Jones Brass & Metal Co...114  
 Morgan Crucible Co...161  
 Murphy Iron Works...145

**N**

Nachod Signal Co., Inc...62  
 National Brake Co...59  
 National City Co...60  
 National Pneumatic Co...36-39  
 National Railway Appliance Co...157  
 National Safety Devices & Mfg. Co...149  
 National Tube Co...142  
 Nebraska Cul. & Mfg. Co...71  
 New England Metal Cul. Co...71  
 New York Switch & Crossing Co...144  
 Niles-Bement-Pond Co...88  
 Norton Co...136  
 Nuttall Co., R. D...12, 13

**O**

Ohio Brass Co...16, 17  
 Ohmer Fare Register Co...98  
 Okonite Co...126  
 O'Neill Co., W. Q...71  
 Oxweld Acetylene Co...161

**P**

Packard Electric Co...132  
 Page & Hill Co...142  
 Page Steel & Wire Co...30  
 Patten Co., P. B...151  
 Paxson Co., J. W...144  
 Pennsylvania Metal Cul. Co...71  
 Percy Mfg. Co., Inc...148  
 Peters & Co., Ltd., G. D...145  
 "Positions Wanted" Ads...152  
 Power Specialty Co...146

**R**

Rail Joint Co...145  
 Railway Improvement Co...19-26  
 Railway & Industrial Eng. Co...128  
 Railway Roller Bearing Co...165  
 Railway Track-work Co...130  
 Railway Utility Co...109  
 Ramapo Iron Works...142  
 Richey, Albert S...60  
 Road Supply & Metal Co...71  
 Roebbling's Sons Co., John A...128  
 Roller Lock Nut Co., Inc...150  
 Rook Automatic Register Co...150  
 Root Spring Scraper Co...150  
 Rubber Insulated Metals Corp...127

**S**

S K F Ball Bearing Co...123  
 Safety Car Devices Co...9  
 Samson Cordage Works...99  
 Sanderson & Porter...60  
 Sargent & Lundy...60  
 Scaife & Sons Co., Wm. B...146  
 Scofield Engineering Co...60  
 Searchlight Section...152-155  
 Second Hand Equip...152-155  
 Sioux Falls Metal Cul. Co...71  
 Sloan, Huddle, Feustel & Freeman...161  
 Smith Heater Co., Peter...163  
 Smith-Ward Brake Co...151  
 Spokane Cul. & Tank Co...71  
 Spray Engineering Co...92  
 Standard Paint Co...148  
 Standard Steel Works Co...141  
 Standard Underground Cable Co...143  
 Standard Varnish Works...89  
 Standard Woven Fabric Co...146  
 Star Brass Works...138  
 St. Louis Car Company, The...119  
 Stone & Webster Eng'g Corp...60  
 Stucki Co., A...151  
 Swan, James T...60

**T**

Taylor Electric Truck Co...140  
 Templeton, Kenly Co., Ltd...154  
 Tennessee Metal Cul. Co...71  
 Thayer & Co., Inc...134  
 Thew Automatic Shovel Co...83  
 Titanium Alloy Mfg. Co...78, 79  
 Trolley Supply Co...150  
 Tubular Woven Fabric Co...100

**U**

Union Spring & Mfg. Co...151  
 Union Switch & Signal Co...14  
 U. S. Electric Signal Co...29  
 United States Graphite Co...134  
 United States Rubber Co...87  
 Universal Safety Tread Co...149

**V**

Valentine-Clark Co...142  
 Van Dorn Coupler Co...64  
 Virginia Metal Cul. Co...71

**W**

"Want" Ads...152  
 Wason Mfg. Co...166, 167  
 Watson-Stillman Co...186  
 Wendell & MacDuffie Co...155  
 Western Electric Co...101  
 Western Metal Mfg. Co...71  
 Westinghouse Elec. & Mfg. Co...2-8  
 Westinghouse Traction Brake Co...10, 11  
 Weston Elec'l Instrument Co...157  
 Wheel Truing Brake Shoe Co...151  
 White Companies, The J. G...60  
 White Elec'l Supply Co., T. C...125  
 Wisch Service, The P. Edw...60  
 Wood Co., Chas. N...63  
 Woodman Mfg. & Supply Co., R.148  
 Woodmansee & Davidson Engineering Co...60  
 Wyatt Metal Works...71

