

# ELECTRIC RAILWAY JOURNAL

PUBLISHED EVERY SATURDAY

Vol. XLIII

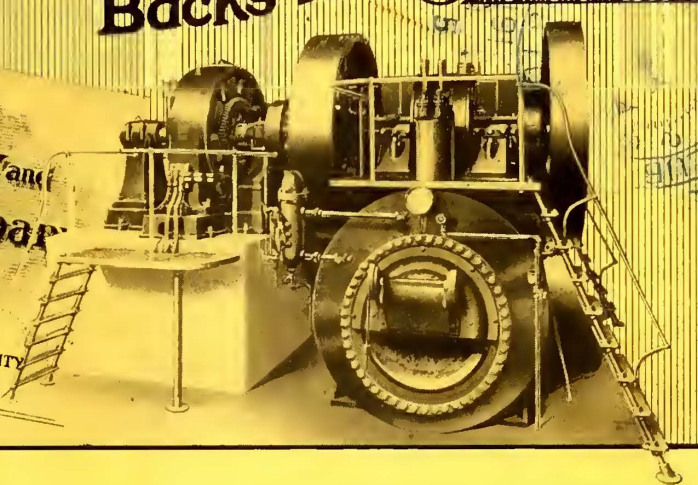
NEW YORK, JANUARY 3, 1914

No. 1

## The \$10,000 Bond That Backs The Buckeyemobile

The Fidelity and Casualty Company of New York

HOME OFFICE  
92 LIBERTY ST., NEW YORK CITY



Special Bond

No. 67234

Obligee: The Purchaser of a

Buckeye-Mobile

Principal: Buckeye Engine Co.

Salem, Ohio

Amount of bond: \$ 10,000.00

Annual premium: \$ Paid

Date of bond: Nov. 25, 1913

Bd. D. 739, 3 M., 7-11

Approximately 2 lbs. coal per K.W. Hr. with coal of not less than 13,500 B.T.U. and not more than 10 per cent. ash.

Guaranteeing an engine's performance is hoary with age.

Bonding the fuel consumption guarantee of an entire power plant is another thing—a new and better protection.

Back of the bonded guarantee of the Buckeyemobile stands the Fidelity and Casualty Company of New York.

### Here is the Proposition

The fuel consumption guarantee (\*) of the Buckeyemobile is backed by a \$10,000.00 bond (of the Fidelity and Casualty Company of N. Y.) calling for a forfeiture of \$1000 cash for every 1/10 pound of coal required per i.h.p. above guarantee, with a nominal bonus for saving in fuel below guaranteed amount (the calorific value of coal being the basis of guarantee).

This goes for the entire plant—from coal pile to switchboard—as the Buckeyemobile is a complete power plant, self contained. If you are contemplating operating units in 50 to 400 Kw., here's your only opportunity to guarantee the efficiency of that coal pile—to save 4 to 6 lb. of coal per h.p. hour over usual cost.

Write for full information.

## Buckeye Engine Co., Salem, Ohio

Sales Offices:

New York, N.Y.  
Bluefield, W. Va.  
Boston, Mass.

Cleveland, Ohio  
Chicago, Ill.  
Birmingham, Ala.

Cincinnati, Ohio  
Denver, Colo.  
Pittsburgh, Pa.

Philadelphia, Pa.  
St. Paul, Minn.  
San Francisco, Cal.



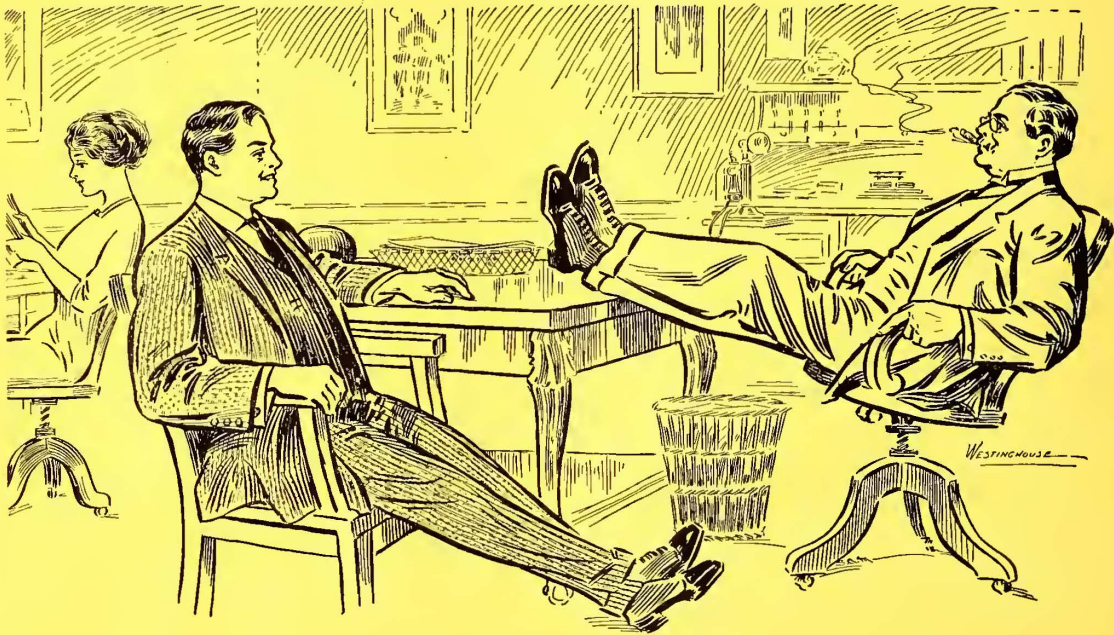
# Happy New Year!

## A Resolution

**R**ESOLVED that the manufacturers and the electric railways of the country join hands, and work together more closely for the betterment of the industry.

Progress and healthy growth depend largely upon the good-will of the public. The public must be educated and we will contribute our share towards this end.

We will also continue our practice of co-operating with railway mechanics and engineers in the perfection of designs—a practice that has contributed so materially to the success of Westinghouse Motors and HL Control.



Contentment reigns in this office as far as equipment is concerned. Their cars are all equipped with Westinghouse Motors and HL Control.

**Westinghouse Electric & Manufacturing Co.**

Sales Offices in  
45 American Cities



East Pittsburgh,  
Pennsylvania

Member Society for Electrical Development. "Do It Electrically"



# ELECTRIC RAILWAY JOURNAL

JANUARY 3, 1914

## TABLE OF CONTENTS

|   |           |           |
|---|-----------|-----------|
| <b>Problems of the Electric Railway Industry</b>  | - - - - - | <b>6</b>  |
| <p>Opportunities Before the American Association, by Charles N. Black.<br/>                 How to Have Good Public Relations, by C. Loomis Allen.<br/>                 Increased Cost of Electric Railway Operation, by Chauncey Eldridge.<br/>                 The Central Electric Railway Association and the Interurbans, by Arthur W. Brady.<br/>                 Purchased Power and the Street Railway, by Charles L. Ayling.<br/>                 Rolling Stock Design, by E. W. Holst.<br/>                 European Railway Electrification, by George Gibbs.<br/>                 The Distribution of Power for Traction, by Louis Bell.<br/>                 The Design of Electric Locomotives, by A. H. Armstrong.<br/>                 Correction of the Street Railway Situation, by E. H. Gay.<br/>                 Buying and Building Cars, by John J. Cummings.<br/>                 The Design of Rapid Transit Cars, by F. M. Brinckerhoff.<br/>                 Street Railway Motor Control Systems, by Clarence Renshaw.<br/>                 The Manufacturer and the Industry, by Guy E. Tripp.<br/>                 The Manufacturer's Relation to the Industry, by Cornell S. Hawley.<br/>                 Municipal Ownership Versus Private Enterprise, by Everett W. Burdett.<br/>                 The Advantage to the Public of Centralized Management of Public Utilities, by Edwin S. Webster.<br/>                 Is Regulation by Commission a Permanent Part of Our Economic Scheme? by J. D. Mortimer.<br/>                 Management by Large Operators, by Arthur St. George Joyce.<br/>                 Public Relations, by Frank W. Rollins.<br/>                 The Holding Company—Its Advantages and Disadvantages, by Frank R. Ford.</p> |           |           |
| <b>New Electric Railway Track Built in 1913</b>   | - - - - - | <b>28</b> |
| <b>Electric Rolling Stock Ordered in 1913</b>   | - - - - - | <b>30</b> |
| <b>Block Signal Installations in 1913</b>   | - - - - - | <b>32</b> |
| <b>Receiverships and Foreclosure Sales in 1913</b>  | - - - - - | <b>33</b> |
| <b>Electrical Equipment for the Chicago, Milwaukee &amp; Puget Sound Electrification</b>  | -         | <b>34</b> |
| <p>This railroad is to commence work in the near future on the electrification of 168 miles of line, and a preliminary description of the equipment is published.</p>   |           |           |
| <b>American Economic Association Discusses Public Utility Questions</b>   | - -       | <b>36</b> |
| <p>The twenty-sixth annual meeting of the association was held in Minneapolis, the opening session being on Dec. 27. The subject of public utility relationships occupied a large share of the attention of those in attendance.</p>  |           |           |
| <b>Methods of Mitigating Electrolysis from Street Railway Currents.</b>   |           |           |
| By E. B. ROSA AND BURTON McCULLOM   | - - - - - | <b>39</b> |
| <p>The authors, who are respectively chief physicist and associate physicist United States Bureau of Standards, Washington, D. C., discuss the most important methods of electrolysis mitigation and present definite conclusions regarding their relative merits.</p>  |           |           |
| <b>Shop and Equipment Practice</b>  | - - - - - | <b>46</b> |
| <p>A department devoted to short articles of especial interest to men in the power stations, shops and carhouses of electric railways.</p>  |           |           |

|   |    |
|---|----|
| Editorials .....  | 1  |
| Meeting of American Association for Labor Legislation ..... | 27 |
| London Letter.....  | 51 |
| News of Electric Railways.....                              | 52 |
| Company's Side of Indianapolis Arbitration...               | 52 |
| Annual Report of the Interstate Commerce Commission .....   | 53 |

|  |    |
|--|----|
| Increase in Accident Claims in Cleveland.....                              | 53 |
| Pennsylvania Railroad Contracts for Energy for Its Philadelphia Lines..... | 54 |
| Financial and Corporate.....   | 56 |
| Traffic and Transportation.....  | 59 |
| Personal Mention.....  | 60 |
| Construction News.....   | 62 |
| Manufactures and Supplies.....   | 64 |



# Summary

## (Westinghouse Brake Equipment and Facilities)

**Straight Air Brake** for single cars only, in very light slow-speed city service. As a matter of fact, some form of semi-automatic equipment is now invariably recommended even for single cars, because of the greater factor of safety provided. Furnished also as a "Featherweight" schedule.

**Semi-Automatic or Straight-Air Brake with Emergency Feature** for single cars, or motor car with one trailer trains, operating in city or suburban service. Furnished also as a "Featherweight" schedule.

**AMM Quick Service, Graduated-Release, High Emergency Pressure Automatic Brake** for trains of from one to five cars, operating in suburban or interurban service.

**AML Quick - Action, Quick-Service, Graduated - Release, High Emergency Pressure Automatic Brake** for trains of any length.

**Electro - Pneumatic Brake** for special subway and elevated road high-pressure traffic conditions, including various combinations of

the universal or "built-up" type of apparatus, as required.

**Governor Synchronizing System** for insuring simultaneous starting and stopping of all compressors in a train, insuring equal diversion of pump labor, and reducing maintenance.

**Signal Systems.** Pneumatic and electro-pneumatic, as required for single cars or trains of any length; reliable and positive in operation, as well as economical in air consumption.

**Air Compressors and Governors** particularly designed for the severe and exacting conditions of air brake service. Compact, light weight, reliable, easily maintained and built in a wide range of capacities.

**Special Shop Facilities** for repairs to brake apparatus of all kinds, insuring accurate restandardizing at a minimum cost.

**Engineers and Experts** at headquarters and in the field, for consultation, advice, supervision, or assistance in getting the very best results possible from the use of air brakes.



**Westinghouse Traction Brake Company**  
PITTSBURGH, PA.



# Westinghouse Type C Suspensions

THESE suspensions consist of a drop-forged steel bolt, insulated by "Westinghouse" compound, placed in a recessed metal body and held by a cap screwed tightly over it. The bolt has a hexagon shoulder at its lower end just above the thread, to which a wrench can be applied for screwing the suspension into the trolley ear.

We give below style numbers, diameters and weights of the bolts and complete suspensions most commonly used. We also manufacture a full line of suspensions for double trolley, and pipe-bracket suspensions.

### Insulated Suspension Bolts

| Style No. | Description             | Diam. Stud, Inches | Wt., Lbs. Per 100 |
|-----------|-------------------------|--------------------|-------------------|
| 45721     | Standard insulated bolt | $\frac{3}{8}$      | 68                |
| 45722     | Standard insulated bolt | $\frac{3}{4}$      | 74                |
| 88703     | Special insulated bolt  | $\frac{3}{8}$      | 55                |
| 88704     | Special insulated bolt  | $\frac{3}{4}$      | 60                |

The "Special" bolts are  $\frac{5}{8}$ -inch shorter than "Standard" and are recommended for 250-volt service only.

The above "Standard" and "Special" insulated bolts have head  $1\frac{1}{16}$ -inch diameter and  $\frac{3}{4}$ -inch high; the body of bolt is  $1\frac{3}{16}$ -inch diameter. The steel bolts are sherardized.

### Complete Suspensions and Bodies Only

Malleable iron castings sherardized.

All "complete" suspensions include "Standard" insulated bolt and leather washer.

| Style No. | Description              | Diam. Stud, Inches | Wt., Lbs. Per 100 |
|-----------|--------------------------|--------------------|-------------------|
| 52602     | Straight line, complete  | $\frac{3}{8}$      | 264               |
| 52603     | Straight line, complete  | $\frac{3}{4}$      | 270               |
| 52604     | Straight line, body only | ..                 | 196               |
| 54966     | Single curve, complete   | $\frac{3}{8}$      | 278               |
| 54967     | Single curve, complete   | $\frac{3}{4}$      | 284               |
| 54924     | Single curve, body only  | ..                 | 210               |
| 54928     | Double curve, complete   | $\frac{3}{8}$      | 345               |
| 54929     | Double curve, complete   | $\frac{3}{4}$      | 351               |
| 54930     | Double curve, body only  | ..                 | 277               |
| 54934     | Ceiling Form 1 complete  | $\frac{3}{8}$      | 216               |
| 54935     | Ceiling Form 1 complete  | $\frac{3}{4}$      | 222               |
| 54936     | Ceiling Form 1 body only | ..                 | 148               |
| 82742     | Ceiling Form 2 complete  | $\frac{3}{8}$      | 258               |
| 82743     | Ceiling Form 2 complete  | $\frac{3}{4}$      | 264               |
| 82747     | Ceiling Form 2 body only | ..                 | 190               |

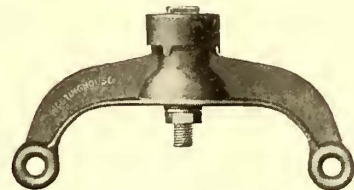
Catalog Section DS-840 describes the full line of Westinghouse Suspensions, Ears and Splicers.



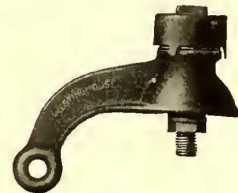
STYLE No. 45721



STRAIGHT LINE



DOUBLE CURVE



SINGLE CURVE



CEILING FORM 1



CEILING FORM 2

## Westinghouse Electric & Manufacturing Co.

Sales Offices in  
45 American Cities



East Pittsburgh,  
Pennsylvania ]

Member Society for Electrical Development. "Do It Electrically"



# The Publisher's Page

## ELECTRIC RAILWAY JOURNAL

**W**HILE horse cars were still a modern institution, the Street Railway Journal, since re-named Electric Railway Journal, was a powerful constructive force helping to build up the industry.

Since 1884, the Journal has continuously foreseen, recorded and discussed every important development.

The files of the Journal are the only complete record of the development of the electric railway industry from the hour of its birth.

Today the Journal is so intimately interwoven with the electric railway field throughout the world that it is an integral part of its very heart.

It enters the New Year better than ever equipped to add new laurels to its record through added service to subscribers and advertisers.

**McGraw Publishing Co. Inc..**

239 West Thirty-ninth Street, New York

Publishers of

Electric Railway Journal    Electrical World    Engineering Record  
Metallurgical and Chemical Engineering





## A Safe Grade Crossing

Protected with National Trolley Guard; the chances of cars being stalled in the path of a locomotive due to trolley jumping are reduced to the absolute minimum.

Guard is easily installed and requires little maintenance.

Is made of open mesh which offers practically no resistance to locomotive exhausts or heavy winds. Will not collect snow or ice to any extent.

OVER 19 MILES IN OPERATION

*Patented—For Sale Only By*

### The Ohio Brass Company

Mansfield, Ohio



# MACALLEN

## Overhead Line Material

We have been manufacturing Overhead Line Material since 1891. We manufacture several "Patented" devices in addition to all Standard types.

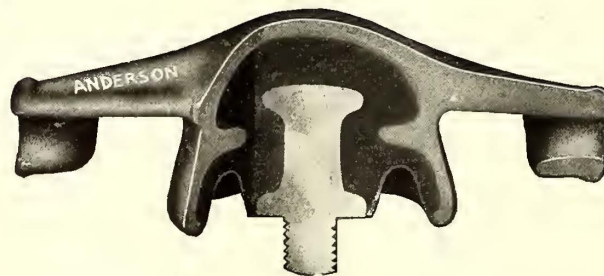
We would be pleased to furnish catalogues and quotations upon request.

**THE MACALLEN CO.**  
Macallen and Foundry Sts., BOSTON

## Equip Your Lines With Suspensions That Hold

One Piece Malleable Iron Shell combines mechanical strength with light weight.

Mechanical Injury Impossible owing to the overlapping skirt.



Drop Forged Steel Stud held firmly in place by AETNA Insulation.

Specially curved out-rigger ears take a firm hold on span wire.

We have spent more than twenty years in the manufacture and perfection of electric railway supplies.

Our experience coupled with the manufacturing facilities, place us in a position to make prompt shipments.

Many of the principal electric lines of America and abroad have adopted our products as standard. Catalog No. 8, Pages 1-35 shows why.

**Albert & J. M. Anderson Mfg. Co.**

289-293 A Street

Established 1877

Boston, Mass., U. S. A.

**BRANCHES:**

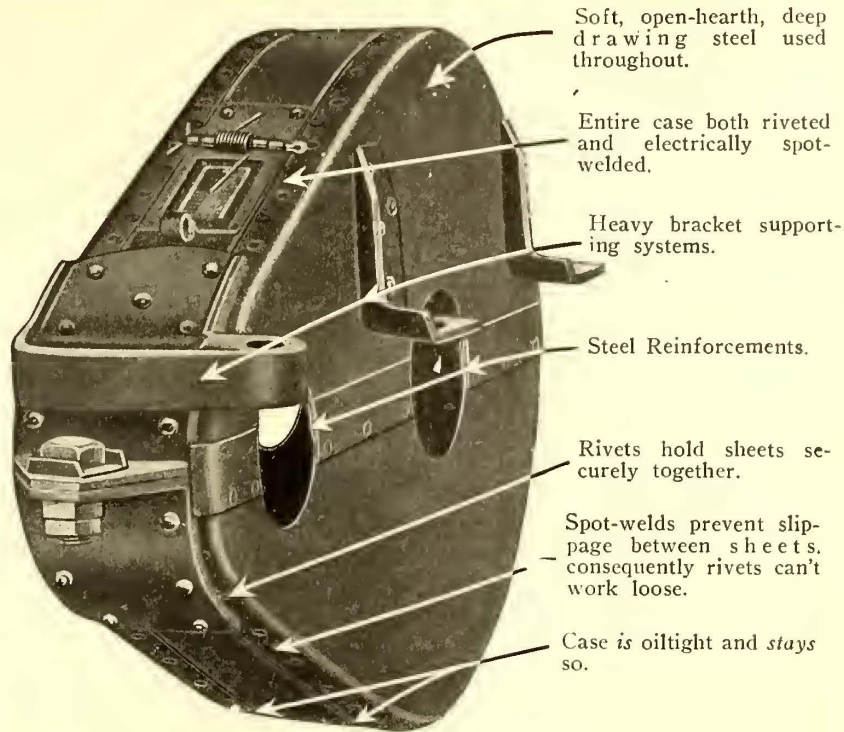
New York, 135 Broadway  
Chicago, 105 So. Dearborn Street  
Philadelphia, 427 Real Estate Trust Bldg.  
London, Moorgate Station Chambers

**AGENCIES:**

St. Louis, T. C. White.  
Kansas City, Moss & Satterlee.  
San Francisco, Eccles & Smith Co.  
Glens Falls, N. Y., John G. Phillips.  
Denver, Northwestern Supply Co.







Soft, open-hearth, deep drawing steel used throughout.

Entire case both riveted and electrically spot-welded.

Heavy bracket supporting systems.

Steel Reinforcements.

Rivets hold sheets securely together.

Spot-welds prevent slippage between sheets, consequently rivets can't work loose.

Case is oiltight and stays so.

## ***Why Not Have This For Your Gear Case?***

Just let's suppose that you had Keystone Steel Gear Cases installed on all your cars.

Their steel—the best quality of deep-drawing, open hearth sheet steel that can be bought—would absorb perfectly all vibration transmitted to it; and, because of its peculiar qualities, crystallization or fracture would be practically eliminated.

Their cast eye brackets and hot pressed steel side brackets on side suspended cases, both securely riveted to the case and securely reinforced with special metal sheets, would afford rigid supporting systems. Systems that would support the case and give long life.

Their process of riveting and electrical spot-welding which holds the sheets of metal together would assure you that severe vibration would not loosen up the seams and so weaken the case. The Keystone is a tight, rigid case in the first place and a case that stays tight and rigid.

Then why not have Keystone's as your cases? Isn't it worth while? Well worth while? And especially when we give you the opportunity to prove all this by absolutely guaranteeing every Keystone Case for a year?

Get and use "The Case of Service."

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

*Manufacturer of Railway Material and Electrical Supplies*

PHILADELPHIA  
17th and Cambria Streets

NEW YORK  
Hudson Terminal

CHICAGO  
417 So. Dearborn Street





## The STANDARD for RUBBER INSULATION

Railway Feed Wires insulated with OKONITE are unequaled 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 WEATHER-  
PROOF WIRES—CANDEE PATENTED  
POTHEADS.

*Samples and Estimates on Application*

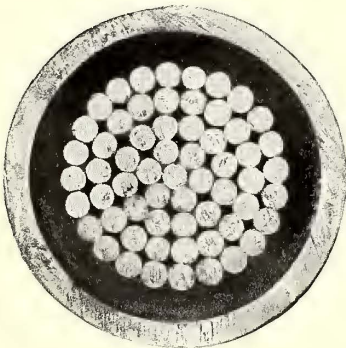
**THE OKONITE COMPANY, 253 Broadway, NEW YORK**

CENTRAL ELECTRIC CO., Chicago, Ill., General Western Agents

F. D. Lawrence Electric Co., Cincinnati, O.

Novelty Electric Co., Philadelphia, Pa.

Pettingell-Andrews Co., Boston, Mass.



## UNDERGROUND Power and Lighting Cables

COMPLETE INSTALLATIONS FURNISHED

### TROLLEY WIRE

in round, grooved and figure 8 sections supplied promptly.

### MAGNET WIRE

for field and armature—round, square and rectangular.

### FEEDER WIRES

and cables—Star Brand Weatherproof Insulation, made to wear—to wear well.

### GALVANIZED IRON WIRE

and strands.

## 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 Ave. So.





# TOUGHNESS

## In "Phono-Electric" Wire

**T**OUGHNESS in trolley wire is a quality not defined by either tensile strength or elasticity, but—a power to resist bending, kinking, wrenching, sudden blows or slow distortions, without giving way.

**"Phono-Electric" is a tough wire, and it is a wire that'll give Long Service Life.**

It is a wire you can absolutely depend upon—does not rely upon a hardened skin for its strength. It is uniform throughout its cross-section.

No matter what your requirements may be—Catenary, Cross-Span or Bracket Construction—no matter how severe the service—"Phono-Electric," a strong, tough wire, will save money on that service giving several times the life of hard drawn copper.

Put up a test section—make comparisons.

## BRIDGEPORT BRASS COMPANY

BRIDGEPORT

CONNECTICUT

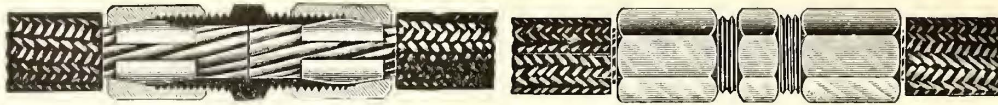
North American Copper Company  
164 Front Street, New York, U. S. A.



Pierson, Roeding & Company  
San Francisco Portland Seattle Los Angeles

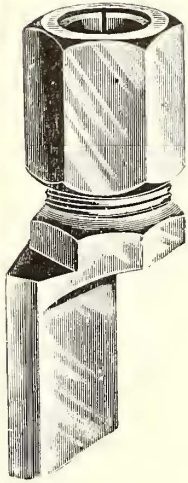
The Equipment & Engineering Company  
2 and 3 Norfolk St., Strand, W. C., London, England

# DOSSERT CONNECTORS



2-way, Type A, detail

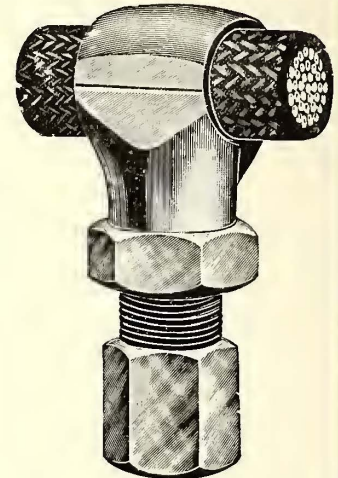
2-way, Type A, completed joint



Dossert Lug

## For the Electric Railway Power and Sub-Station

They stand for **ECONOMY** in **TIME** and **LABOR** of installation and **EFFICIENCY** in **SERVICE** on connections to switchboards, busbars, switch and control gear, generator, converter and transformer apparatus, sectionalizing cases for signal installations, car wiring and all shop wiring and apparatus.



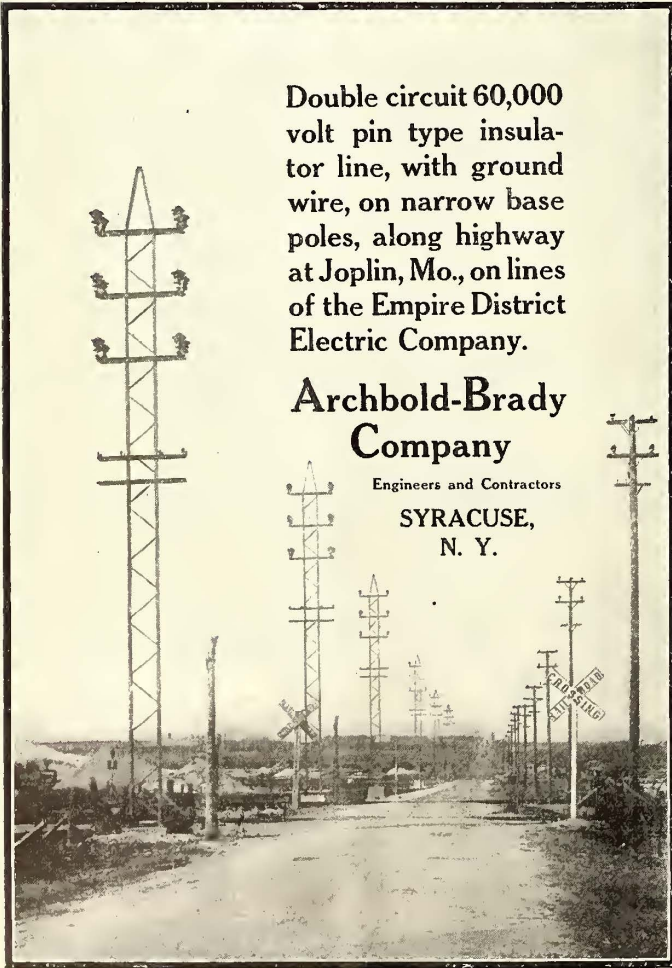
Cable Tap

## Dossert & Company

H. B. LOGAN, President

242 West 41st Street

NEW YORK



Double circuit 60,000 volt pin type insulator line, with ground wire, on narrow base poles, along highway at Joplin, Mo., on lines of the Empire District Electric Company.