**Y**

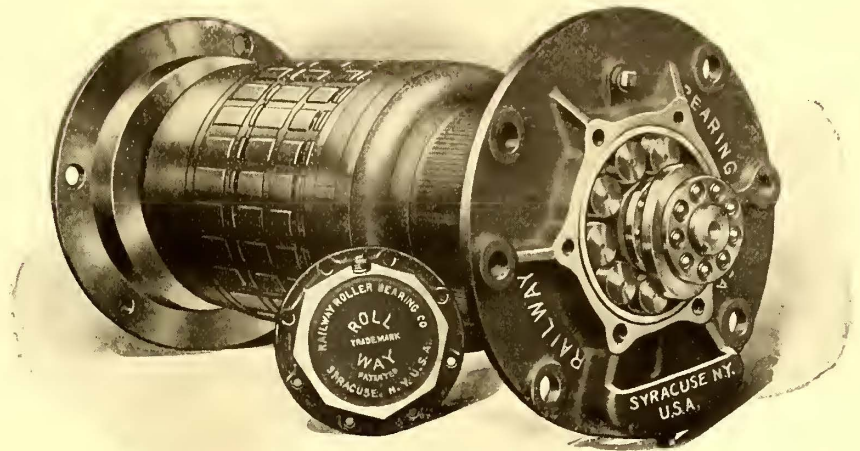
Yale & Towne Mfg. Co...131

**Z**

Zelnicker Supply Co., Walter A.154

# Rollway Bearings

**Will Raise  
Your  
Schedule  
Speeds**



Of course, you are interested in saving power because that means saving coal—and coal is pretty scarce and expensive in these days.

But that isn't the biggest return you can get for an investment in Rollway Bearings. Note the following figures:

A railway compared two 26-ton, four-motor cars, one with plain bearings and one with Rollway Bearings, over a 12.7 mile line with the same motorman and under the same physical conditions.

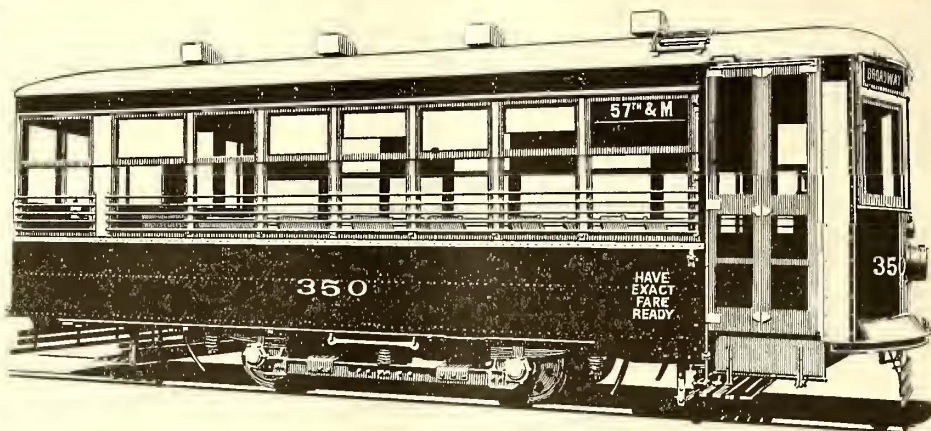
**The Rollway Bearing car not only used 10.15 per cent less energy, but it made the run in**

***55 instead of 61 minutes***

This saving of 9 per cent in running time is almost the equivalent of 9 cars for 10 for the same car mileage!

**The Railway Roller Bearing Co.  
Syracuse, New York**

## THE SINGLE-TRUCK CAR OF 1918



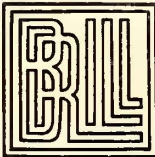
**T**HERE is no need to use this page to detail to railway managers what the Safety Car is and does. It has been so completely told again and again and you are too keenly alive to what is going on in the electric railway field to let anything of such vital consequence get by without knowing all about the first standardized car, the car that has shown itself suited to more classes of service than any other up to date, the car fashioned by the times and for this day and generation.

So what shall we say to you who are tremendously interested in equipping with adequate, flexible, serviceful, safe and economical cars? Or rather where shall we begin? First and foremost, let us finish that statement "the car for this day and generation." The Safety Car, although marvelously suited to the pressing needs of the present, is contrived to stand the test of time. It goes the limit in structural features, operating arrangements and general furnishing for comfort and convenience—beyond that limit of structural features would be sacrifice of durability. There is such a thing as reaching the acme of a type—the horse car was perfected after a score of years—and those who are best qualified to judge recognize the Birney Safety Car

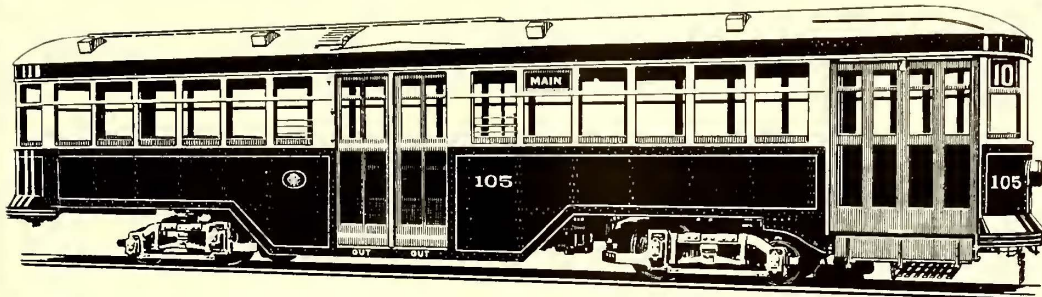
as having reached the goal of completion for the single-truck car. From every angle, the manager of the average railway system, with his mind intent on consolidating his equipment for future success as well as immediate relief, will inevitably come to the standardized Safety Car. Lower initial cost, operating cost, maintenance cost, accident cost, all point to it. Faster schedules, more frequent schedules, greater flexibility, increased business, a satisfied public, all point to it.

Now just a bit of historical evidence of our faith in one-man cars and in the Birney car in particular: From the middle of 1915 to the end of 1916 we devoted practically all of our advertising space in this magazine to the light-weight, one-man car, spreading the gospel of its place and power in traffic up-building and elimination of waste. Gradually we focussed thought and effort on the Safety Car—the American Car Company collaborated with Mr. Birney in its development—because it showed itself to be correct in principle and performance, and the outcome to-day is that we reiterate our absolute confidence in the Safety Car as the attainment of the operator's and the car builder's ideal of the light-weight, one-man type, standardized and complete in every detail.

THE J. G. BRILL COMPANY, PHILADELPHIA  
AMERICAN CAR COMPANY, ST. LOUIS



## THE DOUBLE-TRUCK CAR OF 1918



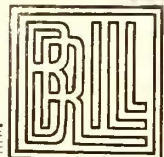
THE city railway manager who is hard after every possible means of making his equipment pay bigger returns to offset bigger costs is getting rid of whatever stands in the way of progress and is leading the way along modern lines, adjusting equipment and methods to the new order of things. He sees that the only way to win is to fight for the right equipment and then fight with it. He sees victory ahead if he concentrates his big attack on the proposition by putting more money into it, by spending more money to make more money, by equipping with modern cars, the cars being the essential part of his equipment to keep modern, his stock-in-trade which he must keep up-to-date to make the whole investment pay a fair return.

Out of the wide variety of city car features developed in the last decade there has been a natural selection according to peculiar, practical fitness, and combinations galore have resulted. These combinations have had to prove their worth just as the individual features had to prove theirs, and so it is the world-old story of the survival of the fittest. It is no matter of opinion as

to which type of double-truck city car has won and is holding the first place to-day—more cities have put Peter Witt Cars on their lines in the last couple of years than have ever made a choice of one special double-truck design since prepayment cars first had their being. It is marvelously simple in its plan and operation and yet it is the distinctly modern prepayment—post-payment—nearside—one-man—two-man car, the car for quickest loading and unloading, the surest car for speeding up schedules, the car for highest convenience to passengers, the easiest car for fare collection, the best car for women conductors. Peter Witt calls it "The Car Rider's Car," railway men call it the "Peter Witt Car," but no matter what it is called it does the work in its own special way and there is no doubting that this way fully satisfies the management, crews and public from the first.