### Archbold-Brady Company

Engineers and Contractors

SYRACUSE, N. Y.

### Let us send you this new Bulletin

It is filled with valuable information for the buyer and user of cable terminals. There are tables of dimensions, weights, voltages, etc., that should be in your files. Note carefully the following:



#### Table of Contents

- General Description of D. S. Terminals
- Regular Types of D. S. Terminals
- Inner Seal Terminals
- Wiped Joints vs. Clamped Joints
- Separation and Insulation of Conductors
- Insulating Compounds
- Terminals for Ordinary Service
- Terminals for Special Service
- Instructions for Ordering and Installing

*A card to our nearest office will bring your copy of this book. Write now.*

### Standard Underground Cable Co. Pittsburgh, Pa.

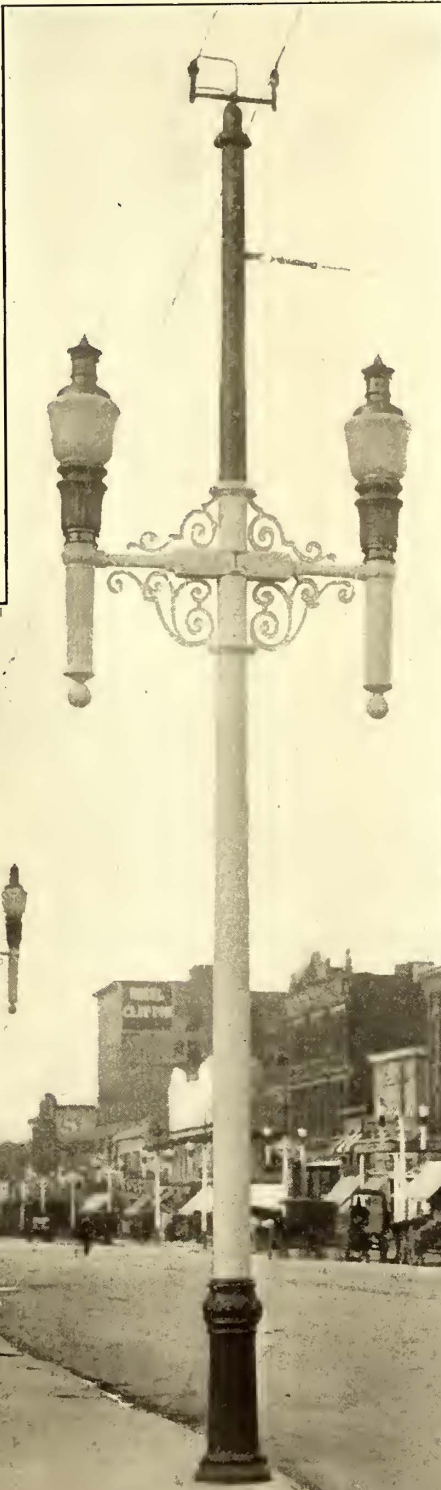
New York Chicago  
Boston Philadelphia San Francisco St. Louis  
For Canada: Standard Underground Cable Co. of  
Canada, Limited, Hamilton, Ont.



# Here's a Case Where City and Railway Both Benefited

**Elreco  
Combination  
Railway  
and  
Lighting  
Poles  
and Pole  
Fixtures**

are made in  
many styles  
for arc and  
tungsten  
lighting



There are no unsightly trolley poles on the street—no unsightly arc lamp poles.

The Elreco Combination Lighting and Trolley Poles solved the problem to the benefit of all concerned.

They saved the cost of lamp standards, saved the expense of underground construction, saved the obstructing of the curb line.

Our catalog "D" will show you the designs of fixtures that are being pretty generally adopted.

Write for a copy.

## Electric Railway Equipment Co.

Cincinnati, O

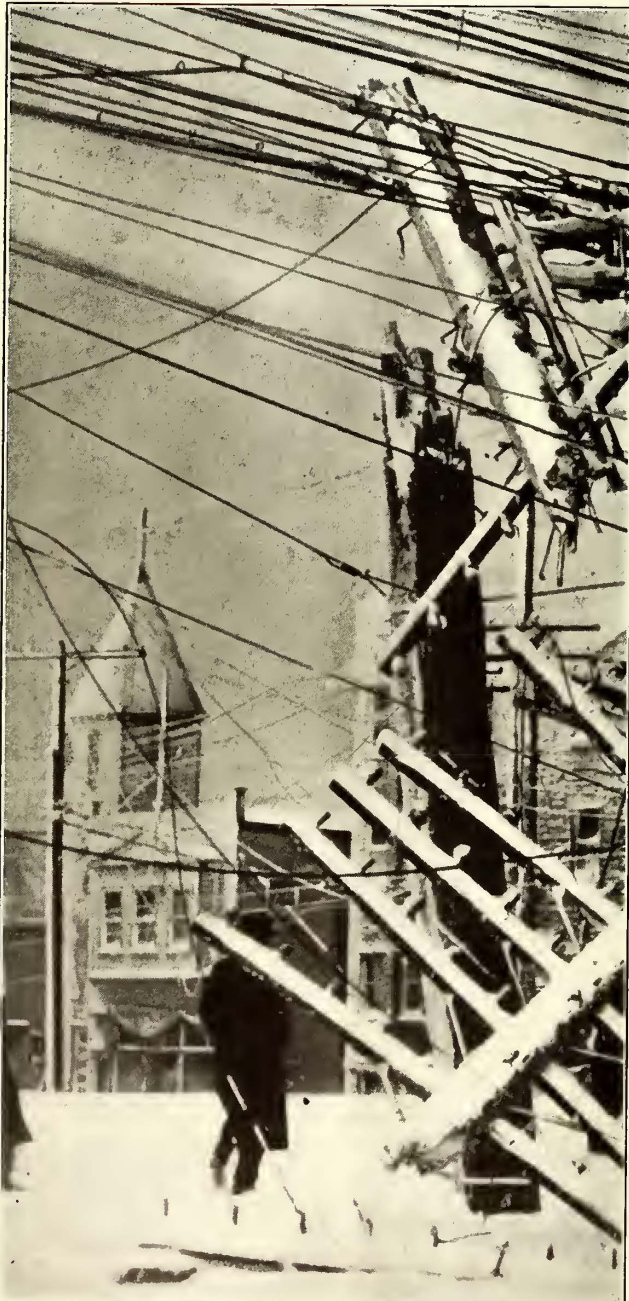
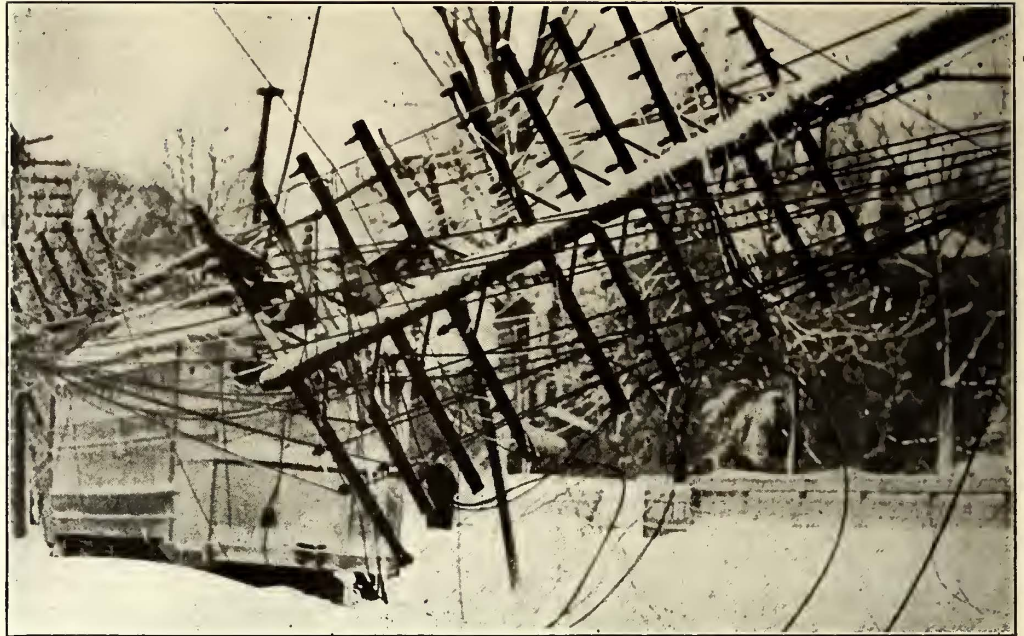
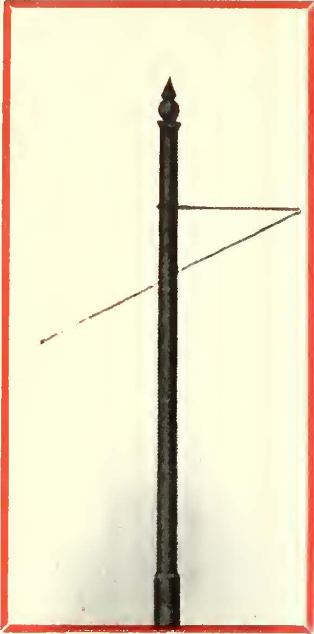
30 Church St.

New York



NIAGARA FALLS, N. Y., INSTALLATION





# Cleveland

¶ These photographs give an idea of the extent to which Cleveland suffered as a result of the recent blizzard.

¶ They also show how Cleveland **profited** wherever "NATIONAL" Tubular Steel Poles were installed as electric railway poles.

¶ They also bear evidence of the oft-repeated statement: "NATIONAL" Tubular Steel Poles are practically indestructible and require minimum maintenance expense."

## NATIONAL TU

General Sales Offices:

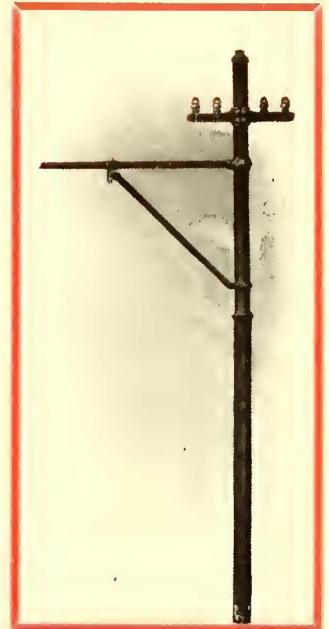
ATLANTA  
BOSTON  
CHICAGO

DISTRICT SALES

DENVER  
KANSAS CITY  
NEW ORLEANS  
NEW YORK

Pacific Coast Representatives: { San Francisco—Los Angeles  
U. S. Steel Products Co. { Seattle—Portland



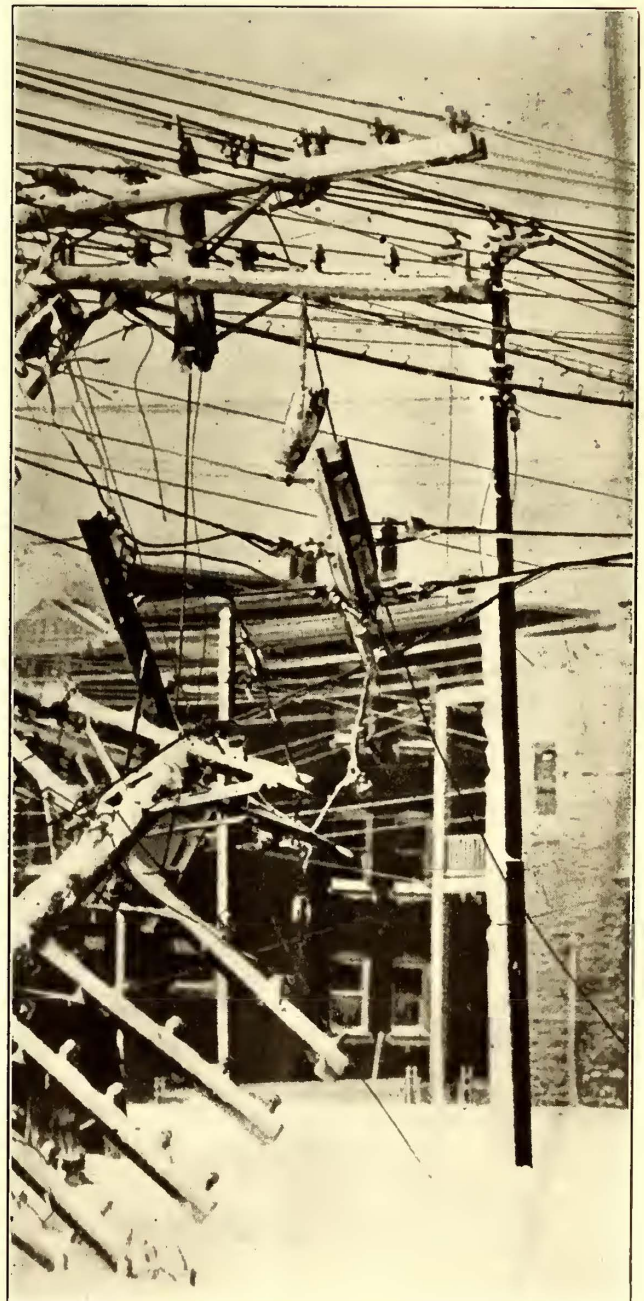


# Profited

“NATIONAL” Tubular Steel Poles while being a decided artistic civic improvement, possess that equally important quality:—Ability to meet abnormal conditions such as those at Cleveland.

All “NATIONAL” poles are uniform in characteristics. From ore to finished product all processes are completed in one plant. This is an assurance of uniformity.

Bulletin 14A is well worth writing for.



## BE COMPANY

Frick Bldg., Pittsburgh

OFFICES:

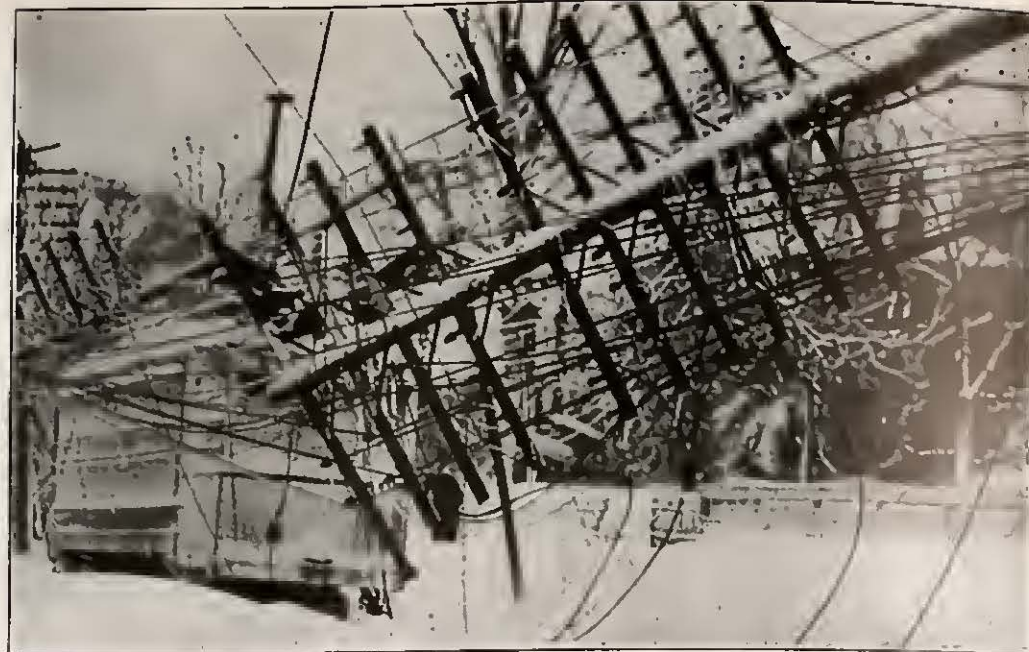
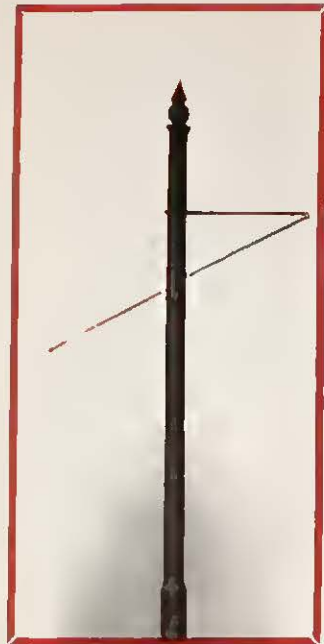
PHILADELPHIA  
PITTSBURGH  
ST. LOUIS

ST. PAUL  
SALT LAKE CITY

Export Representatives: U. S. Steel Products Co.,  
New York City







## Cleveland

¶ These photographs give an idea of the extent to which Cleveland suffered as a result of the recent blizzard.

¶ They also show how Cleveland **profited** wherever "NATIONAL" Tubular Steel Poles were installed as electric railway poles.

¶ They also bear evidence of the oft-repeated statement: "NATIONAL" Tubular Steel Poles are practically indestructible and require minimum maintenance expense."

## NATIONAL TUBULAR STEEL

General Sales Offices:

|                |             |
|----------------|-------------|
| DISTRICT SALES |             |
| ATLANTA        | DENVER      |
| BOSTON         | KANSAS CITY |
| CHICAGO        | NEW ORLEANS |
|                | NEW YORK    |

Pacific Coast Representatives: San Francisco—Los Angeles  
U. S. Steel Products Co. | Seattle—Portland

## Profited

¶ "NATIONAL" Tubular Steel Poles while being a decided artistic civic improvement, possess that equally important quality:—Ability to meet abnormal conditions such as those at Cleveland.

¶ All "NATIONAL" poles are uniform in characteristics. From ore to finished product all processes are completed in one plant. This is an assurance of uniformity.

¶ Bulletin 14A is well worth writing for.

## NATIONAL TUBULAR STEEL COMPANY

Frick Bldg., Pittsburgh

OFFICES:

|              |                |
|--------------|----------------|
| PHILADELPHIA | ST. PAUL       |
| PITTSBURGH   | SALT LAKE CITY |
| ST. LOUIS    |                |

Export Representatives: U. S. Steel Products Co.,  
New York City





WESTERN DOUGLAS FIR

# CEDAR POLES CROSS ARMS

THE LINDSLEY BROTHERS COMPANY

Peyton Building Spokane, Washington

"GOOD POLES QUICK"

**HENDERSON LUMBER CO.**  
 1710 COMMONWEALTH BLDG., PITTSBURGH, PA.

**POLES TIES**

Chestnut, Any Length Oak and Chestnut

*Get our quotation on your next requirements*

**POLES WESTERN CEDAR PILING**

We brag about the SERVICE we give

**B. J. CARNEY & CO.**  
 E. B. BRANDE, Manager, M. P. FLANNERY, Manager,  
 819 Broad Street, Grinnell, Ia. 606 Paulsen Bldg., Spokane, Wash.  
*Commit us to memory.*

**INTERNATIONAL CREOSOTING & CONSTRUCTION CO.**

ADDRESS ALL COMMUNICATIONS TO  
 OFFICE GALVESTON TEXAS

WORKS - BEAUMONT, TEX. TEXARKANA, TEX.

Capacity 100,000,000 FEET B.M. Per Annum

SEND FOR PAMPHLET

## WOOD PRESERVING

When the thunder crashes  
 pin your faith on



## Victor Insulators

It is a fact that the representative transmission installations in this country, and abroad, depend upon them because they are dependable. Try them—they'll make good.

There's an "Insulator Book" here for you too.

**The Locke Insulator Mfg. Co.**  
**Victor, N. Y.**  
 New York Office, 50 Church Street

4 1909

## HY-BOIL-OIL

A High-grade Carbolinum,  
 35 CENTS A GALLON Why Pay More?

**The German Products Association**  
 (Die Deutsche Produkten Vereinigung)  
 112 Pine Street St. Louis, Mo., U. S. A.

Michigan Western

## CEDAR POLES


POSTS, TIES AND PILING

We use C-A-Wood-Preserver in Treating  
**The Valentine-Clark Co.**  
 Minneapolis, Minn. St. Maries, Idaho

**NAUGLE** POLE & TIE CO.

5 SO. WABASH AVE.  
 CHICAGO, ILL.

The Trinity in Poles  
 "Service-Price-Quality" **POLES**



**"C-A-WOOD-PRESERVER"**  
 is the highest grade Carbolinum, Creosote or Wood Preserver produced. For information write

**C-A-Wood-Preserver Company**  
 56 Liberty St., 807 Wright Bldg.,  
 New York. St. Louis



# Aside from Signal Reliability the Thing that Interests You Most is

## PRICE



The first question you ask after being assured of the absolute reliability of a given signal is "What does it cost and how much to maintain."

Now, signal costs vary, depending upon the service you ask of them.

If it's for 60 m.p.h. service, you pay top-notch price.

If it's for service under 30 m.p.h. you can get bottom-notch price because the Chapman Automatic is designed for such speeds. If your speed comes within the scope of the Chapman—our literature will interest you. Write us for it and for operating data regarding Chapman signals.

**CHARLES N. WOOD CO.,** General Sales Agents, **BOSTON**  
79 Milk Street,

## An Assurance of Uninterrupted Service



is best secured by a careful selection of the transmission line insulators. It is here that breakdowns are most likely to occur.

### Hemingray Insulators

by reason of their continued use on important transmission lines have demonstrated the soundness of Hemingray design. The teats on the petticoat attract water on the outer and inner surfaces into drops—preventing the creeping of moisture on insulators and pins. The line is complete and the catalog shows it. Have you a copy?

### Hemingray Glass Company

Established 1848 }  
Incorporated 1870 } Covington, Ky.

Factories - - MUNCIE, INDIANA



## The Protective Signal Manufacturing Co.

1421-39 18th Street, Denver, Colorado

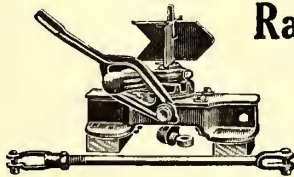
We have decreased the original cost of equipment, installation and maintenance. We have insured the greatest safety adopted to either Steam or Electric Roads. We do not in any way interfere with the track or track circuits. Simplicity and efficiency in equipment, installation and minimum cost of maintenance assured. We protect any kind of crossings, any complicated or conflicting movements. **No track circuits, bond wires, insulated joints.** No interference with any existing signals. Our device can be applied to the control of all electric circuits. Correspondence solicited and satisfaction guaranteed—WRITE US.

## Ramapo Iron Works

Main Office, Hillburn, N. Y.

New York Office: 30 Church St.

**AUTOMATIC SWITCH STANDS — CROSSINGS GUARD RAIL CLAMPS SWITCHES, FROGS, Etc.**



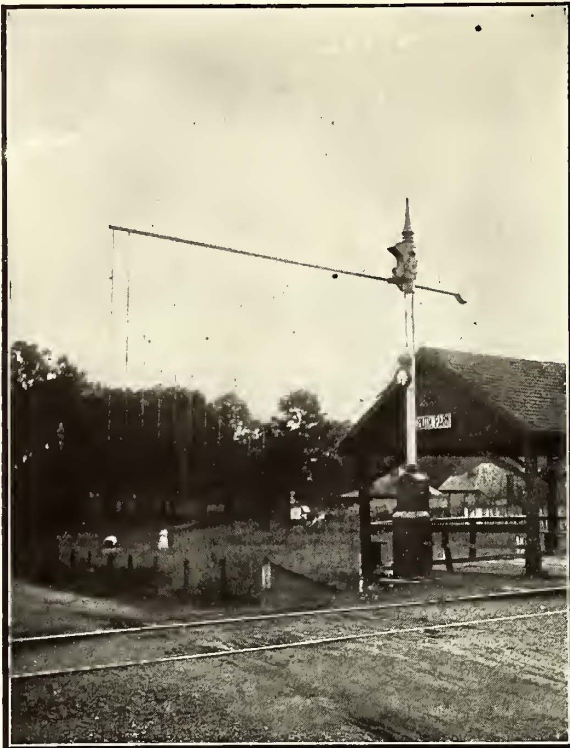
## 1850 KERITE 1914

The performance record of Kerite, covering over half a century, is absolutely unequalled in the whole history of insulated wires and cables.

## KERITE INSULATED WIRE & CABLE COMPANY

General Offices, 30 Church Street, New York City Western Office, Peoples Gas Building, Chicago





## Protection That's Right By Day and By Night

A Bell  
 A Semaphore  
 A Flexible Barrier  
 A Moving Arm

A Bell  
 A Red Light  
 Illuminated Semaphore  
 Illuminated Barrier

Day and night grade crossing protection of an unusual order is obtained automatically—dependable protection that saves serious accidents—by the use of the

## COOK Automatic Signal Gate

This four-fold protection costs you little or no more than ordinary signals.

The COOK connects to circuit the same as an automatic signal—falls to danger position as soon as a car or train is in the circuit, and raises automatically when it has passed. No danger of “pocketing” traffic with this gate.

The COOK is simply constructed, durable and can be maintained at low cost.

Send us a sketch of your troublesome crossings and we will provide plan to afford adequate protection. Write for details today.

**The Cook Railway Signal Co.**  
 Gas & Electric Bldg.                      Denver, Colo.

### ANNOUNCEMENT

The Nachod Signal Co., of Philadelphia, has been re-organized, and on and after January 1st, 1914, will be known as the

**Nachod Signal Co., Inc.,**  
 50 Church St., New York City

Hereafter all our apparatus, comprising Signals, Contactors, Highway Crossing Bells and other contemplated electric railway safety devices, will be manufactured by the

**Hall Switch & Signal Co.,**  
 50 Church St., New York City

Their reputation as engineers and their facilities as manufacturers, of Automatic Signals and Electric Interlocking for the leading steam railroads in the United States, coupled with the broad Electric Railway Signal experiences of the Nachod Signal Co., guarantee our customers the highest type of Electric Railway Signal Service.

Remember  
*Nachod Spells Safety.*

## ALUMINUM Railway Feeders

And all kinds of Electrical Conductors

Aluminum feeders are less than one-half the weight of copper feeders and are of equal conductivity and strength. If insulated wire or cable is required, high-grade insulation is guaranteed. Write for prices and full information.

Aluminum Company of America  
 PITTSBURGH, PA.

## ROEBLING

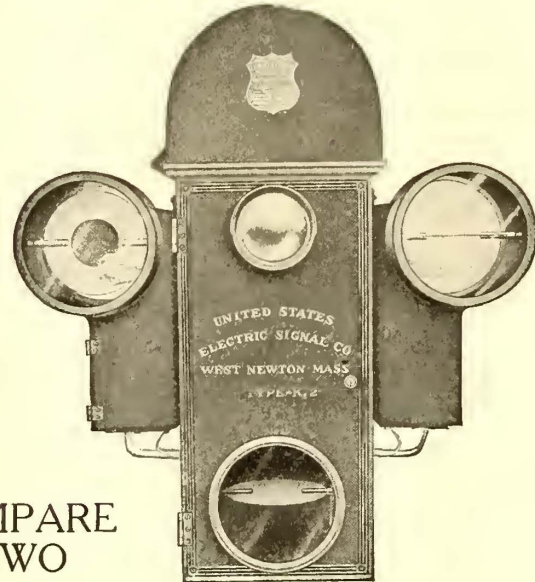
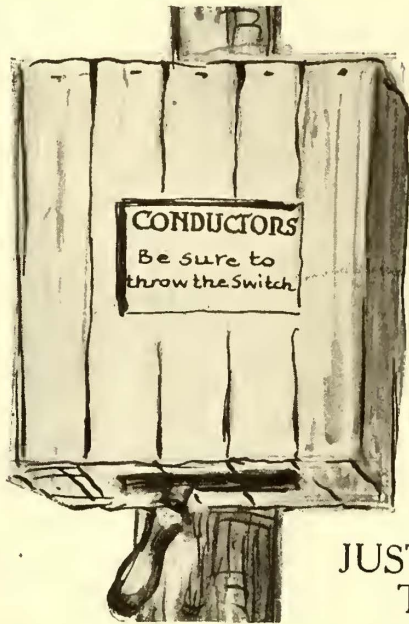
Trolley Wire

Wire Rope                      Wire Strand

**John A. Roebling's Sons Company**  
 TRENTON, N. J.



# Which for You



JUST COMPARE  
THE TWO

This is designed to give safety and does give it under favorable circumstances,

This gives complete safety under any and every condition.

This gives a certain degree of head on protection.

This gives complete facing and following protection.

The hand and mind of platform labor govern the protection you get from this.

The car movement alone governs the movement of this signal. It is a recorder of car movements.

The crews don't like these signals because they make more work—and nasty work on stormy days.

The crews like these signals because they are relieved of trouble and uncertainty and can make time.

The passengers don't like these because they produce car delays.

The passengers like these because they speed up traffic—they have an advertising value.

Then who does like these—do you?

Do you know how little more in first cost these signals are and how much less in eventual cost?

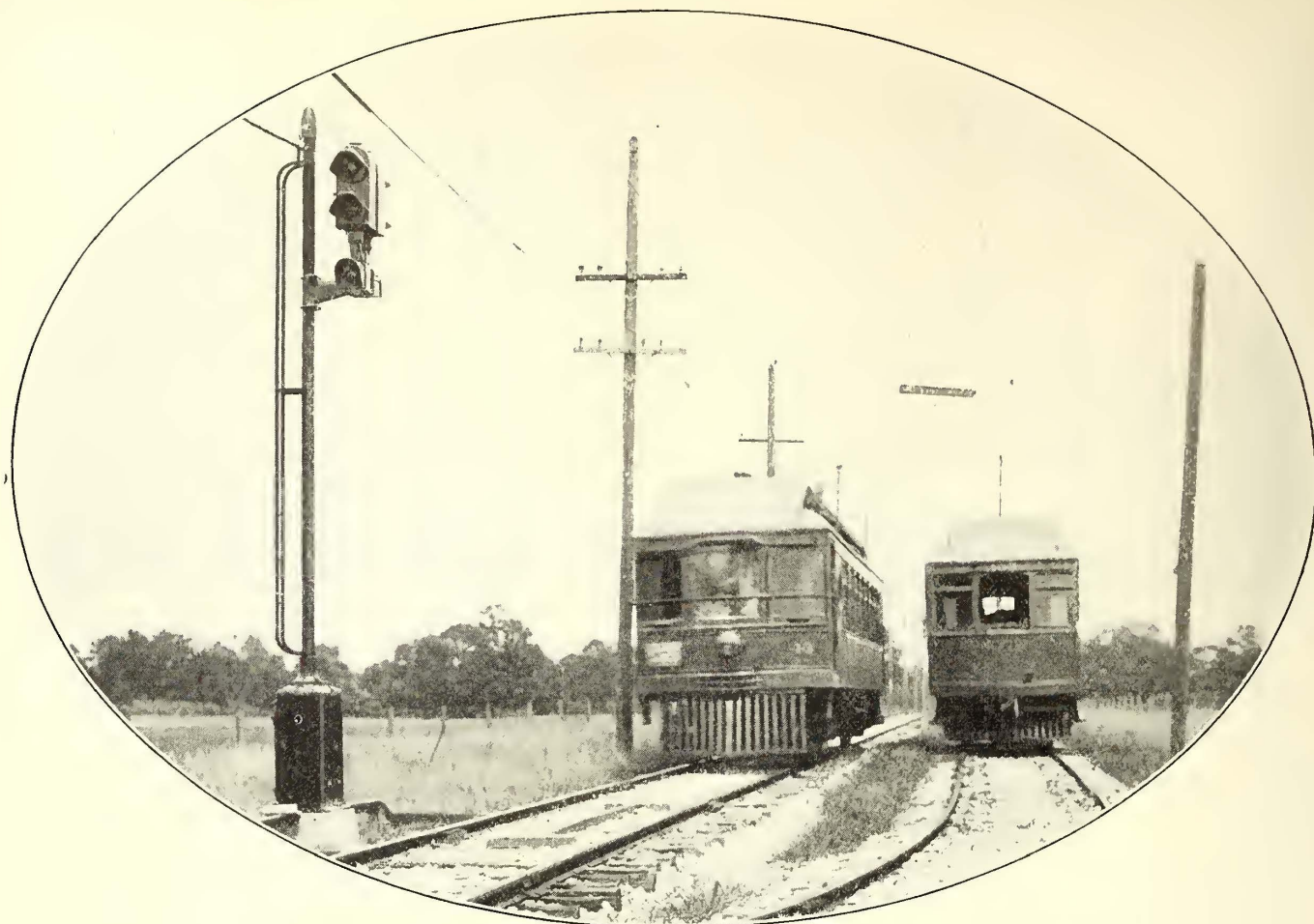
Ask us to write you showing the economical and easy way to replace  
**THESE** WITH **THESE**

United States Electric Signal Company

West Newton, Massachusetts

Foreign Representatives:

Quilliam Brothers, Cleggs Court, Chapel Street, Salford, England



## Ever Ask Yourself These Questions?

“How would a system of Continuous Track Circuit Automatic Block Signals fit the conditions on our road?”

“What would its cost be?”

“What would its maintenance amount to?”

“What financial benefits would accrue from its adoption?”

“How would the effect differ from ordinary signals?”

These are perfectly logical questions—but have you had them answered?

We will, without the slightest obligation on your part, outline a plan which you can keep before you and which will give you in black and white just what to invest and just what returns such investment will make possible.

A line of inquiry brings you the details.

*“ Safety First ”*

**GENERAL RAILWAY SIGNAL COMPANY**  
**ROCHESTER**  
 QUALITY **N.Y.**



Canadian Agency  
 General Railway Signal Company  
 of Canada, Limited  
 Lachine, P. Q. Winnipeg, Man.

New York  
 Liberty Tower Building  
 55 Liberty St.

Chicago  
 Peoples Gas Building  
 122 So. Michigan Ave.

San Francisco  
 Monadnock Building  
 681 Market St.



Australasian Agency  
 R. W. Cameron & Company  
 Sydney, N. S. W. Australia  
 16 Spring Street





## It Meets the Emergencies of Operation

Railway Officials who have made a personal first-hand investigation of the regular daily service given by the

### Simmen System of Signaling

have universally expressed their appreciation of the opportunities which the Simmen System gives for the handling of trains in addition to its fundamental advantage of complete safety.

In making this investigation of results achieved under regular operating conditions, these men have found that the Simmen System produces elements of safety and savings of time in emergencies which are of the utmost value.

They have found that work trains, extras and specials can be put through with remarkable ease and efficiency.

They have found that the certain knowledge established of the location of all trains and the ease and simplicity of reaching train crews at any time, provides an elasticity of traffic handling that is remarkably efficient.

The demonstration of these facts is being made every day in the regular course of business on the railroads where the system is in operation, and the results produced can be readily verified and investigated by any Railway Official who is interested in securing complete safety, with elastic and efficient operation.

**THE NORTHEY-SIMMEN SIGNAL CO., Limited**

BUFFALO, N. Y.

INDIANAPOLIS, IND.

TORONTO, CANADA



**Don't Use  
"OIL"  
On the Signals**

**Use  
*Galena Signal Oil***

When you place so much dependence upon signals—and when so much depends upon the continuity of signal service—it doesn't pay to take any chances on so small a matter as the signal oil.

You take no chances with Galena oil for signals. It does not crust the wick, nor smoke the chimneys, and its candle power is constant—the light is as clear and strong with the last drop as with a full fount.

So little of the Galena oil need be used that it is highly economical.

It acts as a safety factor on your safety equipment.

Write us now for particulars.



***Galena-Signal Oil Co.***  
*Franklin, Pa.*



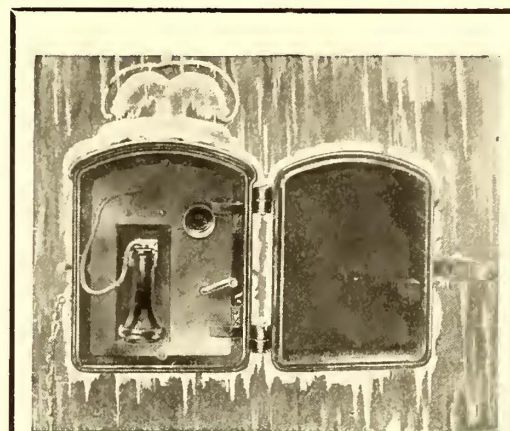


“Last Year’s Big Storms  
 Never Bothered  
 Our  
*Western Electric*  
 IRON BOX  
 SIDING TELEPHONES

a bit,” said the superintendent of telegraph of a big Middle West railroad.

“Every single one of them stayed on the job all the time and we had heavy sleet, rain and snow often enough to put any ordinary telephone out of Business.

“They helped us keep close to schedule when the going was bad.”



The  
 No. 1336 Type  
 IRON BOX TELEPHONE.

Double door construction—moisture proofed apparatus—keep telephones dry and workable in any weather.

What Are Your Requirements?

Let Us Quote You.

**WESTERN ELECTRIC COMPANY**

*Manufacturers of the 7,000,000 “Bell” Telephones*

New York  
 Boston  
 Philadelphia  
 Pittsburg  
 Buffalo  
 Cleveland

Atlanta  
 Savannah  
 Richmond  
 St. Louis  
 Dallas  
 Houston

Chicago  
 Milwaukee  
 Cincinnati  
 Indianapolis  
 Minneapolis  
 St. Paul

Kansas City  
 Oklahoma City  
 Denver  
 Omaha  
 Salt Lake City  
 Los Angeles

San Francisco  
 Oakland  
 Portland  
 Seattle  
 Vancouver  
 Edmonton

Montreal  
 Toronto  
 Winnipeg  
 Calgary  
 Johannesburg  
 Sydney

London  
 Antwerp  
 Berlin  
 Paris  
 Rome  
 Tokyo

**EQUIPMENT FOR EVERY ELECTRICAL NEED**

*Member Society for Electrical Development.*

“DO IT ELECTRICALLY”



# “The Best Article We Ever Purchased”

THE ONLY  
RENEWABLE  
BROOM

—PURCHASING AGENT OF A  
LARGE MIDDLE WEST ROAD

The “Royal Worcester” renewable broom pleased this purchasing agent because it enabled him to save a lot of broom cost last winter.

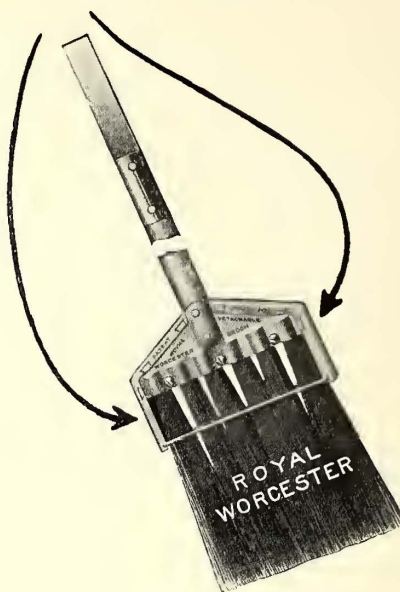
The Way Department liked the broom because they found that tempered round wire inserts cleaned the switches better than fibre or rattan which lose their sweeping qualities when wet.

The switch sweepers liked the broom because they could do the work *quicker* and *easier*.

It is seldom you are afforded the opportunity to get better work done at less cost.

The Royal Worcester broom has a double sherardized pressed steel head that lasts indefinitely and is furnished with or without chisel points.

Get our prices and proposition.



Worcester Brush & Scraper Co.  
WORCESTER, MASS.

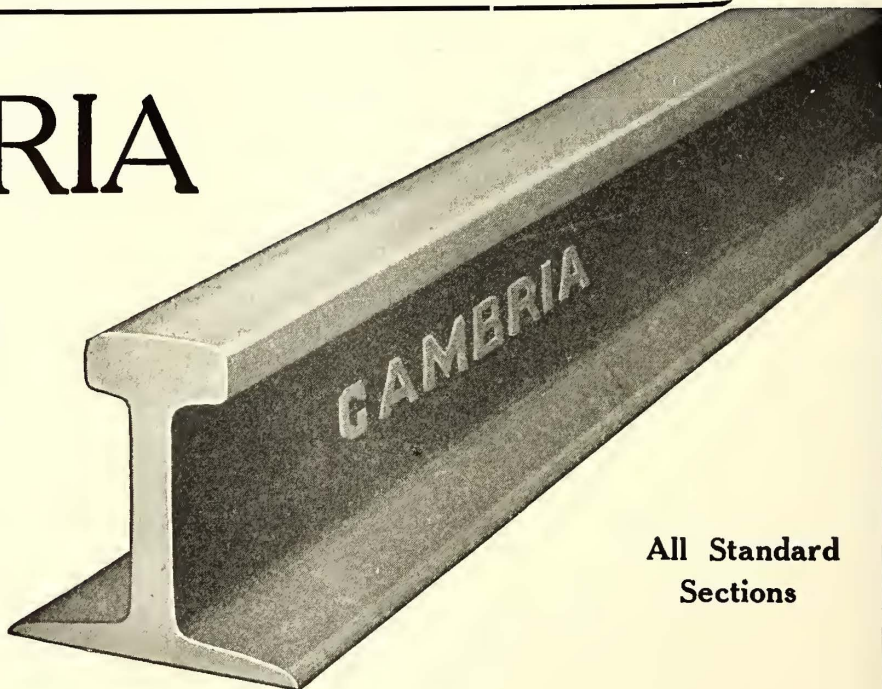
WHEN WORN YOU SCRAP  
ONLY THE INSERTS—RE-  
NEWED FOR A QUARTER  
THE COST OF A CHEAP  
NEW BROOM

# CAMBRIA RAILS

Open Hearth Bessemer

BOLTS AND NUTS

100%  
Splice Bars



All Standard  
Sections

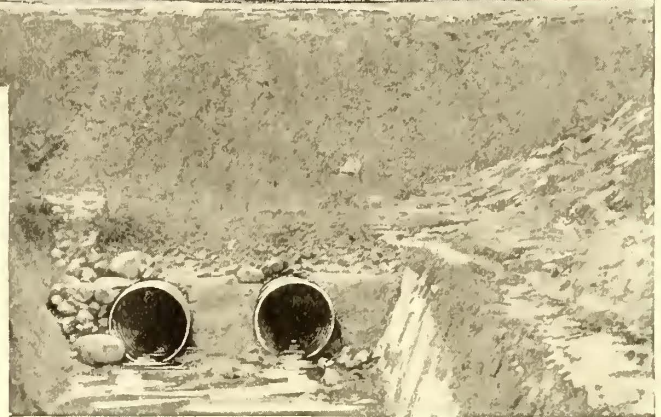
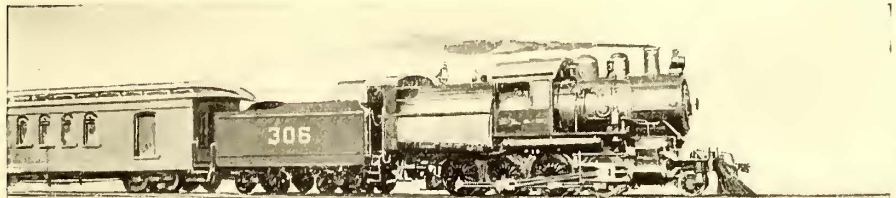
CAMBRIA STEEL COMPANY  
JOHNSTOWN, PA.

Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Tacoma, Montreal





Purity



Permanence



# The Best Evidence of the Superior Merit of American Ingot Iron Corrugated Culverts

is their widespread use in the electric and steam railway fields. The great strength and simplicity of installation of American Ingot Iron Corrugated Culverts have been found to be extremely valuable factors for the railway companies, as they permit the carrying on of culvert laying with a minimum of expense and delay to traffic. Their material is the purest, most even and most durable iron on the market. Write the nearest manufacturer for particulars and prices on

*American Ingot Iron Corrugated Culverts, (Full Circle and Segmental) Plates, Sheets, Roofing and Formed Products*

- |  |  |   |   |
|--|--|---|---|
| <p><b>Arkansas, Little Rock</b><br/>Dixie Culvert &amp; Metal Co.<br/><b>California, Los Angeles</b><br/>California Corrugated Culvert Co.<br/><b>California, West Berkeley</b><br/>California Corrugated Culvert Co.<br/><b>Colorado, Colorado Springs</b><br/>Colorado Ingot Iron Pipe &amp; Flume Co.<br/><b>Delaware, Clayton</b><br/>Delaware Metal Culvert Co.<br/><b>Florida, Jacksonville</b><br/>Dixie Culvert &amp; Metal Co.<br/><b>Georgia, Atlanta</b><br/>Dixie Culvert &amp; Metal Co.<br/><b>Illinois, Bloomington</b><br/>Illinois Corrugated Metal Co.<br/><b>Illiana, Crawfordsville</b><br/>W. Q. O'Neill Co.<br/><b>Indiana, Princeton</b><br/>W. Q. O'Neill Co.<br/><b>Iowa, Des Moines</b><br/>Iowa Pure Iron Culvert Co.<br/><b>Iowa, Independence</b><br/>Independence Corrugated Culvert Co.</p> | <p><b>Kansas, Topeka</b><br/>The Road Supply &amp; Metal Co.<br/><b>Kentucky, Buechel</b><br/>Kentucky Culvert Co.<br/><b>Louisiana, New Orleans</b><br/>Dixie Culvert &amp; Metal Co.<br/><b>Maryland, Havre de Grace</b><br/>J. N. Spencer.<br/><b>Massachusetts, Palmer</b><br/>New England Metal Culvert Co.<br/><b>Michigan, Bark River</b><br/>Bark River Bridge &amp; Culvert Co.<br/><b>Michigan, Lausing</b><br/>Michigan Bridge &amp; Pipe Co.<br/><b>Minnesota, Minneapolis</b><br/>Lyle Corrugated Culvert Co.<br/><b>Minnesota, Lyle</b><br/>Lyle Corrugated Culvert Co.<br/><b>Missouri, Moberly</b><br/>Corrugated Culvert Co.<br/><b>Montana, Missoula</b><br/>Montana Culvert Co.<br/><b>Nebraska, Lincoln</b><br/>Lee Arnett Co.</p> | <p><b>Nebraska, Wahoo</b><br/>Nebraska Culvert &amp; Mfg. Co.<br/><b>Nevada, Reno</b><br/>Nevada Metal Mfg. Co.<br/><b>New Hampshire, Nashua</b><br/>North East Metal Culvert Co.<br/><b>New Jersey, Flemington</b><br/>Pennsylvania Metal Culvert Co.<br/><b>New York, Auburn</b><br/>Pennsylvania Metal Culvert Co.<br/><b>North Carolina, Greensboro</b><br/>Dixie Culvert &amp; Metal Co.<br/><b>North Dakota, Wahpeton</b><br/>Northwestern Sheet &amp; Iron Works<br/><b>Ohio, Middletown</b><br/>American Rolling Mill Co.<br/>Ohio Corrugated Culvert Co.<br/><b>Oklahoma, Shawnee</b><br/>Dixie Culvert &amp; Metal Co.<br/><b>Oregon, Portland</b><br/>Coast Culvert &amp; Flume Co.<br/><b>Pennsylvania, Warren</b><br/>Pennsylvania Metal Culvert Co.</p> | <p><b>South Dakota, Sioux Falls</b><br/>Sioux Falls Metal Culvert Co.<br/><b>Tennessee, Nashville</b><br/>Tennessee Metal Culvert Co.<br/><b>Texas, Dallas</b><br/>Atlas Metal Works<br/><b>Texas, El Paso</b><br/>Western Metal Mfg. Co.<br/><b>Texas, Houston</b><br/>Lone Star Culvert Co.<br/><b>Utah, Woods Cross</b><br/>Utah Culvert Co.<br/><b>Virginia, Roanoke</b><br/>Virginia Metal &amp; Culvert Co.<br/><b>Washington, Spokane</b><br/>Spokane Cor. Culvert &amp; Tank Co.<br/><b>Wisconsin, Eau Claire</b><br/>Bark River Bridge &amp; Culvert Co.<br/><b>Wisconsin, Madison</b><br/>Wisconsin Culvert Co.</p> |
|--|--|---|---|





### Don't Spend Money on Trestle Maintenance

Permanent construction is the order of the day.

The photo shows a wooden structure being replaced by permanent construction—using "ACME"—the *original* Nestable corrugated culvert.

Durability is assured because the "ACME" is made of NO-CO-RO METAL.—*full gauge.*

Our book, G-3, for electric railways tells why NO-CO-RO METAL gives longer life than is generally considered possible from corrugated culverts. Write for a copy.

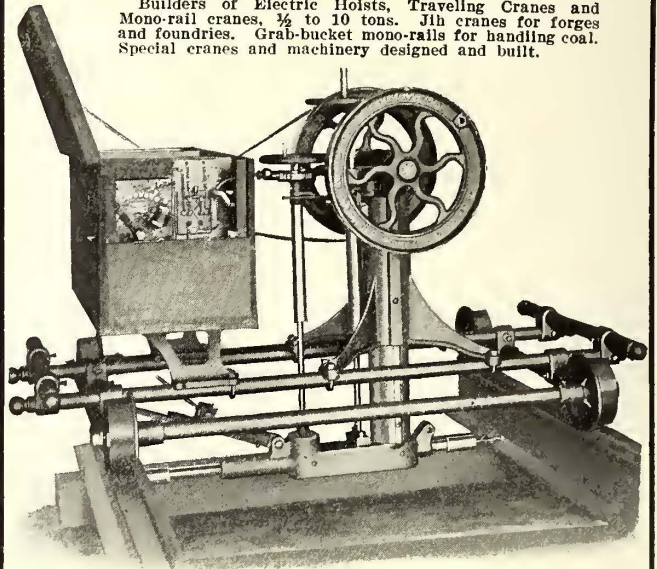
**THE CANTON CULVERT CO.**  
 MANUFACTURERS  
 CANTON, OHIO, U.S.A.

## Ludlow Track Drilling Machine

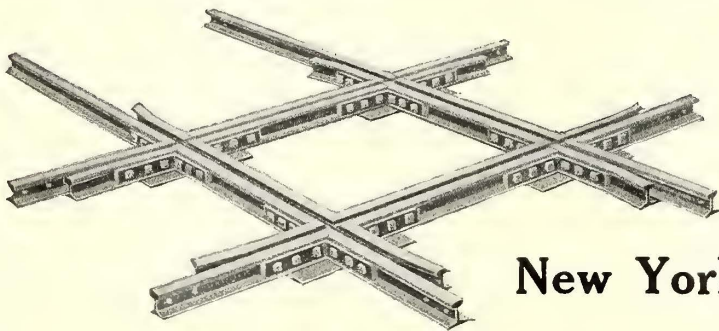
You can crowd it; you can't stall it. You can use high speed drills on hard rails. It has a 2½-hp. motor and two heavy flywheels. It's heavy enough to stand the work and light enough to be handled by your track gang. Any gauge—any voltage—200 in use—one road has eight. Built by

**The Johnston & Jennings Co.**  
 Cleveland, Ohio

Builders of Electric Hoists, Traveling Cranes and Mono-rail cranes, ½ to 10 tons. Jib cranes for forges and foundries. Grab-bucket mono-rails for handling coal. Special cranes and machinery designed and built.



## Long Service Special Track Work



Manganese center, girder rail special work.

Frogs, switches, crossings.

Send us your blueprints for prices and ask for description of our Anti-Straddling Tongue Switch.

**New York Switch & Crossing Co.**  
 HOBOKEN, N. J.

### MANGANESE STEEL TRACK WORK

FROGS, CROSSINGS  
 SWITCHES, ETC.  
 OUR SPECIALTY



St. Louis Steel Foundry, 1560 Kienlen, St. Louis, Mo.

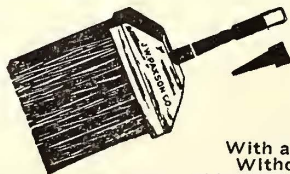
Owned and operated by Curtis & Co. Mfg. Co., St. Louis. 4

### SPECIAL TRACK WORK FOR ELECTRIC RAILWAYS

**THE AMERICAN FROG AND CO.**  
 HAMILTON, OHIO

### Ready For Snow ?

Some roads have already had occasion to call into use their Paxson Steel Wire frog and switch brooms. With and without chisel points. Don't make it a rush shipment. Order now.



**J. W. PAXSON CO.**  
 Philadelphia

With and Without  
 Chisel Points

## WYOMING "21 POUND LOAD" SHOVELS

Registered Trade-Mark  
**WYOMING SHOVEL WORKS,**  
 Wyoming, Pa.

Cut about 50% from shoveling costs.

HOW?

It's all explained in "Scientific Shoveling," an excerpt from Taylor's "SCIENTIFIC MANAGEMENT"

Write us for a free copy.



# In Considering Your Spring Requirements

Look into the Merits of

## **BUDA SPECIAL TRACKWORK**

Highest Grade  
Manganese-Center Construction

*Your Specifications and Inquiries Solicited.*

**THE BUDA COMPANY  
CHICAGO**

Works:  
HARVEY, ILL.

NEW YORK OFFICE:  
Hudson Terminal Building

**HIGHEST QUALITY  
TRACK SPECIAL WORK**



**WE MAKE THIS GRADE ONLY**

**CLEVELAND FROG & CROSSING CO  
CLEVELAND, OHIO**

ESTABLISHED 1882

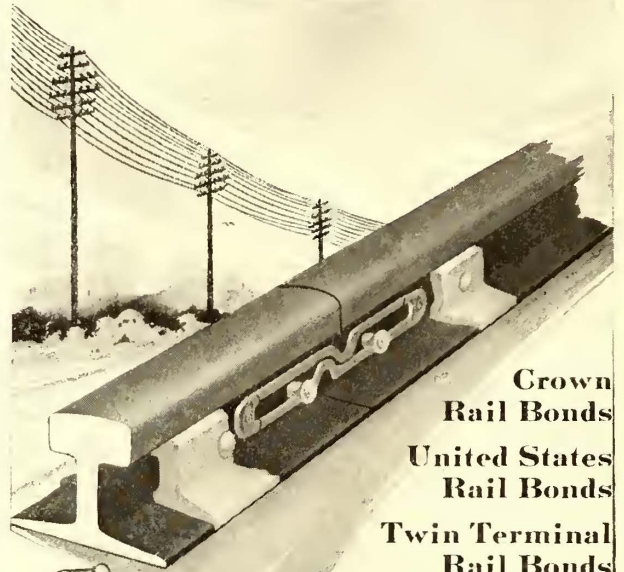
**The Weir Frog Company**  
Manganese Track Work  
Cincinnati, O.

**FROGS, SWITCHES, CROSSINGS  
SWITCH-STANDS, RAIL BRACES**

**The Cincinnati Frog and Switch Company**  
Cincinnati, Ohio

**American Steel & Wire  
Company**

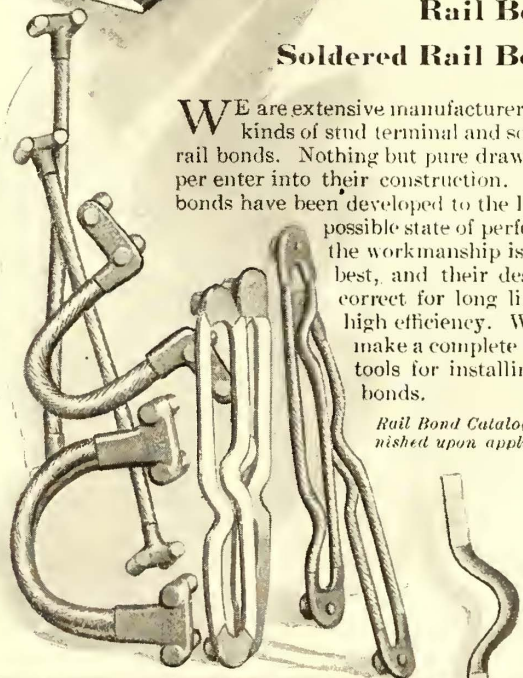
# Rail Bonds



**Crown  
Rail Bonds  
United States  
Rail Bonds  
Twin Terminal  
Rail Bonds  
Soldered Rail Bonds**

WE are extensive manufacturers of all kinds of stud terminal and soldered rail bonds. Nothing but pure drawn copper enter into their construction. These bonds have been developed to the highest possible state of perfection, the workmanship is of the best, and their design is correct for long life and high efficiency. We also make a complete line of tools for installing rail bonds.