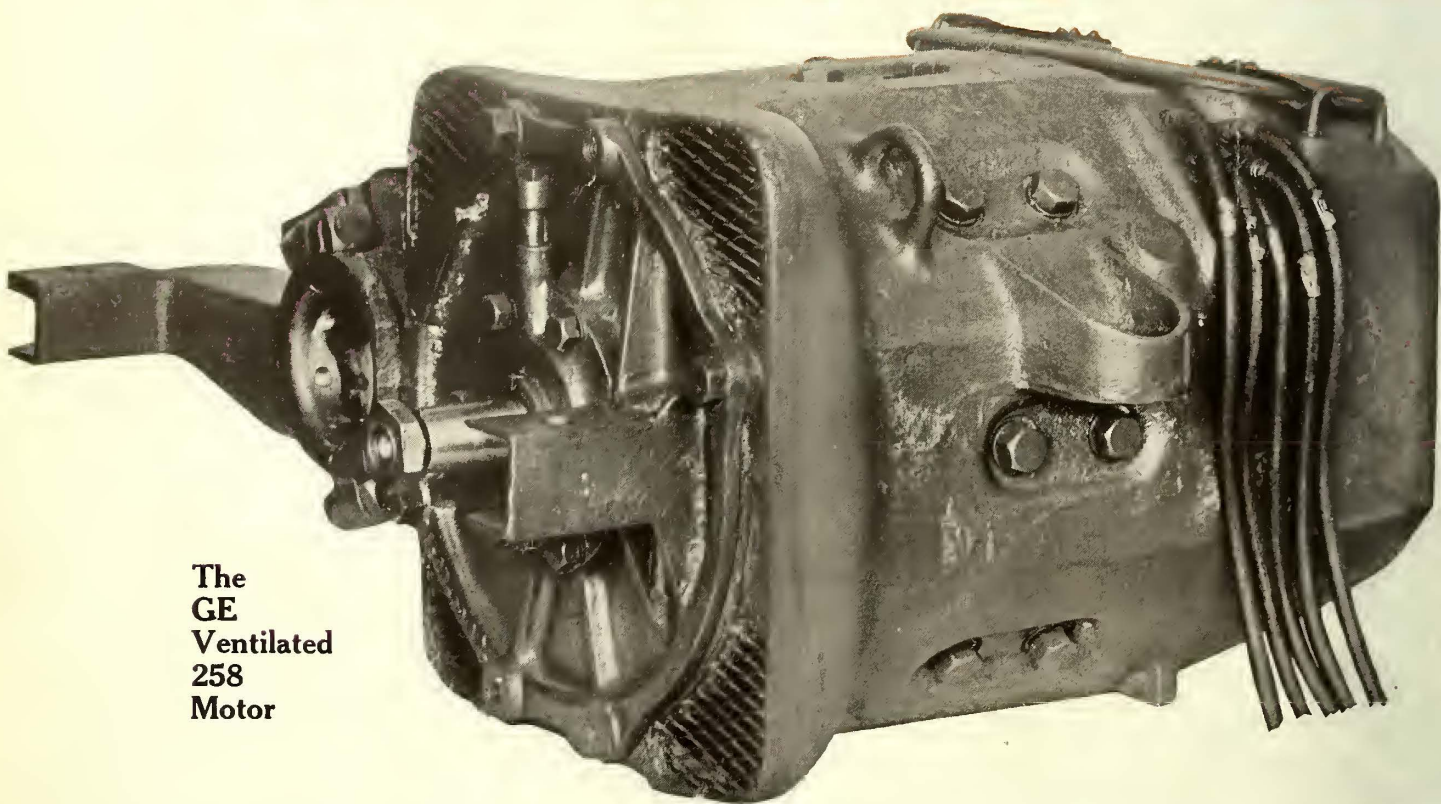
The G. C. Kuhlman Car Company worked out the plans through years of development in association with Mr. Witt and standardized the car completely. The broad experience of many big installations put it squarely up to you.

G. C. KUHLMAN CAR COMPANY, CLEVELAND  
WASON MANFG. COMPANY, SPRINGFIELD





258



The  
GE  
Ventilated  
258  
Motor

The story of this motor and other GE equipment for the attainment of faster schedules is given in the pages immediately preceding editorial

# General Electric Company

General Offices:  
Schenectady, N. Y.



Sales Offices  
in all large cities