*Rail Bond Catalogue furnished upon application*



Chicago  
Worcester

New York  
Pittsburgh

Cleveland  
Denver

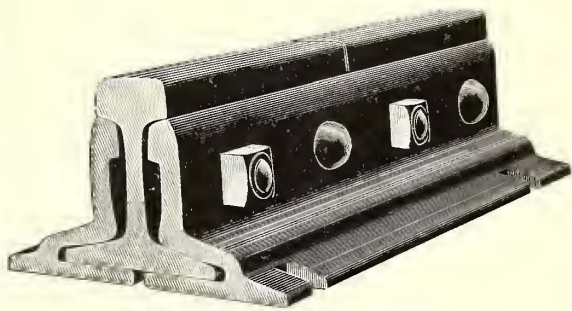
Export Representative: U. S. Steel Products Co., New York.  
Pacific Coast Representative: U. S. Steel Products Co., San Francisco, Los Angeles, Portland, Seattle.



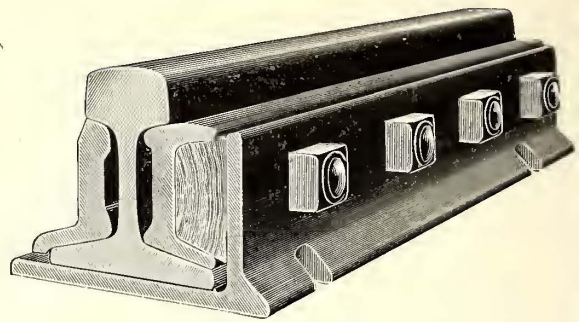
# OVER 50,000

miles of track equipped with enough Continuous, Weber and Wolhaupter base-supported rail joints to girdle the globe with a double track railway. Write for a catalog.

Received the Highest Awards: PARIS, 1900· BUFFALO, 1901; ST. LOUIS, 1904

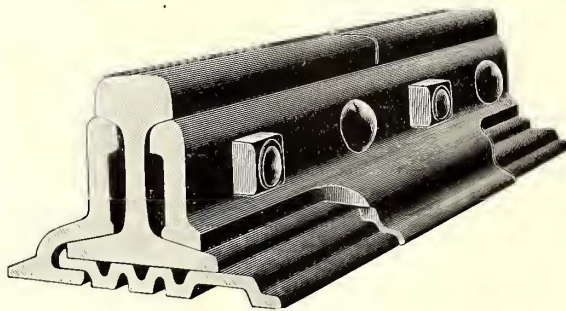


CONTINUOUS RAIL JOINT



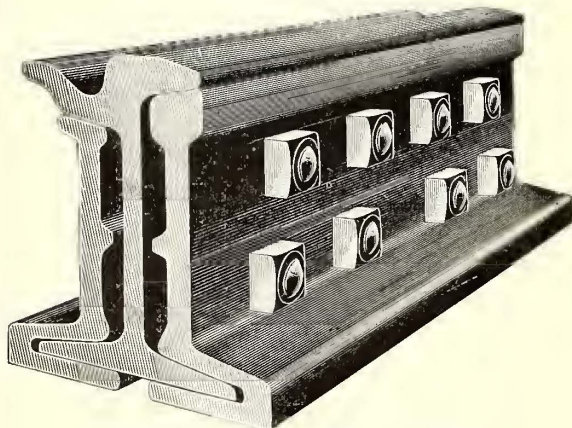
WEBER RAIL JOINT

Vertical action of rail ends is fully controlled, thus protecting copper bonds against crystallization and breakage.

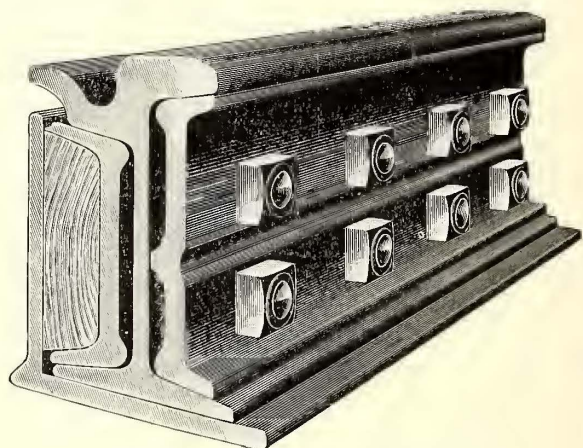


WOLHAUPTER RAIL JOINT

The rail base is perfectly supported, alignment permanently maintained and low joints are entirely eliminated.



CONTINUOUS GIRDER RAIL JOINT



WEBER GIRDER RAIL JOINT

## The Rail Joint Company

GENERAL OFFICES:

185 Madison Avenue, New York City

Makers of Base-Supported Rail Joints for Standard and Special Rail Sections, also Girder, Step or Compromise, Frog and Switch, and Insulated Rail Joints, protected by Patents.

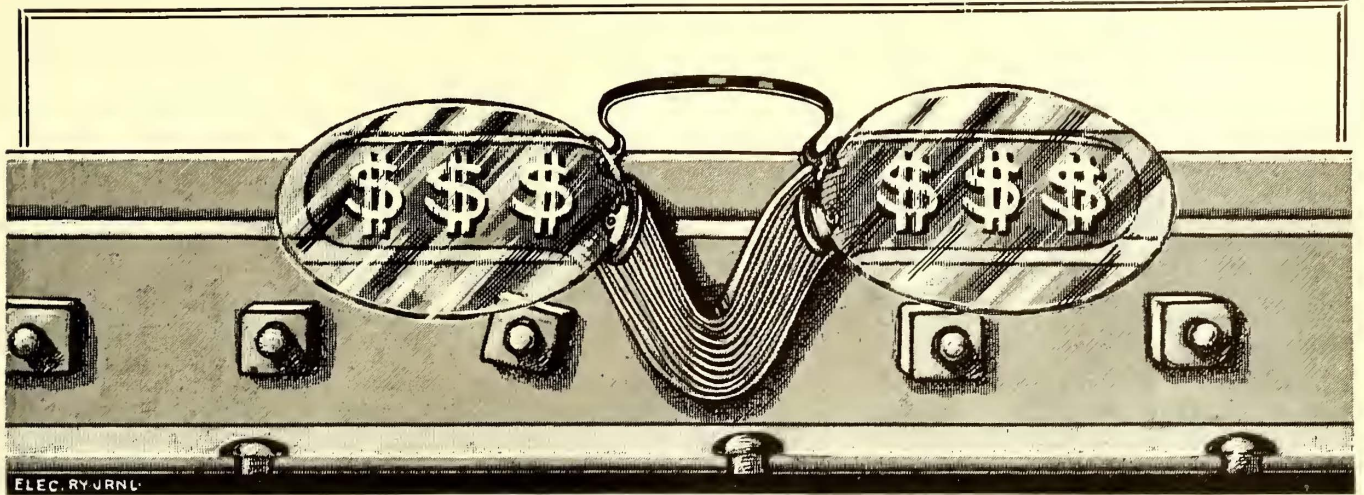
*Catalog and full information furnished at all Agencies.*

BOSTON, MASS., India Bldg.  
CHICAGO, ILL., Railway Ex. Bldg.  
DENVER, COLO., Equitable Bldg.

PORTLAND, ORE., Wilcox Bldg.  
PITTSBURGH, PA., Oliver Bldg.  
ST. LOUIS, MO., Commonwealth Trust Bldg.

TROY, N. Y., Burden Ave.  
MONTREAL, CAN., Board of Trade Bldg.  
LONDON, E. C., ENG., 36 New Broad St.





## You can SEE the big money-advantage in this METHOD of Bonding

You do not have to wait a few years to be assured of the dollars-and-cents advantage of **welding** bonds to the rails.

Even if bonds thus installed gave only the same length of useful life as surface contact bonds you would realize a profitable saving in the **COST** of bonding.

But because resistance does not increase at welded bond terminals, their useful life is greatly prolonged—another saving.

It is worth your while to get some actual service figures on this subject.

Write us for them.

**Electric Railway Improvement Co.**

6005 Carnegie Ave.

Cleveland, Ohio



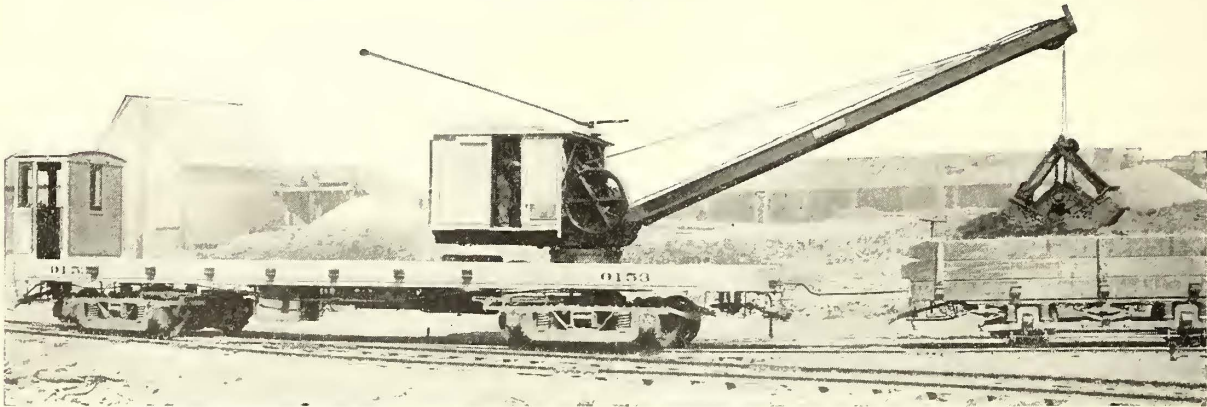
## DOES YOUR APPROPRIATION FOR THIS YEAR INCLUDE A BROWNHOIST Electric Work-car Crane

If not, you should investigate at once, for this crane will reduce your construction and maintenance costs by

rapidly loading and unloading sand, gravel, cinders, crushed stone, coal, etc., with a grab bucket,—and rails, ties, crossovers, etc., with hook. And the crane also hauls the work trains. Other roads are using this crane and you should at least investigate its possibilities on your own line.

*Write for catalog 1 which shows how and where these cranes are used.*

**THE BROWN HOISTING MACHINERY COMPANY**  
Cleveland, Ohio



## CARNEGIE STEEL COMPANY

GENERAL OFFICES,

PITTSBURGH, PA.



### STEEL CROSS TIES

are absolutely the best and cheapest permanent construction.

Introduction of economies are always desirable, especially where they are combined with efficiency as in the case of steel ties.

#### District Sales Offices

|            |              |
|------------|--------------|
| Birmingham | Detroit      |
| Boston     | New Orleans  |
| Buffalo    | New York     |
| Chicago    | Philadelphia |
| Cincinnati | Pittsburgh   |
| Cleveland  | St. Louis    |
| Denver     | St. Paul     |

UNITED STATES STEEL PRODUCTS COMPANY—PACIFIC COAST DEPARTMENT  
Los Angeles                      San Francisco                      Portland                      Seattle

EXPORT REPRESENTATIVES:

UNITED STATES STEEL PRODUCTS COMPANY, NEW YORK, N. Y.

22T



# How the Cleveland Railway Co. handles track work with a

## THEW SPECIAL ELECTRIC STREET RAILWAY SHOVEL

This company first excavates the trench for the track with the THEW ELECTRIC SHOVEL, dumping the excavated material on the pavement at the side. After the track has been laid the THEW SHOVEL is again employed to load the material from the pavement on to cars for hauling away. Where dumping facilities close at hand are available, the material taken from the trench is loaded directly into wagons for the short haul.

### Why the THEW Shovel?

Because its HORIZONTAL CROWDING MOTION will dig the shallow trench rapidly, efficiently and economically.

Because again the HORIZONTAL CROWDING permits rehandling the material without damaging the pavement.

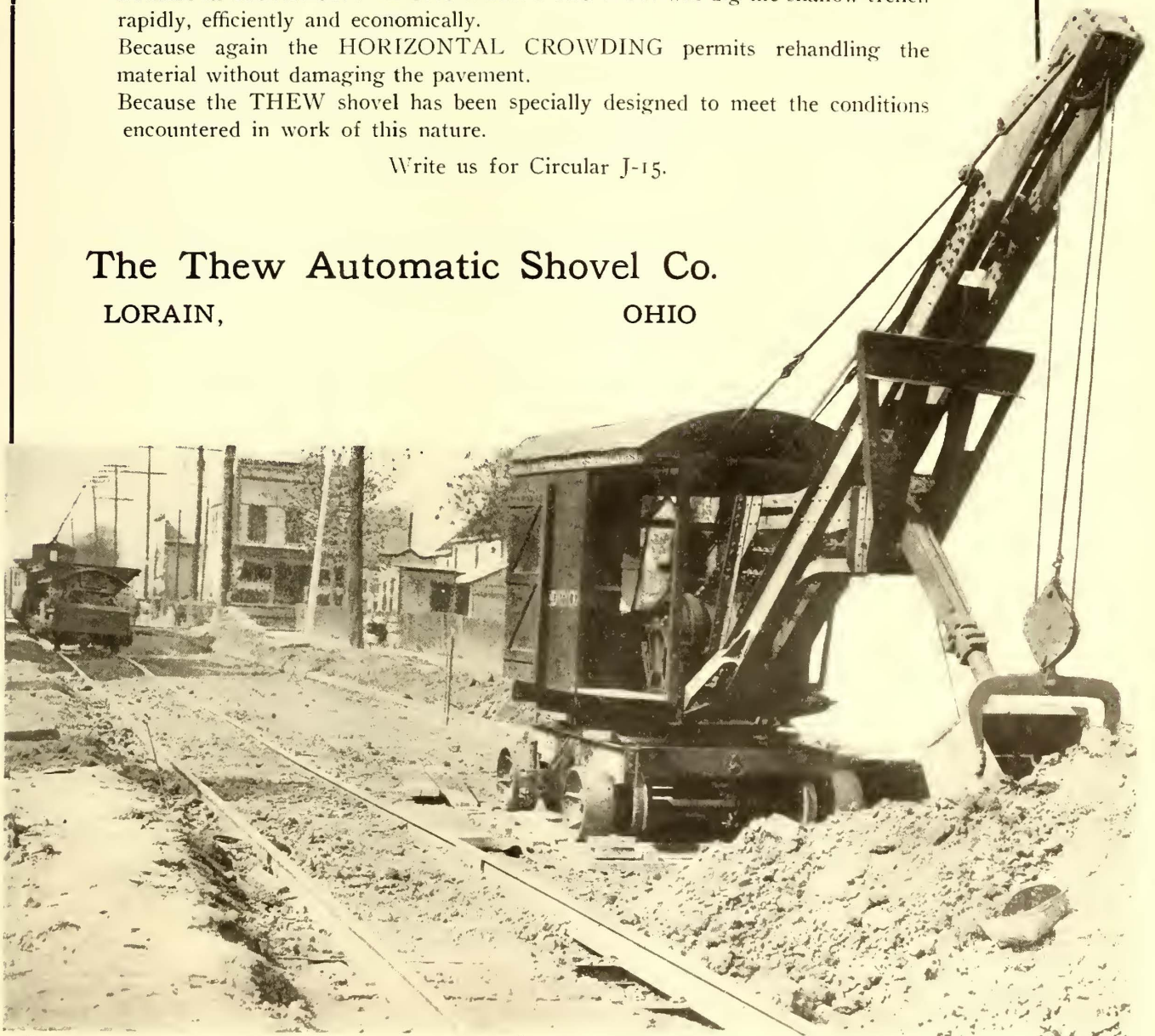
Because the THEW shovel has been specially designed to meet the conditions encountered in work of this nature.

Write us for Circular J-15.

The Thew Automatic Shovel Co.

LORAIN,

OHIO





# DUNTLEY Electric Track Drills and Spike Drivers

## Effect Large Savings in Track Construction and Repair Work

These devices make it possible to do the work with remarkable speed and at a cost consistent with modern ideas of economy and scientific management.

Bulletins describing these and other electric labor saving devices will be supplied on request.

If you are using pneumatic tools, do not forget that we are the leading manufacturers of a complete line of Air Compressors, Hammers and Drills.

*Portable Tools For All Purposes. Write For Bulletins.*

### Chicago Pneumatic Tool Company

Branches Everywhere

CHICAGO OFFICES  
1062 Fisher Building

NEW YORK OFFICES  
50 Church Street



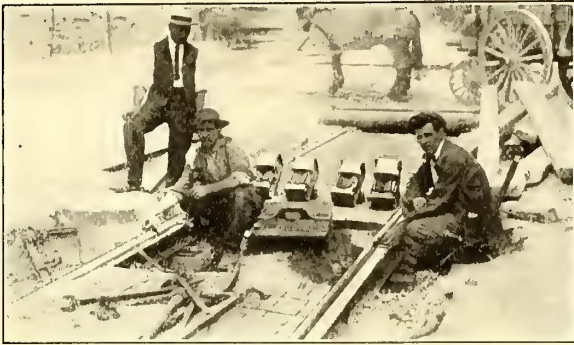
Drilling Bonding Holes with Duntley Electric Track Drill on United Railways of St. Louis



The Duntley Screw-Spike Driver



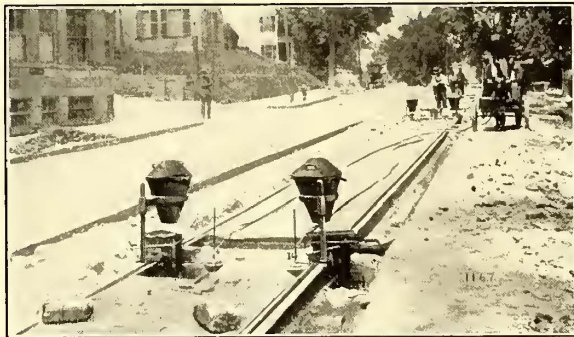




Setting in the Insert Before Putting on Molds.



Molds as Adjusted Being Luted for Insert Rail Welds.



Preheating the Rails Previous to Pouring the Thermit Steel.



Welded Joints Left to Cool with Molds in Place.

# Rail Welding by the New Thermit Insert Method

## Gives 100% Conductivity

and, what is equally important, develops the full strength of the rail.

By eliminating all joints from the track it prolongs the rail life.

There is no "receiving end" to Thermit Welded rails.

It settles the bonding question "for keeps" and the operation in no way changes the composition or wearing quality of the metal in the head of the rail.

Without doubt you will be interested to learn how, in practice, these claims are worked out and other particulars regarding the method.

We will gladly send these upon request.

Write Now for Pamphlet No. 1232



**GOLDSCHMIDT THERMIT CO.**

WILLIAM C. CUNTZ, General Manager

90 WEST STREET, NEW YORK

329-333 Folsom St., San Francisco

103 Richmond St. W., Toronto, Ont.

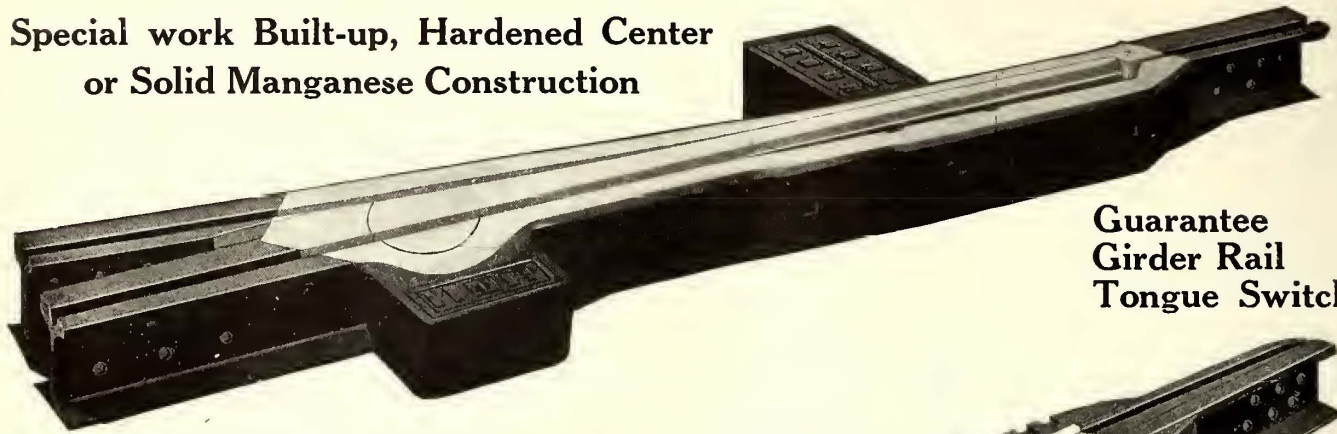
7300 So. Chicago Ave., Chicago



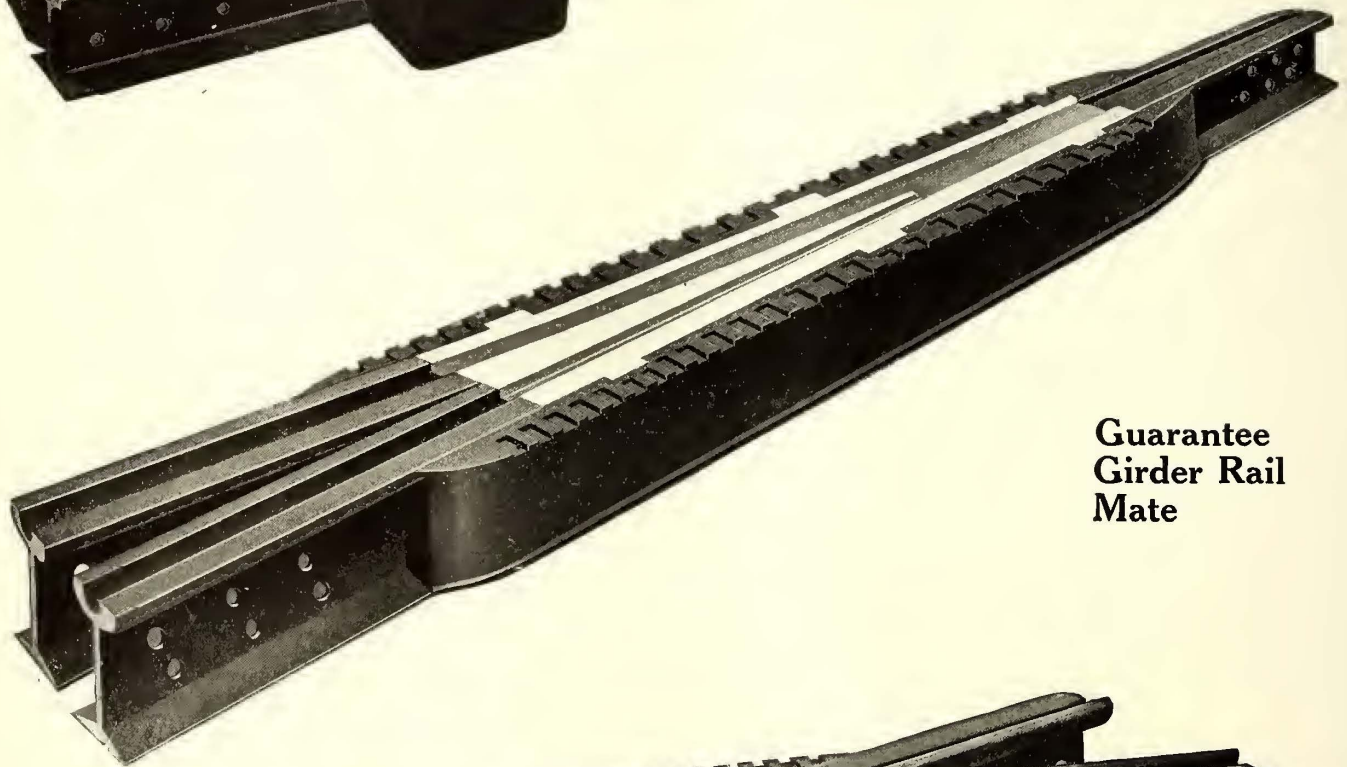


# Kilby Guarantee Switch Pieces For Economical Service

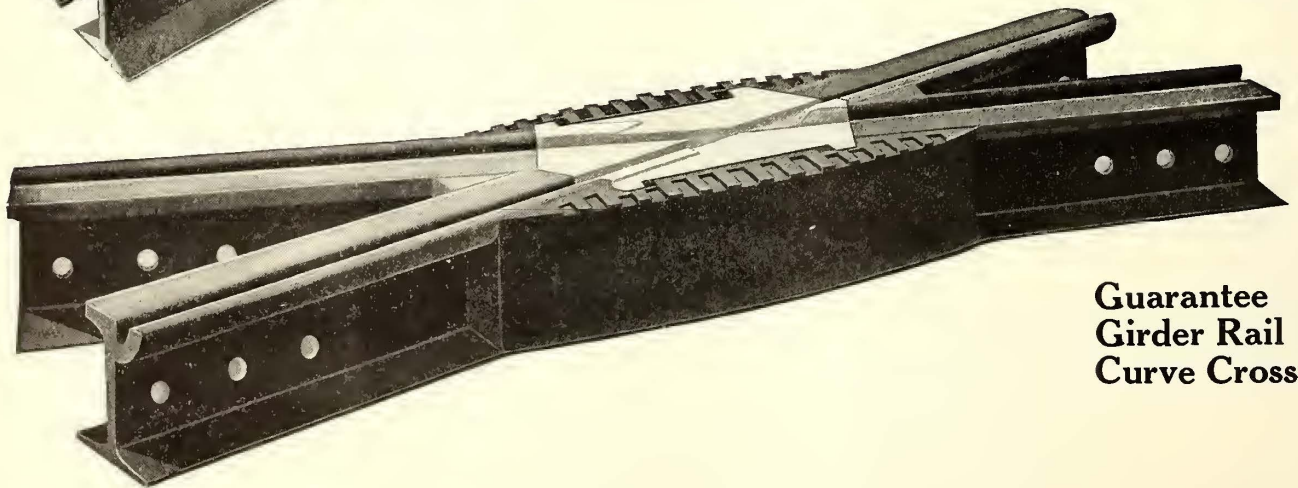
Special work Built-up, Hardened Center  
or Solid Manganese Construction



Guarantee  
Girder Rail  
Tongue Switch



Guarantee  
Girder Rail  
Mate



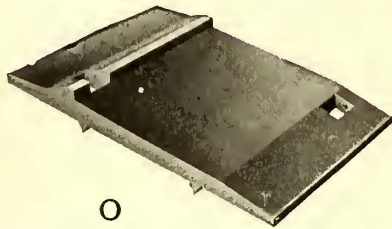
Guarantee  
Girder Rail  
Curve Cross

## Kilby Frog & Switch Company

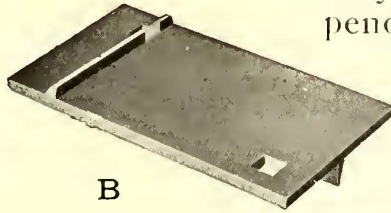
Birmingham, Ala.



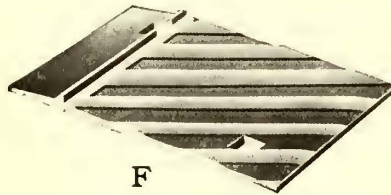
# Tie Plates



O



B



F



A

Send for catalog showing 18 different types.

Rolled only from new steel and mechanically correct in construction, our tie plates measure up to the highest standards of economy, efficiency and dependability in service.



## The MANHATTAN Compromise Joint

Steel casting, base supporting throughout, strongly reinforced by its girder construction.

# The Elyria Iron & Steel Co., Elyria, Ohio

### SALES AGENCIES

NEW YORK—J. H. Allen, U. S. Express Building  
CHICAGO—G. S. Wood, Great Northern Building

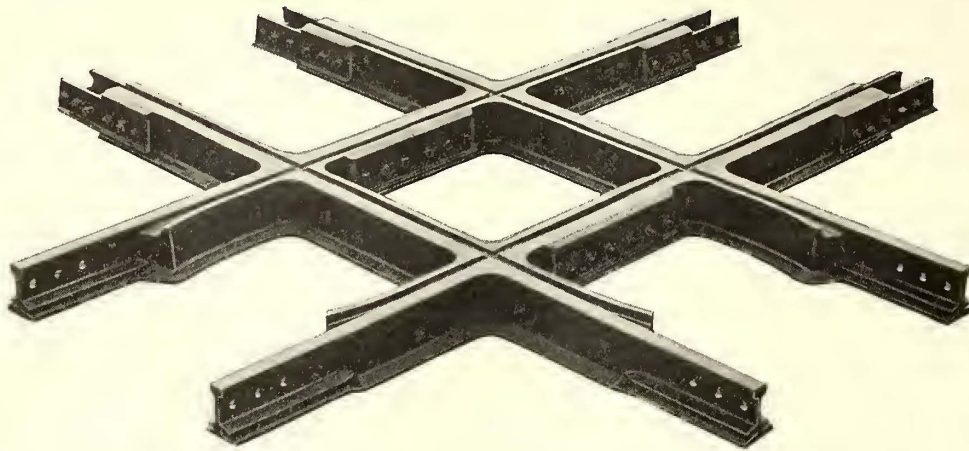
ATLANTA—J. M. Van Harlingen, Candler Building  
SAN FRANCISCO—Edward S. Sullivan Co., Monadnock Building

BALTIMORE—Geo. W. Smith, Union Trust Building  
ST. LOUIS—W. H. Dayton, Security Building



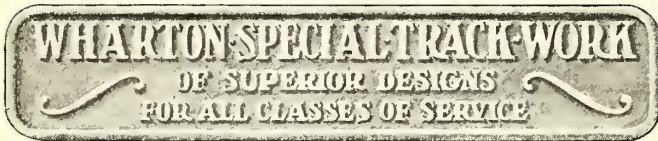
# FALK SPECIAL WORK

## Reduces Your Installation and Maintenance Charges



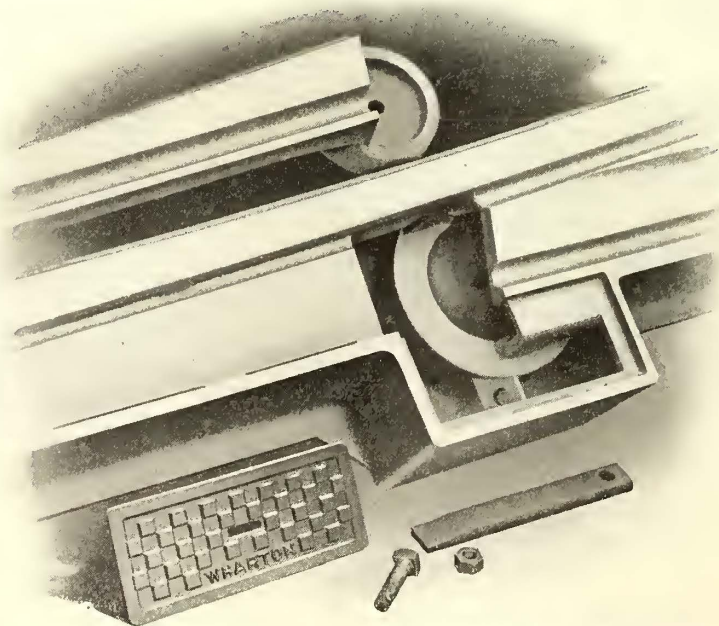
Have you tried our Solid Manganese Track Work? It's good.

### THE FALK COMPANY, - MILWAUKEE



**CIRCULAR  
BEARING  
TONGUE  
SWITCH  
TYPE H. C. B.**

*Patented May 2,  
1905. Additional  
Patent applied for*



Note large  
pivot bearing  
tongue rein-  
forcement and  
simple  
holding device







## When You Need New MANGANESE TRACK WORK

or a machine to save battered and cupped rails—remember the “buy-word”

### “INDIANAPOLIS”

Indianapolis Manganese Track Work stands pre-eminently for the greatest operating value and the **UTMOST** in **FINAL ECONOMY**. It represents not only the highest type of construction; but the most advanced engineering designs based on standard practice and special requirements.

We embody in this construction the same economic features which we apply to steam railway construction and which has practically eliminated maintenance renewals and re-installations.

Illustrated above is a special type of Solid Manganese Construction for Tongue Switches, Mates and Frogs for ordinary TEE rail, which are installed on a uniform tie level.

We specialize in Solid Manganese Boltless Construction.

Tremendous money saving adjuncts to Manganese track work are the twin workers—The Indianapolis Portable Electric Welder and its companion, the Grinder.

Write for complete details. Prompt shipments assured.



The Indianapolis Portable Electric Welder



The Indianapolis Portable Electric Grinder for Resurfacing Track

## Indianapolis Switch & Frog Co.

Manufacturers of Only Highest Grade Manganese and Built-Up Special Work

SPRINGFIELD, OHIO

SALES OFFICES :

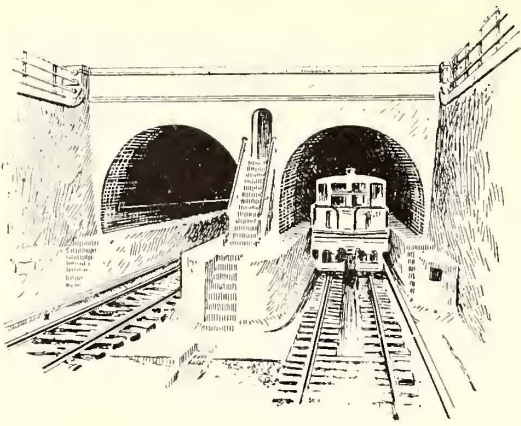
New York  
Portland

Chicago  
Seattle

Kansas City  
Los Angeles

Spokane  
San Francisco





**POWER** to move all trains through the Detroit River Tunnel comes from the largest storage battery plant of its kind in existence. The

**Gould**  
Storage Battery  
**Gould**

used exclusively throughout has given excellent satisfaction.

Likewise, the Gould Battery for storage battery car propulsion has maintained supremacy through our desire and ability to build the best.

All Gould Storage Batteries are made as carefully as the batteries we furnish for driving rush-hour trains in the Grand Central Terminal, New York, for driving New York street cars, for driving submarine naval vessels, for firing big guns of the army and navy, for lighting trains on all prominent American railroads, etc.

If you want the best that exists in storage batteries and you appreciate liberal treatment, try the Gould Battery. (Our renewal plates fit jars of any make.) Our engineering advice is yours for the asking.

## Gould Storage Battery Co.

General Offices: 30 East 42nd St., New York City  
Works: Depew, N. Y.

Boston: 89 State Street  
Philadelphia: 613 Betz Bldg.  
Cleveland: American Trust Bldg.  
Agents: Topeka  
Canadian Representative: R. E. T. Pringle  
Montreal  
Toronto  
Detroit: Boyer Bldg.  
Chicago: The Rookery  
San Francisco: 904 Rialto Bldg.  
Los Angeles  
Seattle  
Winnipeg  
Vancouver

91

Fuel Costs  
are Going  
DOWN

The cost of handling coal and ashes can be rightly considered a part of fuel cost. It is the only part of fuel cost wherein a big cut can usually be made.

There are instances where we have cut this cost 50 per cent to 75 per cent—just by a study of the case and the application of the right handling devices. We select and combine types of apparatus from the market—types which best fit existing conditions.

You will be interested in looking over a book showing instances where we have cut costs and how we have cut them. Write us for a copy.

**R. H. Beaumont Company**

PHILADELPHIA: 111 South 5th Street  
BOSTON: Oliver Bldg. CHICAGO: Webster Bldg.

### Stock Motors Promptly Shipped

We always carry a very complete line of stock motors, both alternating current and direct, in our warehouses located at advantageous shipping points in various parts of the country. Write or wire your requirements to our nearest office.

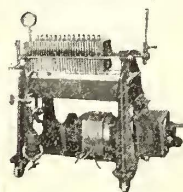
Crocker-Wheeler Co.

Ampere, N. J.

Cotton & Wool  
WASTE  
Wiping Cloths



The  
J. Milton Hagy  
Waste Works, Inc.  
Philadelphia, Penn.



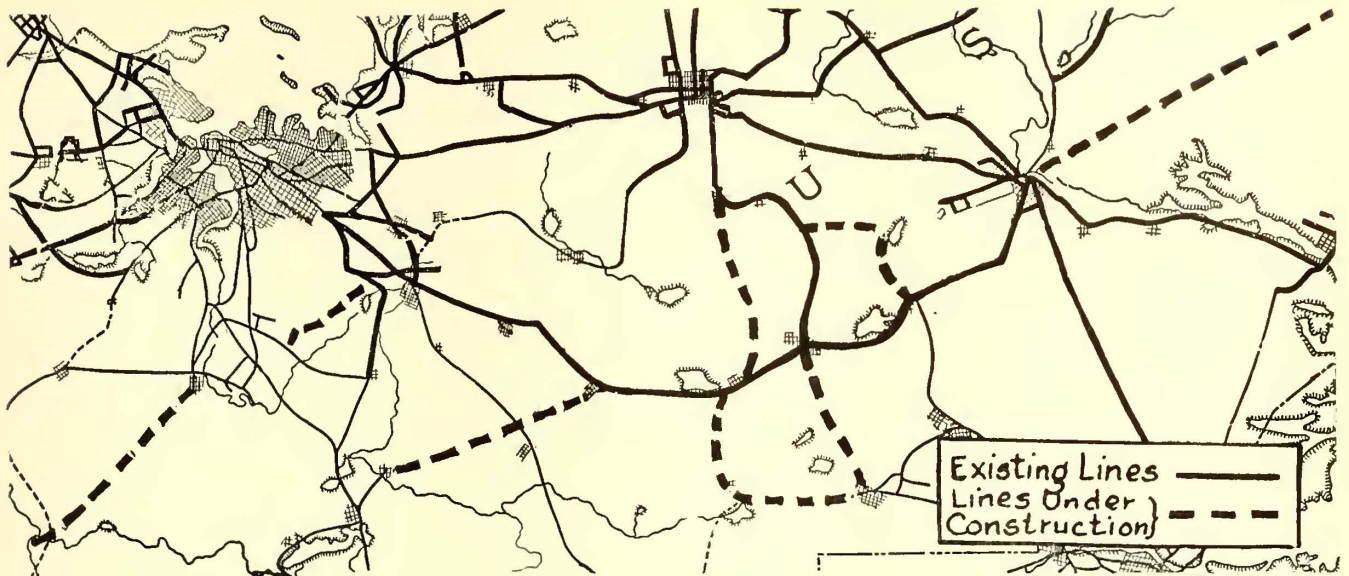
Oil Dryer and Purifier  
For Transformers

E. J. HUNT  
NEWARK, N. J.

**WATER** SOFTENING  
OR  
FILTRATION

FOR BOILER FEED AND ALL INDUSTRIAL USES  
W. S. SCOTT & SONS CO. PITTSBURGH, PA.





## How Are You Going To Handle Those New Extensions?

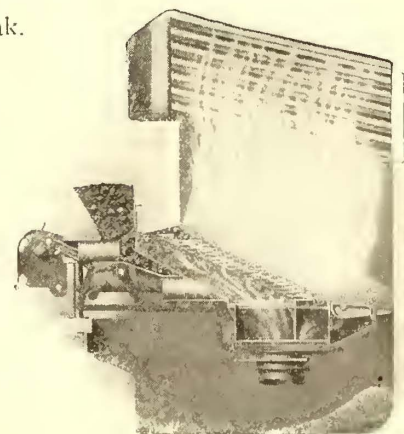
More boilers in your central station? Don't!  
 A small plant at the point of greatest demand, to help out the peaks? Don't!  
 True! new lines mean more business, traffic gets heavier and heavier, but

# *The Taylor Stoker*

## Makes Big Plants Bigger

—makes little plants big.  
 No need to invest a cent in plant extensions.  
 A lower coal rate than you'd think possible—  
 A fraction of your present boiler room force—  
 Without smoke, even when carrying the heaviest peak.

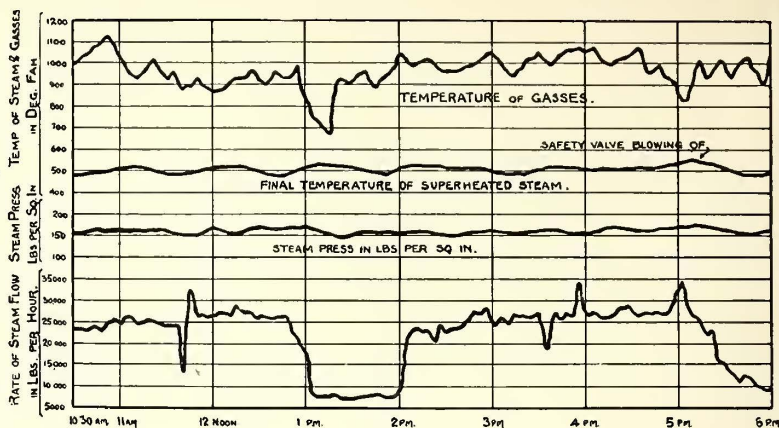
The Taylor Stoker gives a new slant to that word "capacity"—300% to help out that emergency!



**American Engineering Company**  
**Philadelphia**



This Chart  
from a test of  
**FOSTER**  
Superheater  
is of particular interest to  
Railway Men



It shows the uniformity of superheat under wide variations in load and in gas temperatures, such as is encountered in railway work. Superheating is the final step in the preparation of steam for *most efficient* use in driving engines of *any* type. In a general way, here is how this efficiency works out in the *saving* of steam by superheating—100°

|                                |        |
|--------------------------------|--------|
| Steam Turbines .....           | 10%    |
| Triple Expansion Engines ..... | 12%    |
| Compound Engines .....         | 14%    |
| Simple Engines .....           | 18% up |

We have published some highly interesting data on the economy of superheaters. "The Red Book" is what to ask for.

**Power Specialty Co., 111 Broadway, New York**

BRANCH OFFICES

Boston Chicago Pittsburgh Philadelphia San Francisco Birmingham

AGENCIES

Montreal, 211 Board of Trade Manchester, Eng., 4 Chapel Walks London, Eng., 56 Victoria St.

**Do You Get Full Value of the Fuel Burned in Horsepower Developed?**

No matter what experiments or expedients you have tried, no matter what improvement you may feel that your present water softening system has made—so long as you are bothered with scale, corrosion, or other water troubles to any extent whatever, there remains in your plant *Boiler Inefficiency* which you can ill afford.

**DEARBORN WATER TREATMENT**

steps in and makes good where other methods fail or only partially succeed, *because*—  
It is in each individual case a scientifically determined, definite treatment to meet exactly a definite condition! There is no guess work about it, no blind reliance on the "law of averages," no "cure-all" compound, no illogical experimenting with mechanical action to meet chemical conditions—no uncertainties whatever, but an advance assurance of complete efficiency proven by the satisfactory experiences of power plant owners all over the world with Dearborn Methods of Water Treatment.

**DEARBORN CHEMICAL COMPANY, McCormick Building, Chicago.**

**The Babcock & Wilcox Company**

85 Liberty Street, New York

**WATER TUBE STEAM BOILERS**

Steam Superheaters

Mechanical Stokers

Works: BARBERTON, OHIO—BAYONNE, N. J.

BRANCH OFFICES:

ATLANTA, Candler Building DENVER, 435 Seventeenth St. PITTSBURGH, Farmers' Deposit Bank Building  
BOSTON, 35 Federal St. HAVANA, CUBA, 116 1/2 Calle de la Habana PORTLAND, ORE., Wells-Fargo Building  
CHICAGO, Marquette Building LOS ANGELES, American Bank Building SALT LAKE CITY, 313 Atlas Block  
CINCINNATI, Traction Building NEW ORLEANS, Shubert Arcade SAN FRANCISCO, 99 First Street  
CLEVELAND, New England Building PHILADELPHIA, North American Building SEATTLE, Mutual Life Building



## Have Highest Heat and Electrical Resistance

J-M Electrobestos Arc Deflectors, being made of an Asbestos composition, are absolutely fireproof and withstand a temperature of 2500° Fah. continuously without cracking or breaking.

# JM ELECTROBESTOS ARC DEFLECTORS

are also very strong electrically. It requires 30,500 volts to puncture one that is 5/8 in. thick.

These Arc Deflectors, being moulded in tool steel moulds under hydraulic pressure, are hard and tough, and have great density and tensile strength. They are moisture-proof and not affected by extreme weather changes.

J-M Electrobestos Arc Deflectors increase the controller life and cut down maintenance costs.

Made to fit all standard electric railway controllers. Special forms made from blueprints if desired.

Write Nearest Branch for Samples and Prices

## H. W. Johns-Manville Co.

Manufacturers of Service, Subway and Transformer Boxes; Fuses; Line Material; Insulating Materials; Fibre Conduit; Fireproof Wood; Friction Tapes; Dry Batteries; Lighting Systems; Etc.

Albany  
Baltimore  
Boston  
Buffalo

Chicago  
Cincinnati  
Cleveland  
Dallas

Detroit  
Indianapolis  
Kansas City  
Los Angeles

Louisville  
Milwaukee  
Minneapolis  
New Orleans

New York  
Omaha  
Philadelphia  
Pittsburgh

San Francisco  
Seattle  
St. Louis  
Syracuse

Toronto

THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED

Montreal

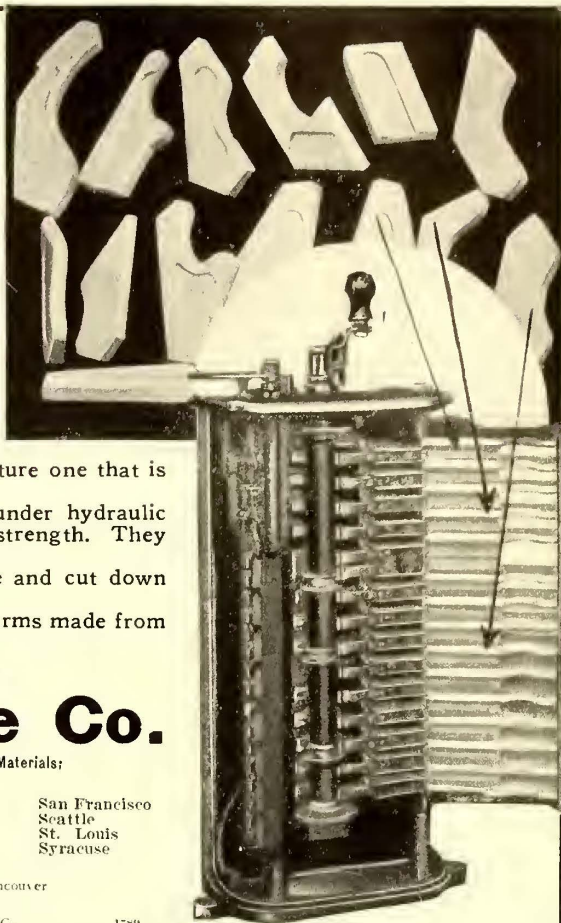
Winnipeg

Vancouver

For Great Britain and Continent of Europe:

TURNERS & MANVILLE LTD., Hopetoun House, 3, Lloyd's Ave., London, E. C.

1789



## SPECIALTIES FOR POWER HOUSE LUBRICATION

# TURBOIL

TRADE MARK

FOR  
TURBINE LUBRICATION

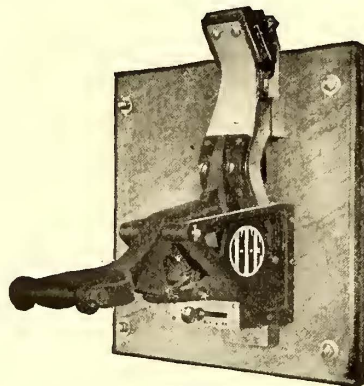


## GAS CYLINDER OIL

TRADE MARK

For High-Duty Gas Engines Using Natural, Producer or Furnace Gas. Get the Original and Successful Brand. Never Failed.

**BORNE, SCRYMSER COMPANY**  
80 SOUTH STREET, NEW YORK



## I-T-E Circuit Breakers for Heavy Railway Service

New General Catalogue will be supplied on application. Specify "DALITE" and secure the Latest Improved I-T-E Circuit Breaker with Time Limit Feature.

**THE CUTTER ELECTRICAL & MFG. CO.**  
Nineteenth and Hamilton Sts., Philadelphia, Pa.



# The Best Proof of the Superiority

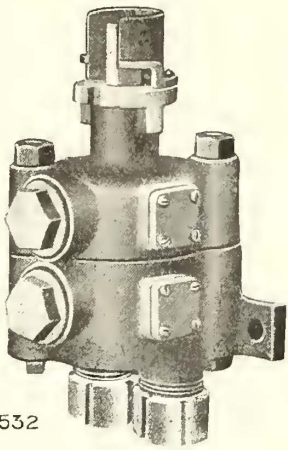
of

# National

## AIR BRAKE EQUIPMENTS

for modern

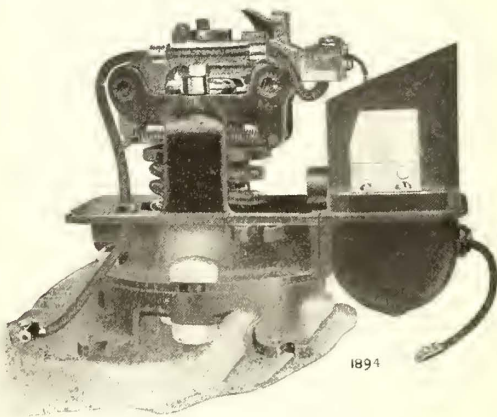
## Electric Railway Service



1532

TYPE "PV"

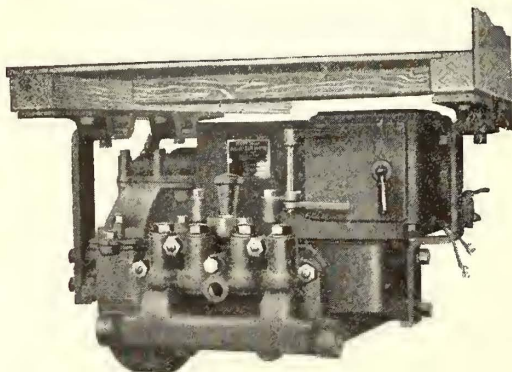
Motorman's Valve, has no ground joints  
Illustrated and described in catalog E-388



1894

TYPE "AR" GOVERNOR

Smallest in size. Lightest in weight.  
Operates at closer range than any other Governor  
of similar type.  
Illustrated and described in catalog E-417



TYPE "A3"

Direct Suspended Air Brake Compressor.  
Increased capacity. Reduced weight.  
Illustrated and described in catalog E-399

can be found in their general adoption by many of the largest Electric Traction Companies.

*There are now nearly 35,000 National Air Brakes in service throughout the entire world.*

National Air Brake Compressors and Equipments embody the latest features of design and many radical refinements in electrical and mechanical construction.

They are designed for Higher Efficiency and Greater Economy.  
Why Not Learn More About Them?  
Write for descriptive catalogs.

### National Brake & Electric Co.

Works at Milwaukee, Wis., U. S. A.

New York, 165 Broadway

St. Louis, 318 Security Building

Chicago, 827 Railway Exchange Bldg. Pittsburgh, 9th and Penn Avenue

London, England, 14 Great Smith Street





# Why Not Save a Few Thousand Dollars on Fuses During 1914



## The Monarch Refillable Fuse Gives You the Opportunity



The Ackley Exhibit at the A. E. R. A. Convention. Monarch Refillable Fuses were blown and refilled 300 times and were still serviceable.

The mere fact that the savings possible from the use of Monarch Refillable Fuses runs up into the thousands of dollars puts them in a class of merchandise which should be investigated at once.

This saving is far from being an idle claim.

One road tells us that it saved more than \$2,500 in one year by using these fuses.

And the road isn't a large one either. That puts the stamp of practicability on the fuses.

The big saving isn't in the first cost of the fuses—they are too well made to enable us to trim that price very low.

It's in the renewals where you save *big*. The construction of the fuse lends itself to easy and simple refilling.

You simply buy the fuse element and let your men put it in the blown fuses.

We have developed a special element which makes it possible to do a clean, safe and accurate job of refilling; far better than by the former method of using commercial lead wire.

In other words—here is a proved practical way of refilling fuses—of saving big money on this one item.

We publish a bulletin showing all types of Monarch Refillable Fuses, ratings, prices, etc.

Write for a copy NOW.

Make it a New Year resolution to save fuse money.

## ACKLEY BRAKE & SUPPLY CO.

Under Sole Ownership and Management of James Arthur Noble

Sole Sales Agents—to whom all inquiries should be addressed

Cable Address, "Acklebrake New York"

Phone 5490 Cortlandt

50 CHURCH ST.

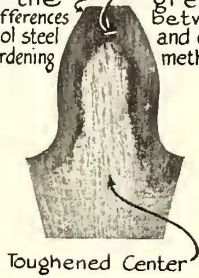
Represented all over the world

NEW YORK CITY





Tool Steel Face  
as hard here as on the  
very surface (This is one  
of the great differences  
between tool steel  
hardening and case-  
methods)



# Why "Tool Steel" Gears and Pinions?

## 1. Quality In Gears Is Very Desirable.

Gearing costs consist not only of the first cost price, but also in a number of supplementary items:

INSTALLATION, including the boring to fit axles where done in customer's shops; pressing wheels and gears on and off usually costs about \$2.00 per gear. Installing pinions is correspondingly expensive.

CAR TIE-UPS mean idle investment of capital. The car in the shop gathers no nickels.

CAR FAILURES, on the road through gear troubles usually bring caustic newspaper criticisms.

NOISE, due to growling gears, frequently starts cheap politicians growling for municipal ownership.

NON-DEPENDABLE GEARS demand a storeroom well stocked for emergency repairs.

*"Tool Steel" in gearing means QUALITY.*

## 2. Proven Quality Means More Than Claims.

Seven years ago a gear was a gear; there was no such thing as a special or a quality gear. At that time we began to market "Tool Steel" Gears and Pinions. Five years ago specials began to make their appearance, each accompanied by extravagant claims, and each in time to be set aside for a newer special backed with the same old claims.

*Only "Tool Steel" gearing has stood the test of time.*

## 3. Guaranteed Quality Insures The Purchaser.

This is true if the guarantee is genuine, that is, definitely stipulates a positive arrangement to take care of failures, if any. If the seller side-steps such an arrangement, his guarantee means nothing.

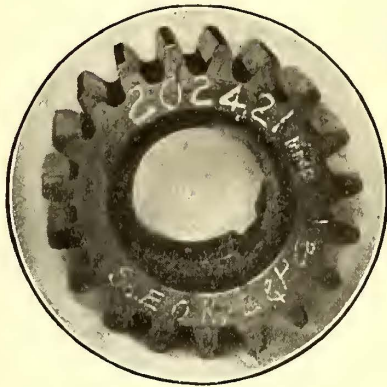
*"Tool Steel" Guarantee has teeth in it, and the teeth bite us if there are failures.*

## 4. Quality Exceeding That Guaranteed Means Extra Profit To Users.

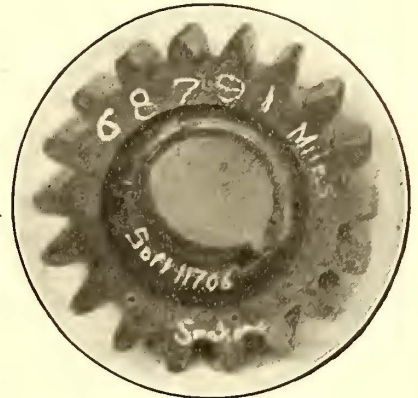
This is one of our strong points. The average life of our gearing is usually double the life we guarantee. Here are four illustrations from gears and pinions loaned us for



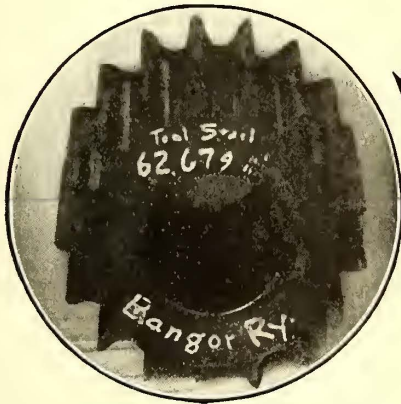
our exhibit at Atlantic City last fall. We show the mileage guaranteed for each pinion when the pinion was sold, the mileage each pinion had made up to October, 1913, and its condition after making such mileage.



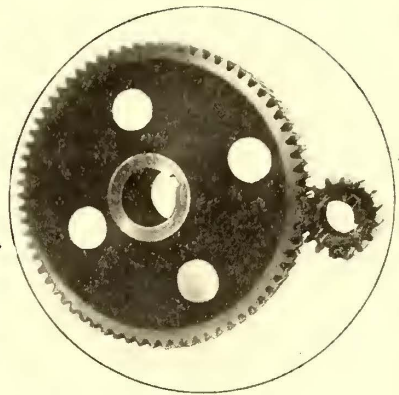
Guaranteed for 175,000 miles  
Has given 202,421 miles



Guaranteed for 23,412 miles  
Has given 68,791 miles



Guaranteed for 40,000 miles  
Has given 62,679 miles



Guaranteed for 100,000 miles  
Has given 183,759 miles

5. Records Are The Real Tests.

We can send you scores of them, records made in all classes of service, against all kinds of other specials that have been marketed at home and abroad long enough for tests, on all types of motors, all weights of cars, hilly and level conditions, just your circumstances duplicated.

*Pin your faith on performances not promises.*

# Then Buy "Tool Steel" Gears and Pinions

## Buy Them Now !

Start the saving at once. The companies that began equipping with "Tool Steel" gearing several years ago are now able to forget they ever faced a gear problem.

## Buy Under Contract.

Contracts save us selling expense, help us buy more advantageously and carry a better stock to help you on deliveries. We are glad to give you the benefit of the saving.

## THE TOOL STEEL GEAR AND PINION CO. CINCINNATI, OHIO

U. S. Metal & Mfg. Co. { New York  
                                  { Chicago  
                                  { Atlanta  
W. F. McKenney, Portland, Ore.  
F. E. Huntress, Boston, Mass.  
Allen General Supplies, Toronto, Ont.  
S. I. Wailes, { San Francisco, Cal.  
                  { Los Angeles, Cal.

Scholey & Co., Ltd., London - Exports Into British Territory

### THE ACKLEY COMPANIES - OTHER EXPORTS

Ackley Brake & Supply Co., Inc'd, New York  
British Ackley Brake & Supply Co., Ltd., London  
For Belgium, Holland, Denmark, Norway and Sweden  
Cie. Francais Des Freins Ackley, Paris  
Deutsche Ackley Bremsen Co., Berlin



# Note How These Hand Brake Stops

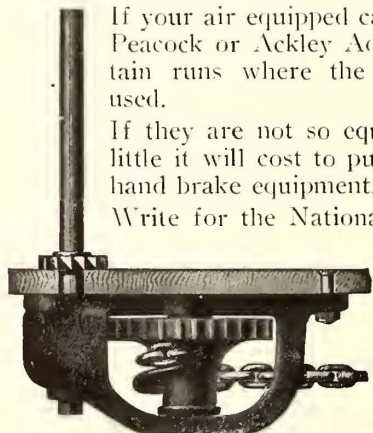
Compare With These Air Brake Stops

|                      | Air Brakes                    | Hand Brakes              |
|----------------------|-------------------------------|--------------------------|
| Car No. . . . .      | 432                           | 454                      |
| Brakes . . . . .     | Air, 85°<br>No sand . . . . . | "A"<br>No sand . . . . . |
| Empty car:           |                               |                          |
| Date . . . . .       | 4-6-12                        | 1-26-12                  |
| Weight, lb . . . . . | 30,300                        | 28,760                   |
| Distance:            |                               |                          |
| 5 M.P.H. . . . .     | 7' 4"                         | 3' 6"                    |
| 10 M.P.H. . . . .    | 26' 11"                       | 18' 3"                   |
| 15 M.P.H. . . . .    | 57' 4"                        | 44' 1"                   |
| 20 M.P.H. . . . .    | 99' 8"                        | 81' 6"                   |
| Seated load:         |                               |                          |
| Date . . . . .       | 4-8-12                        | 1-25-12                  |
| Weight, lb . . . . . | 40,100                        | 38,500                   |
| Distance:            |                               |                          |
| 5 M.P.H. . . . .     | 6' 2"                         | 6' 1"                    |
| 10 M.P.H. . . . .    | 25' 1"                        | 24' 0"                   |
| 15 M.P.H. . . . .    | 55' 11"                       | 51' 3"                   |
| 20 M.P.H. . . . .    | 102' 3"                       | 99' 5"                   |
| Standing load:       |                               |                          |
| Date . . . . .       | 4-11-12                       | 1-26-12                  |
| Weight, lb . . . . . | 45,300                        | 43,700                   |
| Distance:            |                               |                          |
| 5 M.P.H. . . . .     | 6' 1"                         | 5' 8"                    |
| 10 M.P.H. . . . .    | 26' 4"                        | 23' 9"                   |
| 15 M.P.H. . . . .    | 56' 3"                        | 55' 2"                   |
| 20 M.P.H. . . . .    | 117' 5"                       | 107' 1"                  |

## Peacock or Ackley Adjustable Brakes

will make similarly safe stops on your road too. The above results, taken from a table published by this journal, represent a few of about 6000 tests, using Peacock Hand Brakes. Because of the proved efficiency of these brakes your road can profit by their use.

If your air equipped cars are already equipped with Peacock or Ackley Adjustable Brakes, lay out certain runs where the hand brakes *only* must be used. If they are not so equipped, let us show you how little it will cost to put air brake efficiency in your hand brake equipment. Write for the National catalogs.



The Peacock Brake



The Ackley Adjustable Brake

# National Brake Co.

888 Ellicott Sq. SOLE MANUFACTURERS FOR UNITED STATES, CANADA, MEXICO, HAWAIIAN ISLANDS Buffalo, N. Y.



This Trade Mark The Guarantee of Excellence on Goods Electrical.



# Another Year of Prominence in the Electrical Progress of the World . . .



city of Melbourne, Australia. This is the largest single order ever placed for railway motor apparatus. Three hundred and twenty-five track-miles of the Victorian Railways will be electrified, requiring

**ELECTRIFICATION OF MELBOURNE.**—The General Electric Company secured the contract for the direct-current, high-voltage car equipments and control apparatus to be used in the electrification of the suburban railroads of the

400 four-motor car equipments, or 1600 motors, type GE-237, of 140 hp. each; 800 control equipments, 400 of which are for trailer cars and 400 air-compressor equipments. This direct-current, 1500-volt system will be the most extensive and one of the heaviest type ever designed for overhead railway practice. The motors for the cars, operated two in series, will be entirely new in design, better ventilated and with greater capacity for their weight than any heretofore used. Both local and express trains, of six coaches weighing 280 tons, will be used in normal service and will have a free running speed of 50 miles an hour.



& Hudson River Railroad Company ordered ten of these engines, weighing 100 tons each, for terminal service out of New York City. Recently a contract was awarded for six additional similar locomotives, but more powerful and weighing 110 tons each. The 100-ton machines will develop 1460 hp. continuously,

**MOST POWERFUL HIGH-SPEED ELECTRIC LOCOMOTIVES.** During the past year the General Electric Company has developed the most powerful high-speed electric locomotives so far built. Early in the year the New York Central

2000 hp. for one hour, and can develop as high as 5000 hp. for short periods. They will operate 800-ton trains in continual, frequent accelerating service between the New York Central Terminal and Harmon, and are capable of operating a 1000-ton train on level tangent track continuously at 60 miles per hour, or an 800-ton train at 65 miles per hour. The 110-ton locomotives will develop 2000 hp. continuously, or 2600 hp. for one hour. They will haul 1100-ton trains in continual, frequent accelerating service between the Terminal and Harmon, and will operate 1200-ton trains on level tangent track continuously at 57 miles per hour. This makes a total of 63 electric locomotives the General Electric Company has built for this electrified terminal.



Anaconda & Pacific Railway by the General Electric Company represents one of the largest installations of electrical equipment on a road formerly operated by steam. Two substations, one at Butte and the other at Anaconda, each equipped with two 1000-kw.

**2400-VOLT ELECTRIFICATION OF THE BUTTE, ANACONDA & PACIFIC.**—This year has witnessed the successful operation of the first steam railway in the world electrified at 2400 volts, direct current. The equipment of the Butte,

motor generators, are furnished power by the Great Falls Power Company, transmitted at 100,000 volts. There are seventeen locomotive units, each weighing 85 tons, fifteen for freight and two for passenger service. Two units are coupled together for heavy freight service and operated in multiple unit. The combination freight locomotives haul the main-line trains of 3400 tons at a speed of 17 miles per hour against the ruling grade of .3 per cent, and at 21 miles per hour on level tangent track. The passenger locomotives are geared for maximum speed of 45 miles per hour on level tangent track. The electrification comprises a total of about 90 miles on a single-track basis.



**NEW INCANDESCENT LAMP.**—Another improvement in the Mazda incandescent lamp was recently announced by the General Electric Company. These lamps, containing specially shaped metal filaments and filled with inert gas,

are being developed for high-current consumption and operate at an efficiency of only a half watt per candle. This is twice the efficiency of the best incandescent lamps in commercial use before this discovery. Single units of as much as 5000 candlepower have been developed. This new Mazda lamp promises to be of particular value in fields not heretofore covered by incandescent lamps.



**HARNESSING THE MISSISSIPPI.**—The power plant at Keokuk, Iowa, which commenced operation this past year, is the largest in the world. More than 300,000 horsepower will ultimately be developed from the Mississippi at this point and

sent out over a web of transmission circuits covering a radius of 150 miles. The electrical apparatus was made by the General Electrical Company. Alternating three-phase current is generated at 11,000 volts. The generators, the largest of this kind, each with a normal capacity of 10,000 horsepower, measure 32 feet in diameter and weigh over 600,000 pounds. Several 9000-kv-a., water-cooled, 110,000-volt transformers will step up the voltage for the high-tension transmission lines to distant points.



Continued from Page 47



**2400-VOLT ELECTRIFICATION OF THE MONTREAL TUNNEL AND TERMINAL.**—The Canadian Northern Railway has recently decided to electrify the tunnel and terminal entering Montreal for operation on 2400 volts direct current.

The selection of this system was consummated after a very careful consideration of the cost and maintenance in comparison with the single-phase system. The contract was awarded the General Electric Company, through the Canadian General Electric Company, for all the substation apparatus and rolling-stock equipment. The terminal electrification will consist of 10 miles of double track between the

passenger and freight terminals in Montreal and the Cartierville yards beyond the town of Mount Royal, where the incoming and outgoing trains will change from steam to electric locomotives and vice versa. Multiple-unit trains will give the suburban town of Mount Royal and the country beyond a quick and frequent service to the city. Seven locomotives weighing 83 tons will be employed, all the weight being on the drivers. Eight four-motor equipments, rated 125-hp. each, have been ordered for the multiple-unit cars. All the motors will be of the commutating-pole type, wound for 1200 volts, and connected permanently for operation two in series. The substation will be designed for an ultimate capacity of 4500 kw., but at present only two 1500-kw., three-unit, two-bearing, 2400-volt, motor-generator sets will be installed.

**HIGH-VOLTAGE LOCOMOTIVES FOR THE CANADIAN-PACIFIC.**—This company has also chosen the 2400-volt, direct-current system for the electrification of its Rossland Division, and has ordered, through the Canadian General Electric Company, four 92-ton electric locomotives for the serv-

ice. In this case, as in the others mentioned, the selection was made only after a most thorough comparison on a basis of cost and maintenance of the high-voltage, direct-current and single-phase systems.



**LARGEST SINGLE TURBINE EVER BUILT.**—The largest single turbo-generator, either operating or being built, is a 35,000-kw. Curtis turbine unit, which is now under construction at the Schenectady plant of the General Electric Company

for the Philadelphia Electric Company. It will have an overall length of 65 ft. and a weight of approximately 1,200,000 pounds. The following may be mentioned among other large turbine orders for the year:

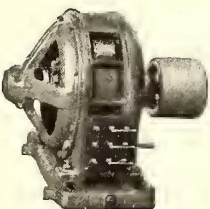
An additional horizontal 30,000-kw. unit and two 15,000-kw. vertical units for the Philadelphia Electric Co.; a 30,000-kw. horizontal unit for the New York Edison Co.; one 30,000-kw. and one 20,000-kw. horizontal units for the Commonwealth Edison Co., Chicago; one horizontal 20,000-kw. unit for the Cleveland Electric Illuminating Co.; one vertical 20,000-kw. unit for the Southern California Edison Co.; two horizontal 20,000-kw. and one vertical 15,000-kw. units for the Detroit Edison Co.; one horizontal 15,000-kw. unit for the Consolidated Gas & Electric Co., Baltimore; a 15,000-kw. unit for the Pacific Gas & Electric Co.; one 12,500-kw. unit for the Toledo Railway & Light Co.



**PANAMA CANAL TO BE OPERATED BY ELECTRICITY.**—Practically the entire electrical equipment for the Panama Canal, involving many new engineering details, was constructed by the General Electric Company in accordance with the

highly special requirements imposed by the Government specifications designed to withstand the severe tropical conditions. The ships will be towed through

the canal locks by electric locomotives, the locks will be operated by electric motors and the canal will be lighted with electricity. The locomotives will run on a track on each side of the canal lock walls and will receive their electric energy from a hydro-electric plant built in connection with Gatun Dam. The gates, valves and other machinery of the huge locks will be opened and closed by powerful electric motors. The switchboards for the control of the locks reproduce in miniature on the board by synchronous indicators every detail of operation so the attendant sees the complete movement of all gates, valves, etc.



**NEW YORK STATE BARGE CANAL ELECTRIC EQUIPMENT.**—

The construction of the New York State Barge Canal ranks second as an engineering project only to the vast undertaking

now nearly completed at Panama. As in the case of the Panama Canal electric equipment, the contract for all the generators, motors, switchboards, controlling devices and accessories for constructive work and for operating the completed locks on the Barge Canal has been awarded to the General Electric Company.



**GAS-ELECTRIC MOTOR CARS.**—Ever since these cars were introduced by the General Electric Company they have demonstrated that they fulfill the requirements of steam roads for supplementary service and have gained lasting popularity with

the traveling public. Twenty-four gas-electric cars have been sold to, or placed in service, during the past year on such representative roads as the Pere Marquette; Chicago, Peoria & St. Louis; New Orleans Great Northern; Midland Valley; Great Northern; Chicago, Milwaukee & St. Paul; Atchison, Topeka & Santa Fé; Minneapolis, St. Paul, Rochester & Dubuque (Dan Patch); Electric Short Line, and St. Louis & Southwestern Railway Co.

Continued on Page 49



Continued from Page 48



Patch" line, has been operating a heavy passenger business from Minneapolis to Northfield, Minn., for

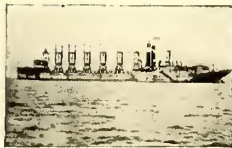
**GAS-ELECTRIC LOCOMOTIVE.**—The first gas-electric locomotive ever built is a product of the General Electric Company and was brought out this year. The Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Co., known as the "Dan

several years entirely by gas-electric cars. This with the freight traffic has grown so heavy that a 57-ton gas-electric locomotive was purchased for auxiliary equipment. This locomotive has attained in service a speed of 51 mph., running light, and 45 mph. with a five-car train. The power equipment consists of duplicate units, run in parallel, each similar to the standard set used in gas-electric motor cars. Four 100-hp., 600-volt, commutating-pole railway motors are mounted on the axles of the trucks, driving direct through gear reduction.



**STORAGE BATTERY RAILWAY CARS.**—The past year has seen nearly all the remaining horsecar lines in New York City replaced by storage-battery cars, and credit is due the General Electric Company for developing recently the motor and control equip-

ments that have made the first successful storage-battery cars possible. The Third Avenue Railway Company now has an equipment of 160 battery cars, the last horsecar having been withdrawn July 20, 1913. The New York Railway Company has forty-six of these cars in operation, although they are of somewhat different design and resemble the familiar single-deck center-entrance prototype of the company on Broadway. All of these cars have been equipped with General Electric motors and controllers.



**ELECTRIC SHIP PROPULSION.**—The United States collier "Jupiter," recently launched, is the first large vessel to be equipped with electric propulsion. A Curtis steam

turbo-generator set delivers its electrical output to a pair of induction motors, each of which is direct connected to a propeller shaft. The entire electrical equipment of this vessel was designed and constructed by the General Electric Company. This equipment has demonstrated a great economy in fuel consumption as well as a considerable saving of weight.



**LARGEST DIRECT-CURRENT GENERATORS IN THE WORLD.**—The task of developing direct-current generators of the largest capacity ever built has been entrusted to the General Electric Company, The Southern Aluminum Com-

pany, recently organized, is establishing a vast plant near Whitney, N. C., for the reduction of aluminum. The process is largely electrolytic and the company has contracted for eleven 5200-kw. horizontal water-wheel-type, direct-current generators, each developing 10,000 amperes at 520 volts. The order also includes two 1250-kv-a. alternating-current generators with all necessary switchboards, controlling devices and accessories.



**LARGEST SINGLE ORDER FOR RAILWAY-CAR EQUIPMENTS.**—The largest single contract for car equipments during the year was awarded the General Electric Company by the Philadelphia Rapid Transit Company. Before

placing the order the engineers of the railway company conducted a series of exhaustive stand and operative tests for the purpose of demonstrating the most advanced developments in electric railway apparatus. The order embraces 650 two-motor car equipments, type GE-201, 60 hp., and 650 straight air brake equipments with CP-27 compressors for surface cars; also 50 two-motor car equipments, type GE-222, 135 hp., for the elevated division.



**OTHER IMPORTANT ORDERS FOR LOCOMOTIVES AND CAR EQUIPMENTS.**—Many other large orders for railway equipment have been entrusted to the General Electric Company during the past year. Among these may

be cited 50 GE-210, 70-hp., two-motor, 65 GE-203, 50-hp., four-motor and 252 GE-203, 50-hp., two-motor car equipments for the Detroit United Railway Co., Detroit, Mich.; 60 GE-246, 40-hp., four-motor equipments for the United Railway & Electric Co., Baltimore, Md.; 100 GE-242, 60-hp., two-motor equipments, 14 extra motors and 100 straight air-brake equipments with CP-27 compressors for the Chicago City Railway Co.; 6 GE-69, 200-hp., four-motor locomotive equipments, 20 GE-222, 140-hp., four-motor car equipments and 52 GE-201, 60-hp. motors for the St. Louis, Springfield & Peoria Railway Co., Peoria, Ill.; 53 GE-203, 50-hp., four-motor equipments and 53 straight-air brake equipments with CP-25 compressors for the Twin City Rapid Transit Co., Minneapolis, Minn.; six 60-ton 1500-volt electric locomotives and four extra GE-212 motors for the Greenville, Spartanburg & Anderson RR. Co., Charlotte, N. C.; 50 GE-200, 40-hp., four-motor equipments for the Bay State Street Railway Co., Boston, Mass.; 240 four-motor equipments for the New York, New Haven & Hartford RR. Co.; 73 GE-207, 145 hp., 600-1200 volt two-motor equipments for the Oakland, Alameda & Berkeley RR.; four 120-ton locomotives for the Detroit River Tunnel electrification of the Michigan Central Railroad.

be cited 50 GE-210, 70-hp., two-motor, 65 GE-203, 50-hp., four-motor and 252 GE-203, 50-hp., two-motor car equipments for the Detroit United Railway Co., Detroit, Mich.; 60 GE-246, 40-hp., four-motor equipments for the United Railway & Electric Co., Baltimore, Md.; 100 GE-242, 60-hp., two-motor equipments, 14 extra motors and 100 straight air-brake equipments with CP-27 compressors for

**LIGHTING THE PANAMA-PACIFIC EXPOSITION.**—The lighting of the Panama-Pacific exposition will be the greatest undertaking ever attempted in the art of illumination, and this task has

been assigned to the General Electric Company. The combined decorative and lighting scheme will be an unique achievement throughout, an entirely new "symphony in color."

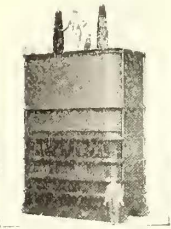


Continued from Page 49



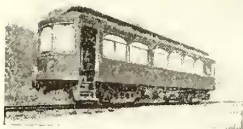
**LARGEST WATER-POWER DEVELOPMENT IN CANADA.**—The electrical apparatus for the power station of the Cedar Rapids Mfg. & Power Co., near Montreal, the largest water-power

development in Canada, will be furnished by the General Electric Company. The contract, obtained through the Canadian General Electric Company, comprises twelve 10,000 kv-a. vertical shaft water-wheel type generators, six 1250-kv-a. generators, thirteen 150-kw. motor-generator sets, switchboards, regulators and all accessories.



**HIGH - VOLTAGE TRANSMISSION.**—The Big Creek installation of the Pacific Light & Power Co. is intended to operate at 150,000 volts, the highest in commercial service—the largest self-cooled, oil-insulated transformers, rated at 3000-

kv-a., were built for the Southern Power Co. for outdoor use on lines carrying 100,000 volts.—Several units of 3000-kv-a., 140,000-volt rating, have been installed by the Eastern Michigan Power Co.—A number of other units for 7500 kv-a., 120,000 volts, have been installed by the Utah Power Co.—All these installations were made by the General Electric Company.



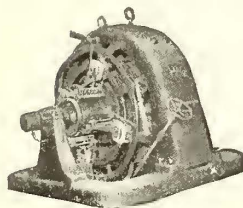
**MICHIGAN UNITED TRACTION COMPANY ADOPTS 2400 - VOLT DIRECT - CURRENT SYSTEM.**—Another instance of the increasing tendency to use high-voltage railway systems is the decision of the Michigan United Traction

Co. to electrify for operation on 2400 volts direct current. This contract for the complete equipment was also awarded the General Electric Company. The order comprises twenty GE-239, four-motor, 125-hp. complete car equipments, thirteen 500-kw. motor-generator sets, eight 500-kw. rotary converters, a 7500-kw. Curtis turbo-generator, 1500-kv-a. water-cooled transformer, and complete switchboard panels and accessories. The electrification embraces a 92-mile section of the road.



**PITTSBURG & BUTLER CHANGES TO 1200-VOLT D.-C. SYSTEM.**—This year has witnessed a very interesting change on the Pittsburg & Butler Street Railway system. The company had been operating for about four years

on the single-phase system, but this was abandoned the past year and the road newly equipped throughout with the 1200-volt direct-current system. The contract was awarded the General Electric Company for the entire substation apparatus, comprising four 300-kw., 1200-volt, 25-cycle rotary converters, four 300-kv-a. transformers, switchboards and accessories; also all the car equipments, consisting of ten GE-225, 100-hp., complete four-motor, 1200-volt equipments, and all apparatus necessary for making the change in the power station and transmission systems.

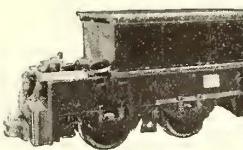


**LARGEST ROTARY CONVERTERS.**—To the General Electric Company is credited the development of the largest-size rotary converter ever built. A contract was secured for eight of these machines, of 4000 kw., for the Commonwealth Edi-

son Co. of Chicago and three 4000 kw. for the Chicago Railways Co. Among other important orders received for large machines may be mentioned ten 3500-kw. converters for the New York Edison Co., three 3000-kw. for the Brooklyn Rapid Transit Co., five 2000-kw. for the Aluminum Company of America, three 1700-kw. for the Rochester Railway & Light Co., four 1000-kw. for the Lehigh Coal & Navigation Co.

**LARGEST ELECTRIC MINING HOIST.**—The General Electric Company has built for the Crown Mines Ltd., of South Africa, a 4000-hp. hoist, the largest of its kind. The hoist is driven

by two 2000-hp., 500-volt, d.-c. motors, direct connected to the drums and operated in series. The hoist motors develop fully 7000-hp. during acceleration.



**CATSKILL AQUEDUCT.**—Ninety-five per cent. of the electrical equipment used in the construction of the great Catskill aqueduct system for New York City was

purchased from the General Electric Company. This engineering task ranks in a class with the construction of the Panama Canal and comprises the largest artificial dam and the longest and most extensive tunnel system in the world. Thirty storage-battery mining locomotives are in service in the tunnel construction work under New York City.

**STORAGE-BATTERY MINING LOCOMOTIVES.**—The successful introduction, during the past year, of several 4½-ton storage-battery locomotives

in coal mines offers a solution for the economical gathering and hauling of coal in the mines.

# General Electric Company

List of Sales Offices on Back Cover.

4782



The Trade Mark of the Largest Electrical Manufacturer in The World.



## Union Signal Apparatus

—is well known, it has the authority and prestige of time behind it. If your road is equipped with Union signal apparatus it will pay you to advertise the fact. Because it

—has splendid advertising value; the public is interested in knowing whether or not your road is protected with the best system and apparatus obtainable.

## Union Automatic Block Signals

—promote economy in operation. Our signals controlled by continuous A.C. track circuits do this because they

—help to keep trains on time; signals facilitate traffic and they  
 —increase the capacity of the road by making it possible to run more trains on your present tracks. Also they thus

—postpone the necessity for additional tracks. If the capacity of existing tracks is increased, you can handle more business without buying more cars, because those you have can get over the road more often.

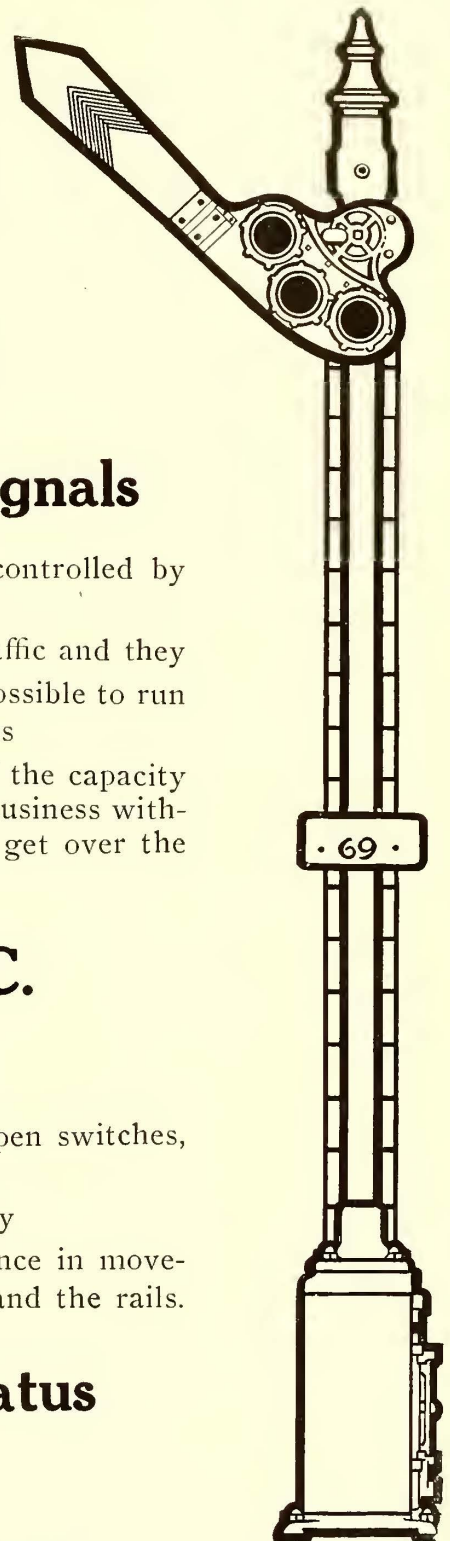
## Union Continuous A. C. Track Circuits

—insure you against collision, accidents, detect open switches, defective and broken power bonds and

—give protection at every point in the block. They  
 —do not depend for safe operation on any sequence in movements or any contacts, except between the wheels and the rails.

## All Union Signal Apparatus

—is built for service.



*“Safety AND Economy”*

# The Union Switch & Signal Co.

SWISSVALE, PA.

**SALES DEPARTMENT:  
30 CHURCH STREET, NEW YORK**



HUDSON TERMINAL BLDG. New York    PEOPLES GAS BLDG. Chicago    PACIFIC BLDG. San Francisco    CANDLER ANNEX Atlanta    CANADIAN EXPRESS BLDG. Montreal

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



# Bankers and Engineers

## PERRY, COFFIN & BURR

**PURCHASERS** of Public Service  
Bonds

**ENTIRE** issues on Properties  
**ANYWHERE** in the United States or  
Canada.

*Provided*

**COMMUNITIES** are substantial and  
**BUSINESS** is reasonably developed

**A Specialized Business gives  
A Specialized Service**

**60 State Street, Boston, Massachusetts**

## THE ARNOLD COMPANY

ENGINEERS—CONSTRUCTORS  
ELECTRICAL—CIVIL—MECHANICAL  
105 SOUTH LA SALLE STREET  
CHICAGO

**ALBERT S. RICHEY**  
**ELECTRIC RAILWAY ENGINEER**  
WORCESTER POLYTECHNIC INSTITUTE  
WORCESTER, MASSACHUSETTS

The Economical Production, Distribution and Application of Power;  
Transportation Efficiency; Physical Reports; Electrolysis Investiga-  
tions; Estimates; Designs; Specifications; Tests

**THE W. H. SCHOTT COMPANY**  
Engineers—Constructors—Managers  
**DEVELOP and MANAGE:**

Electric Railways—Light and Power Plants—Hydro-Electric De-  
velopments, Central Station Heating Plants—Gas and water-works.  
(Physical and Financial Examinations and Reports a Specialty.)  
Harris Trust Building, Chicago

**Scotfield Engineering Co.** Consulting Engineers  
PHILADELPHIA, PA.  
POWER STATIONS  
HYDRAULIC DEVELOPMENTS  
GAS WORKS  
ELECTRIC RAILWAYS

**Electric Railway Lighting and  
Power Company Bonds**

**ENTIRE ISSUES PURCHASED**

**N. W. HALSEY & CO.**

New York Philadelphia Chicago San Francisco

**THE J. G. WHITE COMPANIES**  
ENGINEERS-MANAGERS  
FINANCIERS

43 EXCHANGE PLACE, NEW YORK  
CHICAGO SAN FRANCISCO

**Ford, Bacon & Davis,**  
Engineers,

115 BROADWAY,  
New Orleans NEW YORK San Francisco



**STONE & WEBSTER ENGINEERING CORPORATION**

CONSTRUCTING ENGINEERS

NEW YORK BOSTON CHICAGO

**SANDERSON & PORTER**

ENGINEERS AND CONTRACTORS

REPORTS • DESIGNS • CONSTRUCTION • MANAGEMENT

HYDRO-ELECTRIC DEVELOPMENTS

RAILWAY, LIGHT AND POWER PROPERTIES

NEW YORK SAN FRANCISCO

**H. M. Byllesby & Co., Incorporated**

CHICAGO, NEW YORK,  
INSURANCE EXCHANGE BLDG. TRINITY BUILDING.

Purchase, Finance, Construct and Operate Electric Light,  
Gas, Street Railway and Water Power Properties.

Examination and reports. Utility Securities Bought and Sold.

**WOODMANSEE & DAVIDSON, Inc.**

**ENGINEERS**

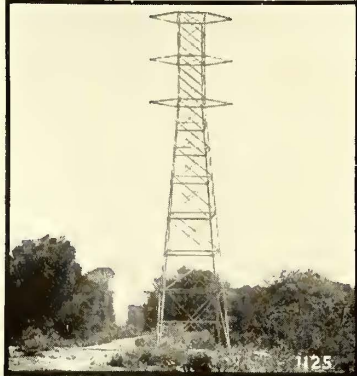
MILWAUKEE CHICAGO  
Wells Bldg. 1st National Bank Bldg.

**M. H. HOVEY, Consulting Signal Engineer**  
MADISON, WISC.  
Investigations, Plans, Specifications, Estimates and Valuations.



**AMERICAN BRIDGE COMPANY OF NEW YORK**  
**HUDSON TERMINAL-30 CHURCH STREET, NEW YORK**

*Manufacturers of Steel Structures of all classes particularly* **BRIDGES AND BUILDINGS**



Line of Twelve Electric Transmission Towers, 78 feet high.

|  |  |
|--|--|
| NEW YORK, N. Y., Hudson Terminal, 30 Church Street | CHICAGO, ILL., Commercial National Bank Building |
| Philadelphia, Pa., Pennsylvania Building           | St. Louis, Mo., Third Nat'l Bank Building        |
| Boston, Mass. John Hancock Bldg.                   | Denver, Colo., First Nat'l Bank Building         |
| Baltimore, Md., Continental Trust Building         | Salt Lake City, Utah, Walker Bank Building       |
| PITTSBURGH, PA. . . . Frick Building               | Duluth, Minn. . . . Wolvin Building              |
| Rochester, N. Y. . . . Powers Block                | Minneapolis, Minn., 7th Ave. & 2d St., S. E.     |
| Buffalo, N. Y. . . Marine National Bank            | Pacific Coast Representative:                    |
| Cincinnati, Ohio . . Union Trust Building          | U. S. Steel Products Co., Pacific Coast Dpt.     |
| Atlanta, Ga. . . . . Candler Building              | SAN FRANCISCO, CAL., Rialto Building             |
| Cleveland, Ohio . . Rockefeller Building           | Portland, Ore. . . . Selling Building            |
| Detroit, Mich., Beecher Ave. & M. C. R. R.         | Seattle, Wash., 4th Ave. So., Cor. Conn. St.     |

Export Representative: United States Steel Products Co., 30 Church St., N. Y.

**D. C. & WM. B. JACKSON**  
**ENGINEERS**

CHICAGO BOSTON  
 HARRIS TRUST BLDG. 248 BOYLSTON ST.  
 Plans, Specifications, Supervision of Construction  
 General Superintendence and Management  
 Examinations and Reports  
 Financial Investigations and Rate Adjustments

**A. L. DRUM & COMPANY**

CONSULTING AND CONSTRUCTING ENGINEERS  
 ELECTRICAL - CIVIL - MECHANICAL  
 PHYSICAL AND FINANCIAL REPORTS  
 American Trust Building CHICAGO

E. H. McHenry W. S. Murray

**McHENRY & MURRAY, ENGINEERS**

General Railway Engineering and Electrification  
 Second National Bank Bldg.  
 New Haven, Conn.

**GULICK-HENDERSON CO.**

Inspection Railway Equipment & Materials  
 PITTSBURGH CHICAGO NEW YORK

**ROOSEVELT & THOMPSON**  
**ENGINEERS**

Report, Investigate, Appraise, Manage Electric Railway,  
 Light and Power Properties.  
 71 Broadway, New York

**The Engineering and Contracting Co.**  
**1265 Broadway, New York**

**CONSULTING ENGINEERS**

Electric Railroad and Power Plant Work a Specialty.

Qualified by long experience to handle your most difficult problems.

*Prompt Service Standardized Charges*

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

**ROBERT W. HUNT & CO., Engineers**  
 BUREAU OF INSPECTION TESTS & CONSULTATION  
**Inspection and Test of all Electrical Equipment**

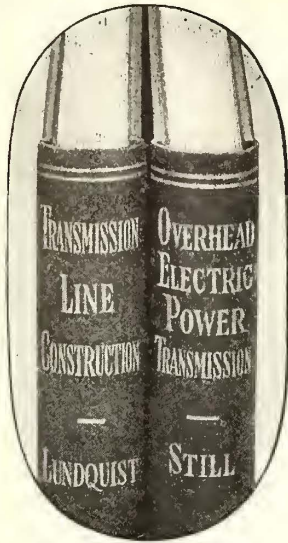
NEW YORK, 90 West St. ST. LOUIS, Syndicate Trust Bldg.  
 CHICAGO, 2200 Insurance Exchange  
 PITTSBURGH, Monongahela Bk. Bldg.

**KNOX, HESKETT & CO.**  
**ENGINEERS**

Investigations, Engineering, Construction and Management  
 for Public Utilities and Industrial Plants

Fisher Building CHICAGO Oklahoma City OKLA.





# Overhead Electric Power Transmission

By Alfred Still, Assistant Professor of Electrical Engineering, Purdue University. 306 pages, 6 x 9, illustrated, \$3.00 (12/6) net, postpaid.

# Transmission Line Construction

By R. A. Lundquist. 295 pages, 6 x 9, 183 illustrations, \$3.00 (12/6) net, postpaid.

These two books cover the field completely.

"Overhead Electric Power Transmission" is for the office engineer.

One reviewer said:

"It is evidently written by a man who has been 'through the mill,' and has known the inconvenience of searching here and there for specific information on methods of arriving at the best choice of details of a transmission system for given service under specified operating and financial limitations."

"Transmission Line Construction" gives cost data, specifications and up-to-date information on materials, equipment, labor, etc., etc.

They are companion volumes and have been much in demand.

## Wiring Diagrams of Electrical Apparatus and Installations

252 pages, 6 x 9, 439 illustrations. \$2.00 (8/4) net, postpaid.

They show much more than simple wiring connections. By their use it is possible to lay out a modern switchboard, to connect the apparatus and to understand the principles of operation of the various machines. The book does not attempt to cover armature winding.

There is practically no text, the circuit diagrams having been so drawn as to be self-explanatory.

## Transformer Practice

By William T. Taylor. Second edition, 278 pages, 6 x 9, 189 illustrations, \$2.50 (10/6) net, postpaid.

It does not treat of fundamental principles and design. Instead, it confines itself to the problems of the engineer in charge of installations and operation. It covers manufacture, assembling, connections, operation and testing.

McGraw-Hill Book Co., Inc., 239 W. 39th St., N. Y. Publishers of Books for the Electric Railway Journal

# MARSH & McLENNAN

## FIRE INSURANCE

Special Attention Given to Traction Insurance

New York Office  
54 William Street

Chicago Office  
175 Jackson Blv'd  
Insurance Exchange

OFFICES:  
London Office  
123 Bishopsgate Street

Minneapolis Office  
300 Nicollet Ave.

Duluth Office  
Torrey Building

# DETECTIVES

Street and Interurban Railway Work and Prosecutions our Specialties

## THE P. EDW. WISCH SERVICE

171 Broadway, Suite 11, NEW YORK

# Drummond's Detective Agency

A quarter of a century in business

A. L. DRUMMOND, Gen. Mgr., Ex-Chief U.S. Secret Service  
Park Row and Ann St., New York

Inside Work  
Checking

Strike Breaking  
Investigating of Claims

# GEO. P. NICHOLS & BRO

OLD COLONY BUILDING CHICAGO, ILLINOIS  
DESIGNERS AND BUILDERS OF

## Electric Transfer Tables

Our transfer tables are used on nearly every important steam railroad system in this country and on many electric railways. We can furnish these in either the surface or the pit types, and to meet all requirements.

The Searchlight Section has been created to fill your "wants." Are you taking advantage of its services?

## A. G. E. LABOR SAVING MACHINES

For Armature Banding, Coil Winding, Taping, Pinion Pulling, Commutator Slotting and Pit Jacks, Armature Buggies and Armature Removing Machines.

Manufactured by

### AMERICAN GENERAL ENGINEERING CO.

253 Broadway, New York, U. S. A.

## NEILER, RICH & CO., INC.

Successors to

PIERCE, RICHARDSON & NEILER, (Inc.) Engineers  
Manhattan Building, CHICAGO, ILL.

Frederick Sargent  
Wm. S. Monroe

A. D. Lundy  
James Lyman

SARGENT & LUNDY, Engineers  
Railway Exchange Bldg. Chicago, Ill.





# Wood Block Pavement

## The Experience of the Connecticut Company

The Connecticut Company operates 75% of the total street railroad mileage in Connecticut, embracing nearly all the principal cities. Mr. R. C. Cram, till recently the Assistant Engineer of this Company, quotes some illuminating experiences with wood block pavement. He states in the Electric Railway Journal of September 6th:



Noble Avenue, north of Barnum Street, Bridgeport, Conn.

"As a paving material, it rivals granite even when wear is considered, and is more readily cut in around obstructions. While trouble is had at times from the tendency of the block to buckle under certain conditions, such troubles are usually quite easy to remedy. The result is a smooth, clean, quiet pavement which is highly desirable, especially in residential sections. It is adaptable to both T and groove rail and may be quickly replaced after track repairs, even in the winter time, with the least loss of material."

The above illustration shows a typical stretch of wood block pavement laid

in 1907—removed temporarily and replaced in 1910. The photograph was taken in July, 1913, showing the pavement still in first-class condition.

For track use, wood block paving has the advantage of being smooth, clean, noise-deadening, and immune from fracture or damage by rail vibration. It is easily removed and replaced for track repairs without loss of material or extra expense. Its durability exceeds that of granite block.

*Booklets free on request*

**U. S. WOOD PRESERVING COMPANY**

162 Broadway, New York City



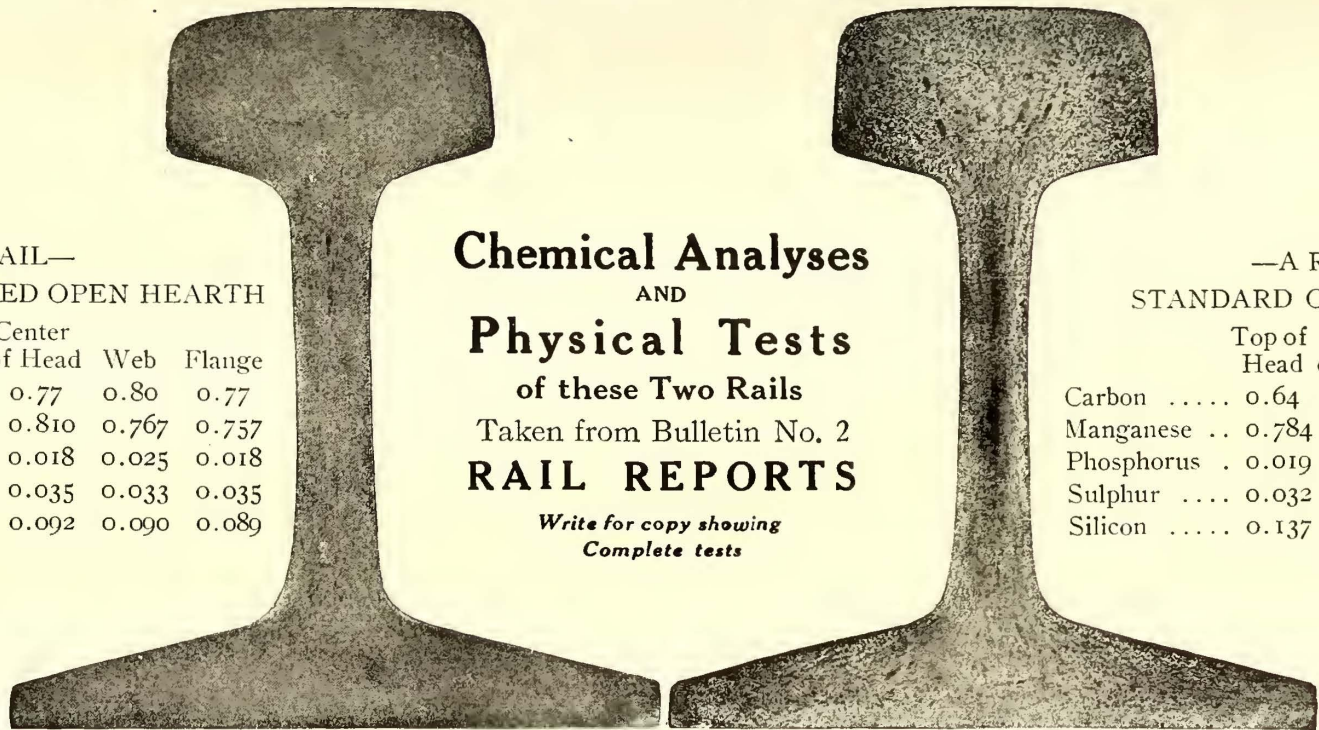
INDEX TO ADVERTISEMENTS

(An asterisk \* indicates advertisements appearing in the International Edition only.)

Table with 4 columns: Advertiser Name, Page, Advertiser Name, Page. Includes sections A through Z and an asterisk section. Advertisers include Abrahams & Co., American Brake Shoe & Foundry, Babcock & Wilcox, etc.

Classified Directory of Advertisers, Pages 66-72
'Want' and 'For Sale' Advertisements, Pages 76-77





## Chemical Analyses

AND

## Physical Tests

of these Two Rails

Taken from Bulletin No. 2

## RAIL REPORTS

*Write for copy showing  
Complete tests*

—A RAIL—

TITANIUM-TREATED OPEN HEARTH

|            | Top of Center | Head  | Web   | Flange |
|------------|---------------|-------|-------|--------|
| Carbon     | 0.76          | 0.77  | 0.80  | 0.77   |
| Manganese  | 0.744         | 0.810 | 0.767 | 0.757  |
| Phosphorus | 0.019         | 0.018 | 0.025 | 0.018  |
| Sulphur    | 0.034         | 0.035 | 0.033 | 0.035  |
| Silicon    | 0.090         | 0.092 | 0.090 | 0.089  |

—A RAIL—

STANDARD OPEN HEARTH

|            | Top of Center | Head  | Web   | Flange |
|------------|---------------|-------|-------|--------|
| Carbon     | 0.64          | 0.75  | 0.88  | 0.73   |
| Manganese  | 0.784         | 0.901 | 0.814 | 0.790  |
| Phosphorus | 0.019         | 0.026 | 0.044 | 0.020  |
| Sulphur    | 0.032         | 0.050 | 0.069 | 0.038  |
| Silicon    | 0.137         | 0.145 | 0.150 | 0.145  |

### PHYSICAL PROPERTIES

|   | Head                                | Web   | Flange |
|---|-------------------------------------|-------|--------|
| Elastic Limit   | 58700                               | ..... | 59600  |
| Ultimate Strength                                       | 125000                              | ..... | 128900 |
| Per Cent. Elongation                                    | 9.5                                 | ..... | 10.8   |
| Per Cent. Reduction                                     | 10.1                                | ..... | 12.3   |
| Hardness  | 237                                 | 250   | 226    |
| Impact Resistance                                       | 1.32                                | 1.04  | 1.28   |
| White-Souther Endurance,<br>both ends unbroken after... | Number of Revolutions<br>31,667,800 |       |        |
| Landgraf-Turner Endurance                               | 1215                                | 960   | 870    |

### PHYSICAL PROPERTIES

|                            | Head                                | Web   | Flange |
|----------------------------|-------------------------------------|-------|--------|
| Elastic Limit              | 56100                               | ..... | 57100  |
| Ultimate Strength          | 122100                              | ..... | 120500 |
| Per Cent. Elongation       | 8.5                                 | ..... | 11.5   |
| Per Cent. Reduction        | 8.5                                 | ..... | 12.7   |
| Hardness                   | 217                                 | 283   | 214    |
| Impact Resistance          | 1.16                                | 0.88  | 0.92   |
| White-Souther Endurance... | Number of Revolutions<br>12,122,700 |       |        |
| Landgraf-Turner Endurance  | 1350                                | 740   | 1355   |

# TITANIUM ALLOY MANUFACTURING COMPANY

Operating Under Rossi Patents

Processes and Products Patented

**General Offices and Works  
Niagara Falls, N. Y.**

### AGENTS:

THE PRIMOS CHEMICAL CO., Primos, Delaware Co., Pa.  
Pacific Coast: ECCLES & SMITH CO., Los Angeles, Portland, San Francisco  
Great Britain and Europe: T. ROWLANDS & CO., Sheffield, England

**Pittsburgh Office: Oliver Building  
Chicago Office: Peoples Gas Bldg.**





# CLASSIFIED DIRECTORY

of Manufacturers, Manufacturers' Agents, Engineers, Contractors, Bankers, Brokers, Etc., Etc.

advertising in this issue of the Electric Railway Journal

NOTE—For reference to the advertisements, see alphabetical index on page 64. \*Indicates advertisements appearing in the International Edition only

- Advertising, Street Car. Collier, Barron G., Inc.
- Air Cleaners. Lord Mfg. Co.
- Alloys and Bearing Metals. (See Bearings and Bearing Metals.)
- Alloys, Steel and Iron. Titanium Alloy Mfg. Co.
- Alternators. (See Generators, Alternating Current.)
- Anchor, Guy. Garton Co., W. R. Johns-Manville Co., H. W. Ohio Brass Co. Western Electric Co. Westinghouse Elec. & M. Co.
- Anti-Climbers. Railway Improvement Co.
- Armature Lifts. (See Cranes, Hoists and Lifts.)
- Automobiles and Busses. Brill Co., J. G.
- Axle Straighteners. Columbia M. W. & M. I. Co.
- Axles. Bemis Car Truck Co. Brill Co., The J. G. Cambria Steel Co. Carnegie Steel Co. Cincinnati Car Co. \*Hadfield's Steel Fdry. Co. Hanna Co., J. A. Lobdell Car Wheel Co. McGuire-Cummings Mfg. Co. National Tube Co. Niles Car & Mfg. Co. Railway Steel Spring Co. St. Louis Car Co. Standard Motor Truck Co. Standard Steel Works Co. Taylor Elec. Truck Co. Westinghouse Electric & Mfg. Co.
- Babbitting Devices. American Gen'l Eng'g Co. Columbia M. W. & M. I. Co.
- Babbitt Metals. (See Bearings & Bearing Metals.)
- Badges and Buttons. American Railway Supply Co. International Register Co. Western Electric Co. Woodman Mfg. & Supply Co., R.
- Ballast Cars and Ballast-ing Machinery. \*Hadfield's Steel Fdry. Co. Jeffrey Mfg. Co.
- Bankers and Brokers. Halsey & Co., N. W. Perry, Coffin & Burr.
- Batteries, Dry. Johns-Manville Co., H. W. Stackpole Carbon Co. Western Electric Co.
- Batteries, Storage. Electric Storage Battery Co. Federal Storage Battery Car. Co. Gould Storage Battery Co. Western Electric Co.
- Bearings and Bearing Metals. American General Engrg. Co. Bemis Car Truck Co. Columbia M. W. & M. I. Co. General Electric Co. Hess-Bright Mfg. Co. Long Co., E. G. Lumen Bearing Co. More-Jones Brass & M. Co. Ohio Brass Co. Post & Co., E. L. Railway Roller Bearing Co. St. Louis Car Co. Taylor Electric Truck Co. Westinghouse Elec. & M. Co.
- Bearings, Center. Baldwin Loco. Works
- Bearings, Oilless, Graphite & Bronze & Wooden. Graphite Lubricating Co.
- Bearings, Roller & Ball. Hess-Bright Mfg. Co. Railway Roller Bearing Co.
- Bells and Gongs. Brill Co., The J. G. Consolidated Car-Heating Co. Electric Service Supplies Co. National Tube Co. Ohio Brass Co. St. Louis Car Co. Trolley Supply Co. Western Electric Co.
- Belt Conveyors. Jeffrey Mfg. Co.
- Belting. Jeffrey Mfg. Co.
- Benders, Rail. Buda Co., The. \*Hadfield's Steel Fdry. Co. Niles-Bement-Pond Co. Watson-Stillman Co. Wharton, Jr., & Co., Wm. Zelnicker Sup. Co., W. A.
- Blowers. General Electric Co. Westinghouse Electric & Mfg. Co.
- Bollers. Babcock & Wilcox Co.
- Boiler Cleaning Com-pounds. Dearborn Chemical Co. Johns-Manville Co., H. W.
- Boiler Coverings. Johns-Manville Co., H. W.
- Boiler Tubes. National Tube Co.
- Bolts. (See Nuts and Bolts.)
- Bond Clips. Electric Railway Improvement Co.
- Bond Testers. American Steel & Wire Co. Lord Mfg. Co. Ohio Brass Co.
- Bonding Tools. American Steel & Wire Co. Elec. Ry. Improvement Co. Elec. Service Supplies Co. Ohio Brass Co.
- Bonds, Rail. American Steel & Wire Co. Elec. Ry. Improvement Co. Electric Service Supplies Co. Garton Co., W. R. General Electric Co. Goldschmidt Thermit Co. Johns-Manville Co., H. W. Lord Mfg. Co. Ohio Brass Co. Roebing's Sons Co., John A. Union Electric Co. Westinghouse Electric & Mfg. Co.
- Book Publishers. McGraw-Hill Book Co., Inc.
- Boring Tools, Car Wheel. Niles-Bement-Pond Co.
- Braces, Rail. National Malleable Castings Co. Kilby Frog & Switch Co. Weir Frog. Co.
- Brackets and Cross Arms. (See also Poles, Ties, Posts, etc.) American Bridge Co. Craghead Engineering Co. Electric Railway Equipment Co. Electric Service Supplies Co. International Creosoting & Construction Co. Lindsley Bros. Co. National Malleable Castings Co. Ohio Brass Co. Union Electric Co. Western Electric Co.
- Brake Adjusters. Ackley Brake & Supply Co., Inc.
- Brake Shoes. Amer. Brake Shoe & Fdy. Co. Barbour-Stockwell Co. Brill Co., The J. G. \*Canadian Brake Shoe Co. Columbia M. Wks. & M. I. Co. \*Hadfield's Steel Fdry. Co. Long Co., E. G. McGuire-Cummings Mfg. Co. St. Louis Car Co. Taylor Electric Truck Co. Wheel Truing Brake S. Co.
- Brakes, Brake Systems and Brake Parts. Ackley Brake & Supply Co., Inc. Allis-Chalmers Manufacturing Co. Brill Co., The J. G. Columbia M. Wks. & M. I. Co. General Electric Co. Jones' Sons Co., J. M. Kerschner, W. R. Long Co., E. G. Lord Mfg. Co. McGuire-Cummings Mfg. Co. McQuay-Norris Mfg. Co. National Brake Co. National Brake & Elec. Co. National Malleable Castings Co. Ohio Brass Co. St. Louis Car Co. Taylor Electric Truck Co. U. S. Metal & Mfg. Co. Westinghouse Trac. B Co.
- Brazing and Welding Processes. Goldschmidt Thermit Co. Indianapolis Switch & Frog Co. Ohio Brass Co. Oxweld Acetylene Co. Westinghouse Electric & Mfg. Co.
- Bridges and Buildings. American Bridge Co. Brown Hoisting Machinery Co.
- Brooms, Track, Steel or Rattan. Paxson Co., J. W. Western Electric Co. Worcester Brush & Scraper Co. Zelnicker Sup. Co., W. A.
- Brushes, Carbon. Dixon Crucible Co., Jos. Drew Electric & Mfg. Co. General Electric Co. Jeandron, W. J. Le Carbone Co. Le Valley Vitæ Carbon B. Co. Morgan Crucible Co. Speer Carbon Co. Stackpole Carbon Co. Western Elec. Co. Westinghouse Elec. & M. Co.
- Buckets, Grab. Beaumont Co., R. H.
- Bumpers, Car. Brill Co., The J. G. Cincinnati Car Co., G. C. Railway Improvement Co. Railway & Traction Supply Co.
- Bumpers, Car Seat. Elastic Tip Co. Elec. Service Supplies Co. Imperial Rubber Co. Massachusetts Chemical Co. Walpole Tire & Rubber Co.
- Bunkers, Coal. American Bridge Co. Beaumont Co., R. H.
- Bushings, Graphite & Wooden. Graphite Lubricating Co.
- Bushings, Rubber. Imperial Rubber Co.
- Bushings. (See Wheels and Bushing, Trolley.)
- Buttons. (See Badges and Buttons.)
- Buzzer Systems. Consolidated Car-Heating Co.
- Cables. (See Wires and Cables.)
- Carbon Brushes. (See Brushes, Carbon.)
- Car Equipment. (For Fenders, Heaters, Registers, Wheels, etc., see those headings.)
- Car Trimmings. (See also Curtains and Curtain Fixtures, Registers and Register Fittings, etc.) Brill Co., The J. G. Cincinnati Car Co. Columbia M. Wks. & M. I. Co. Electric Service Supplies Co. Hale & Kilburn Mfg. Co. St. Louis Car Co.
- Cars, Near-Side. Near-Side Car Co.
- Cars, Passenger, Freight and Express. American Car Co. Brill Co., The J. G. The Buda Co. Cambria Steel Co. Cincinnati Car Co. Federal Storage Battery Car Co. Hanna Co., J. A. Jewett Car Co. Jones' Sons Co., J. M. Kuhlman Car Co., G. C. McGuire-Cummings Mfg. Co. Near-Side Car Co. Niles Car & Mfg. Co. St. Louis Car Co. Stephenson Co., John. \*United Electric Car Co. Wason Mfg. Co.
- Cars, Prepayment. Electric Service Supplies Co. Near-Side Car Co. Prepayment Car Sales Co.
- Cars, Self-Propelled. Brill Co., The J. G. Federal Storage Battery Car Co. General Electric Co. Gould Storage Battery Co. McKean Motor Car Co.
- Cars, Work & Derrick. American Bridge Co. The Buda Co. Cincinnati Car Co. Hanna Co., J. A. McGuire-Cummings Mfg. Co.
- Cast Welded Joints. (See Joints, Rail.)
- Castings, Composition or Copper. Anderson M. Co., A. & J. M.
- Castings, Gray Iron and Steel. Amer. Brake Shoe & Fdy. Co. American Bridge Co. American Gen'l Eng'g Co. Bemis Car Truck Co. Columbia M. Wks. & M. I. Co. Falk Co., The. \*Hadfield's Steel Fdry. Co. Jeffrey Mfg. Co. Jones' Sons Co., J. M. Long Co., E. G. St. Louis Car Co. St. Louis Steel Fdy. Standard Steel Works Co. Union Spring & Mfg. Co. Wharton Jr., & Co., Wm.
- Castings, Malleable and Brass. Amer. Brake Shoe & Fdy. Co. American Gen'l Eng'g Co. Bemis Car Truck Co. \*Hadfield's Steel Fdry. Co. Jeffrey Mfg. Co. Long Co., E. G.
- National Malleable Castings Co. Ohio Brass Co. St. Louis Car Co. Catchers and Retrievers, Trolley. Eclipse Railway Supply Co. Elec. Service Supplies Co. Holland Trolley Supply Co. Long, E. G. Lord Mfg. Co. Trolley Supply Co. Union Electric Co. Wood Co., Chas. N.
- Ceiling, Car. Keyes Products Co. Pantasote Co.
- Chain & Belt Machinery. Beaumont & Co., R. H.
- Change Carriers. Etter, Chas. F.
- Charging Sets, Storage Battery. General Electric Co.
- Checks, Employees'. American Ry. Supply Co.
- Circuit Breakers. \*British Westinghouse Elect. & Mfg. Co. Ltd. Cutter Co. Garton Co., W. R. General Electric Co. Ohio Brass Co. Western Electric Co. Westinghouse Elec. & M. Co.
- Clamps and Connectors for Wires and Cables. American Gen'l Eng'g Co. Anderson M. Co., A. & J. M. Dossier & Co. Elec. Service Supplies Co. General Electric Co. Klein & Sons, Mathias. Ohio Brass Co. Western Electric Co. Westinghouse Elec. & M. Co.
- Cleaners and Scrapers, Track. (See also Snow-Plows, Sweepers and Brooms.) Brill Co., The J. G. Cincinnati Car Co. McGuire-Cummings Mfg. Co. Ohio Brass Co. Paxson Co., J. W. Root Spring Scraper Co. Van Dorn & Dutton Co. Western Electric Co. Worcester Brush & Scraper Co.
- Cleats, Car Wiring. General Electric Co.
- Clusters and Sockets. General Electric Co.
- Coal and Ash Handling. (See Conveying and Hoisting Machinery.)
- Coasting Clocks. Railway Improvement Co.
- Coils, Armature & Field. Cleveland Armature Works. Cleveland Coil & Mfg. Co. Columbia M. W. & M. I. Co. D & W Fuse Co. General Electric Co. Independent Lamp & Wire Co. McLeer Electric & Mfg. Co. Roebing's Sons Co., John A. Westinghouse Elec. & M. Co.
- Coils, Choke & Kicking. Electric Service Supplies Co. General Electric Co. Lord Mfg. Co. Westinghouse Elec. & M. Co.
- Coils, Machines for Band-ing and Winding. American Gen'l Eng'g Co. Columbia M. W. & M. I. Co. Electric Service Supplies Co. Garton Co., W. R. Griswold Mach. Co., Geo. M. Western Electric Co.
- Coin-Counting Machines. International Register Co. Johnson Fare Box Co.
- Commutator Slotters. American General Engineering Co.





**MODEL 280, Single Range Portable Voltmeter.**  
(One-quarter Size.)

# WESTON

## Miniature Precision Instruments for Direct Current

**A new group of very small Indicating Instruments**  
**COMPACT—ACCURATE—DURABLE—BEAUTIFUL**



**MODEL 280, Triple Range Portable Volt-Ammeter**  
(One-quarter Size.)



**MODEL 267, Switchboard Ammeter.**  
(One-quarter Size.)

### PORTABLE

**Voltmeters, Millivoltmeters, Volt-Ammeters, Ammeters, Mill-Ammeters** are supplied in single, double and triple ranges.  
**The Triple range Volt-Ammeter comprising six instruments in one.**

This group also includes **BATTERY TESTERS.**

### SWITCHBOARD

**Voltmeters Volt-Ammeters Ammeters Mill-Ammeters**  
This new line of instruments represents the latest development of the pivoted moving coil, permanent magnet type for low ranges.  
The refinement of design and mechanical work in them has been carried to a degree which would appear to be almost impossible of accomplishment, if the results were not evident in the instruments themselves.



**MODEL 268, Switchboard Volt-Ammeter. Reads Amperes, Press Button for Volts.**  
(One-quarter Size.)

They embody characteristics which have made the well known Weston Standards famous throughout the world. They are accurate, dead beat and extremely sensitive. They may be left continuously in circuit at full load without injury and are shielded against the external electrical and magnetic influences of other apparatus in their vicinity. They are substantially constructed and may be safely sent long distances through the mails and will withstand an extraordinary amount of vibration without injury. They have the longest scale ever provided in instruments with equal length of pointer. Each model has been thoroughly tested under the most severe conditions of service and in experiments extending over more than one year. The portable instruments may be conveniently carried in the coat pocket. The prices have been established upon so low a scale that any one may possess one or more of these remarkable instruments at moderate cost. If you cannot obtain the instrument desired from your dealer, write us. The several models and ranges offer a selection from over 300 different combinations, listed in Bulletin No. 8. Will be mailed upon request.

### WESTON ELECTRICAL INSTRUMENT COMPANY

New York, 114 Liberty St.  
Chicago, 832 Monadnock Block.  
Boston, 176 Federal St.  
Philadelphia, 342 Mint Arcade.  
Birmingham, American Trust Bldg.

St. Louis, 915 Olive St.  
Denver, 231 15th St.  
San Francisco, 682 Mission St.  
Cleveland, 1729 E. 12th St.  
Detroit, 618 Union Trust Bldg.

Montreal  
Winnipeg  
Vancouver  
Calgary  
Toronto, 76 Bay St.  
Paris, 12 Rue St. Georges.

**Main Office and Works:**  
**NEWARK, N. J.**  
London, Audrey House, Ely Place, Holborn.  
Berlin, Genest, Str. 5 Schoenberg.  
Johannesburg, So. Africa, F. Peabody Rice, Standard Bank Buildings, Harrison St.



## SKYLIGHTS

Without packing or filling substance—Of GLASS and METAL ONLY—ABSOLUTELY and PERMANENTLY PROOF AGAINST LEAKAGE. Send for details. WE BUILD THEM RIGHT.

National Ventilating Co., 339 E. 26th St., N.Y.

## Every Power Plant Manager

should have a copy of the Jeffrey New Bulletin No. 32-B on Coal and Ashes Handling Machinery, just off the press.

Send for it—Now

1-3-14

Jeffrey Mfg. Co.

Columbus, O.

## Money Savers—ALL

We carry a line of equipment designed to save you money—chief among which are:

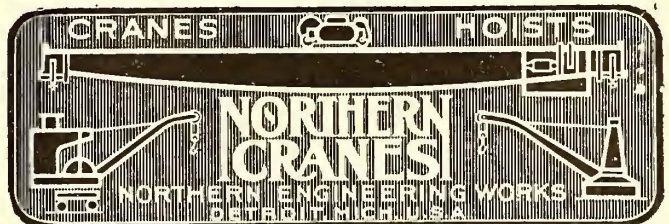
- Commutator Slotting Devices
- Pinion Pullers
- Motormen's Seats
- Wilson Trolley Catchers

A line from you will bring the prices and full details.

CHAS. N. WOOD CO., 79 Milk St., Boston, Mass.

## MURPHY AUTOMATIC SMOKELESS FURNACE

MURPHY IRON WORKS  
10 Walker Street, Detroit, Mich.

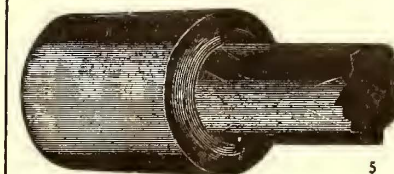


## GREEN CHAIN GRATE STOKERS

For Water Tube and Tubular Boilers

GREEN ENGINEERING CO.  
1300 Steger Bldg. Chicago, Ill.

Catalogue "G"—Green Chain Grate Stokers  
Catalogue No. 8—Geco Ash Handling Systems  
Sent on application



## Car Sign Stick Rubber

Elastic Tip Co.  
370 Atlantic Ave.  
BOSTON, MASS.



## CLASSIFIED DIRECTORY—Continued

- General Electric Co.  
Westinghouse Elec. & Mfg. Co.  
Wood Co., Chas. N.
- Commutator Truing Devices.**  
American General Engineering Co.  
General Electric Co.
- Commutators and Parts.**  
American Gen'l Eng's Co.  
Cameron Electrical Mfg. Co.  
Cleveland Armature Wks.  
Cleveland Coil & Mfg. Co.  
Columbia M. Wks. & M. I. Electric Service Co.  
Garton Co., W. R.  
General Electrical Co.  
Long Co., E. G.  
Van Dorn & Dutton Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Compounds, Insulating.**  
(See Insulation and Insulating Compounds.)
- Compressors, Air.**  
Allis-Chalmers Manufacturing Co.  
Chicago Pneumatic Tool Co.  
Curtis & Co. Mfg. Co.  
General Electric Co.  
National Brake & Elec. Co.  
Vulcan Engrg. Sales Co.  
Westinghouse Trac. B. Co.
- Condensers.**  
Allis-Chalmers Manufacturing Co.  
General Electric Co.  
Westinghouse Machine Co.
- Conduits, Underground.**  
Johns-Manville Co., H. W.  
Standard Underg. Cable Co.  
Western Electric Co.
- Controller Regulators.**  
Electric Service Supplies Co.  
Lord Mfg. Co.
- Controllers and Controller Parts.**  
Allis-Chalmers Manufacturing Co.  
American Gen'l Eng'g Co.  
Columbia M. Wks. & M. I. Co.  
Crocker-Wheeler Co.  
Electric Service Supplies Co.  
General Electric Co.  
Johns-Manville Co., H. W.  
Kerschmer, W. R.  
Lord Mfg. Co.  
Westinghouse Elec. & M. Co.
- Controlling Systems.**  
General Electric Co.  
Westinghouse Elec. & M. Co.
- Converters, Rotary.**  
Allis-Chalmers Manufacturing Co.  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Conveying and Hoisting Machinery.**  
\*Allen & Co., Ltd., Edgar.  
American Bridge Co.  
Beaumont Co., R. H.  
Brown Hoisting Machinery Co.  
Green Eng. Co.  
\*Hadfield's Steel Fdry. Co.  
Jeffrey Mfg. Co.  
Johnston & Jennings Co.  
Northern Engineering Wks.
- Conveyors.**  
Beaumont Co., R. H.
- Cord, Bell, Trolley, Register & Sash.**  
Brill Co., The J. G.  
Electric Service Supplies Co.  
Garton Co., W. R.  
Imperial Rubber Co.  
International Register Co.  
Long Co., E. G.  
Roebling's Sons Co., John A.  
Samson Cordage Works.  
Trolley Supply Co.
- Cord Connectors & Couplers.**  
Elec. Service Supplies Co.  
Samson Cordage Works.  
Wood Co., Chas. N.
- Couplers, Car.**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Long Company, E. G.  
McGuire-Cummings Mfg. Co.  
National Malleable Castings Co.  
Ohio Brass Co.  
Westinghouse Trac. B. Co.
- Cranes.** (See also Hoists & Lifts.)  
Allis-Chalmers Manufacturing Co.  
Beaumont Co., R. H.  
Brown Hoisting Machinery Co.  
Curtis & Co. Mfg. Co.  
Duff Mfg. Co.  
Franklin Portable Crane & Hoist Co.  
Johnston & Jennings Co.  
Niles-Bement-Pond Co.  
Northern Engineering Works  
Patten Co., Paul B.  
Thew Automatic Shovel Co.  
Van Dorn & Dutton Co.
- Creosoting.** (See Wood Preservatives.)
- Cross Arms.** (See Brackets and Cross Arms.)
- Crossing Signals, Highway.**  
Elec. Service Supplies Co.  
Protective Signal Mfg. Co.  
U. S. Electric Signal Co.
- Crossings, Track.** (See Track, Special Work.)
- Crushers and Pulverizers.**  
Jeffrey Mfg. Co.
- Culverts.**  
Arnett Co., Lee.  
Atlas Metal Works.  
Bark River B. & Culvert Co.  
California Corr. Culvert Co.  
Canton Culvert Co.  
Coast Culvert & Flume Co.  
Colorado I. I. P. & Col. Co.  
Corrugated Culvert Co.  
Delaware Metal Culvert Co.  
Dixie Culvert & Metal Co.  
Illinois Corrugated Metal Co.  
Independence Corrugated Culvert Co.  
Kentucky Culvert Mfg. Co.  
Lone Star Culvert Co.  
Lyle Corrugated Culvert Co.  
Michigan Bridge & Pipe Co.  
Montana Culvert Co.  
Nebraska Culvert Co.  
Nevada Metal Mfg. Co.  
New England Metal Col. Co.  
North East Metal Cul. Co.  
Northwest, Sheet & I. Wks.  
Ohio Corrugated Culvert Co.  
Oklahoma Corr. Culvert Co.  
O'Neill Co., W. O.  
Pennsylvania Metal Cul. Co.  
Princeton Sheet Metal Wks.  
Road Supply & Metal Co.  
Sioux Falls Culvert Co.  
Spencer, J. N.  
Spokane Corrugated Culvert & Tank Co.  
Tennessee Metal Culvert Co.  
Utah Culvert Co.  
Virginia Metal & Culvert Co.  
Western Metal Mfg. Co.  
Wisconsin Culvert Co.
- Curtains, Curtain Fixtures and Curtain Material.**  
Brill Co., The J. G.  
Edwards Co., Inc., The O. M.  
Electric Service Supplies Co.  
Hartshorn Co., Stewart  
National Lock Washer Co.  
Pantasote Co., The  
Railway Supply & Curtain Co.  
St. Louis Car Co.
- Cushions, Field Coll.**  
Massachusetts Chemical Co.  
Walpole Tire & Rubber Co.
- Derailing Devices.** (See also Track Work.)  
The Buda Co.  
Cleveland, Frog & Cross Co.  
\*Hadfield's Steel Fdry. Co.  
U. S. Metal & Mfg. Co.  
Wharton, Jr., & Co., Wm.
- Despatching Systems.**  
Northey-Simmen Signal Co., Ltd., The
- Detective Service.**  
Drummond's Detective Ag'y  
Wisch Service, P. Edward.
- Door Operating Devices.**  
Consolidated Car-Heating Co.
- Doors and Door Fixtures.**  
Brill Co., The J. G.  
Edwards Co., Inc., The O. M.  
Crocker-Wheeler Co.  
General Electric Co.
- Electric Service Supplies Co.**  
Hale & Kilburn Mfg. Co.
- Doors & Shutters, Fire-proof.**  
Kinnear Mfg. Co.
- Doors, Asbestos.**  
Johns-Manville Co., H. W.
- Doors, Folding Vestibule.**  
Electric Service Supplies Co.
- Doors, Steel Rolling.**  
Kinnear Mfg. Co.
- Doors, Trap.**  
Edwards Co., Inc., The O. M.
- Draft Rigging and Draw Bars.** (See Couplers, Car.)
- Drills, Track.**  
American Steel & Wire Co.  
The Buda Co.  
Chicago Pneumatic Tool Co.  
Elec. Service Supplies Co.  
Johnston & Jennings Co.  
Long Co., E. G.  
Ohio Brass Co.  
Van Dorn & Dutton Co.
- Dryers and Purifiers, Oil.**  
(See Purifiers and Dryers, Oil.)
- Dryers, Sand.**  
Arnett Eng'g Sales Co.  
Zelmicker Sup. Co., W. A.
- Drying Apparatus.** (See also Heating and Ventilating Apparatus.)  
Jeffrey Mfg. Co.
- Dynamos.** (See Generators.)
- Elevators.**  
Curtis & Co. Mfg. Co.
- Engineers, Consulting.**  
Contracting and Operating.  
Archbold-Brady Co.  
Arnold Co.  
\*British Westinghouse Electric & Mfg. Co. Ltd.  
Byllesby & Co., H. M.  
Columbia Machine Works & Malleable Iron Co.  
Drum & Co., A. L.  
Engineering & Contracting Co.  
Ford, Bacon & Davis.  
Gulick-Henderson Co.  
Hovey, M. H.  
Hunt & Co., Robt. W.  
Jackson, D. C. & Wm. B.  
Knox, Heskett & Co.  
McHenry & Murray.  
Neiler, Rich & Co.  
Richey, A. S.  
Roosevelt & Thompson.  
Sanderson & Porter.  
Sargent & Lundy.  
Schott Co., W. H.  
Scofield Engineering Co.  
Stone & Webster Eng. Corp.  
White & Co., J. G.  
\*White & Co. Ltd., J. G.  
Woodmansee & Davidson.
- Engines, Gas and Oil.**  
Allis-Chalmers Manufacturing Co.  
Buckeye Engine Co.  
Westinghouse Machine Co.
- Engines, Steam.**  
Allis-Chalmers Manufacturing Co.  
\*British Westinghouse Electric & Mfg. Co. Ltd.  
Buckeye Engine Co.  
Westinghouse Machine Co.
- Fare Boxes.**  
American Gen'l Eng'g Co.  
Brill Co., The J. G.  
Cleveland Fare Box Co.  
International Register Co.  
Johnson Fare Box Co.  
Rooke Auto. Register Co.
- Felt.**  
Gehlert, Louis.
- Fence Post Moulds.**  
D. & A. Post Mold Co.
- Fences and Fence Posts.**  
American Steel & Wire Co.  
D. & A. Post Mold Co.
- Fenders & Wheel Guards.**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Consolidated Car Fender Co.  
Eclipse Railway Supply Co.  
Electric Service Supplies Co.  
Fonger Fender Co.  
Lord Mfg. Co.  
McGuire-Cummings Mfg. Co.
- Parmenter, F. & W. G. Co.**  
Star Brass Works.  
Western Electric Co.
- Fibre.**  
Amer. Vulcanized Fibre Co.  
Continental Fibre Co.  
Diamond State Fibre Co.  
Westinghouse Electric & Mfg. Co.
- Fibre, Tubing.**  
Continental Fibre Co.
- Field Coils.** (See Armature and Field Coils.)
- Filters, Water.** (See Water Filters.)
- Fire Extinguishing Apparatus.**  
Imperial Rubber Co.  
Johns-Manville Co., H. W.  
Pyrene Mfg. Co.
- Fireproofing Materials.**  
Johns-Manville Co., H. W.
- First Aid Cabinets.**  
Johnson & Johnson
- Flooring Composition, Car and Building.**  
Western Elec. Co.
- Forging, Punching & Shearing Machinery.**  
Bliss Co., E. W.
- Forgings.**  
American Bridge Co.  
Bliss Co., E. W.  
Standard Motor Truck Co.  
Standard Steel Works Co.
- Friction Tape and Cloths.**  
Imperial Rubber Co.  
Massachusetts Chemical Co.  
Walpole Tire & Rubber Co.  
Westinghouse Electric & Mfg. Co.
- Frogs, Track.** (See Track Work.)
- Furnaces.** (See Stokers.)
- Furniture, Metal Office.**  
Edwards Co., Inc., The O. M.
- Fuses, Refillable.**  
Ackley Brake & Supply Co.
- Fuses and Fuse Boxes.**  
American Gen'l Eng'g Co.  
Columbia M. Wks. & M. I. Co.  
D & W Fuse Co.  
General Electric Co.  
Johns-Manville Co., H. W.  
Lord Mfg. Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Gages, Oil and Water.**  
Ohio Brass Co.
- Gaskets.**  
Imperial Rubber Co.  
Johns-Manville Co., H. W.  
Power Specialty Co.
- Gas Producers.**  
Westinghouse Machine Co.
- Gates, Car.**  
Brill Co., The J. G.  
Cincinnati Car Co.  
Jewett Car Co.
- Gear Cases.**  
Bemis Car Truck Co.  
Columbia M. Wks. & M. I. Co.  
Elec. Service Supplies Co.  
Jeffrey Mfg. Co.  
Kerschmer, W. R.  
Westinghouse Elec. & Mfg. Co.
- Gears and Pinions.**  
American Gen'l Eng'g Co.  
Amer. Vulcanized Fibre Co.  
Bemis Car Truck Co.  
Bliss Co., E. W.  
Columbia M. Wks. & M. I. Co.  
Elec. Service Supplies Co.  
Garton Co., W. R.  
General Electric Co.  
\*Hadfield's Steel Fdry. Co.  
Kerschmer, W. R.  
Long Co., E. G.  
Nuttall Co., R. D.  
Tool Steel Gear & Pinion Co.  
Union Electric Co.  
Van Dorn & Dutton Co.
- Generating Sets, Gas-Electric.**  
General Electric Co.
- Generators and Motors, Spare Parts of.**  
Allis-Chalmers Manufacturing Co.
- Western Electric Co.**  
Westinghouse Elec. & M. Co.
- Generators, Alternating Current.**  
Allis-Chalmers Manufacturing Co.  
Crocker-Wheeler Co.  
General Electric Co.  
National Brake & Electric Co.  
Western Electric Co.  
Westinghouse, Elec. & M. Co.
- Generators, Direct Current.**  
Allis-Chalmers Manufacturing Co.  
\*British Westinghouse Electric & Mfg. Co. Ltd.  
Crocker-Wheeler Co.  
\*Dick, Kerr & Co.  
General Electric Co.  
Jeffrey Mfg. Co.  
National Brake & 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. Co.
- Greases.** (See Lubricants.)
- Grinders and Grinding Wheels.**  
The Buda Co.  
Chicago Pneumatic Tool Co.  
Goldschmidt Thermit Co.  
\*Hadfield's Steel Fdy. Co.  
Indianapolis Switch & Frog Co.  
Niles-Bement-Pond Co.  
Railway Track Work Co.  
Western Electric Co.  
Wheel Truing Brake Shoe Co.
- Grounds.**  
Lord Manufacturing Co.
- Guards, Cattle.**  
American Bridge Co.
- Guards, Lamp.**  
Electric Service Supplies Co.
- Guards, Trolley.**  
Electric Service Supplies Co.  
Lord Mfg. Co.  
Ohio Brass Co.
- Harps, Trolley.**  
American Gen'l Eng'g Co.  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Elec. Service Supplies Co.  
Garton Co., W. R.  
Holland Trolley Supply Co.  
Lumen Bearing Co.  
More-Jones Brass & Metal Co.  
Nuttall Co., R. D.  
Ohio Brass Co.  
Star Brass Works.  
Western Electric Co.
- Headlights.**  
Electric Service Supplies Co.  
Garton Co., W. R.  
General Electric Co.  
Jones' Sons Co., J. M.  
Long Co., E. G.  
Ohio Brass Co.  
St. Louis Car Co.  
Trolley Supply Co.  
Union Electric Co.  
Westinghouse Elec. & M. Co.
- Headlining.**  
Keys Products Co.  
Pantasote Co., The.
- Heaters, Car (Electric).**  
Consolidated Car-Heating Co.  
Gold Car Htg. & Ltg. Co.  
Johns-Manville Co., H. W.  
Smith Heater Co., Peter.
- Heaters, Car, Hot Air.**  
Cooper Heater Co.  
Smith Heater Co., Peter.
- Heaters, Car, Hot Water.**  
Cooper Heater Co.  
Smith Heater Co., Peter.
- Heaters, Car, Stove.**  
Electric Service Supplies Co.  
McGuire-Cummings Mfg. Co.
- Hoists and Lifts, Electric and Pneumatic.**  
Curtis & Co. Mfg. Co.  
Duff Mfg. Co.





## Grip Nuts After New Fields to Conquer

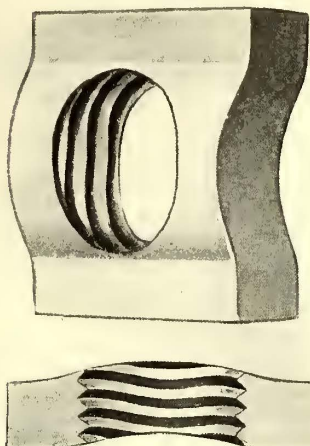
Seventy-five per cent. of the railroads now use grip nuts on locomotives, cars, frogs and crossings, on points of application subject to greatest vibration, with entire satisfaction. Grip Nuts can be reapplied without injury to the threads of the bolt.

## The Reason Grip Nuts Lock

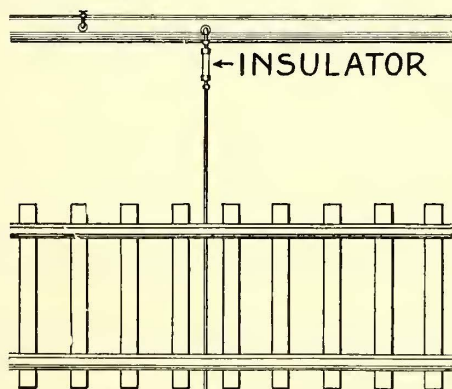
Each bar of steel has an arch running through the center of it. This nut is blanked out and threaded through this arch, after which it is accurately gauged, then deflected by pressure upon the crown of the arch by automatic machinery, thus producing a locking friction upon the threads, as shown in the illustration.

The thread deflection in Grip Nuts has been made with scientific precision before leaving the factory. Each nut is gauged to determine its thickness so that the deflection in the threads is absolutely uniform at all times. They are all ready to wrench in place and will lock upon a bolt as soon as all the threads of the Grip Nut are engaged. They do not require to be jammed or sprung. Good conduct is all that is required and they are guaranteed not to injure the bolt threads.

**GRIP NUT CO. CHICAGO**



This cut shows an exaggerated curve in thread pitch—or more than is given in practice, in order to emphasize this feature.



## ELECTROLYSIS IS CHECKMATED

and full efficiency obtained from your generators, because current is conserved by using

## Samson Pipe Insulators

The vast network of underground service pipes which attract stray electrical currents can be effectually insulated, and the current kept in its proper channels with Samson Pipe Insulators for water and gas pipes. They consist of a dense heavily glazed porcelain tube capped at each end with bronze castings. Attached at any point on the service pipe leading to the main, perfect insulation is obtained. They are a proven success wherever used. The price is small. They are easily installed at small labor cost, and in new work the labor cost is zero. Write to-day for further particulars.

Drew Electric & Manufacturing Co.  
614 Traction Terminal Building  
Indianapolis, Ind.



## CLASSIFIED DIRECTORY—Continued

- Ford Chain Block & Mfg. Co.  
Franklin Portable Crane & Hoist Co.  
Johnston & Jennings Co.  
Niles-Bement-Pond Co.  
Northern Engineering Works.  
Van Dorn & Dutton Co.
- Hose Bridges.**  
\*Hadfield's Steel Fdry. Co. Ohio Brass Co.
- Hose, Pneumatic & Fire.**  
Imperial Rubber Co.
- Hydraulic Machinery.**  
Allis-Chalmers Manufacturing Co.  
\*Hadfield's Steel Fdry. Co. Niles-Bement-Pond Co. Watson-Stillman Co.
- Impregnating Apparatus.**  
(See Vacuum Drying and Impregnating Apparatus.)
- Inspection.**  
Gulick-Henderson Co.  
Hunt & Co., Robt. W.
- Instruments, Electrical Measuring, Testing and Recording.**  
General Electric Co.  
Johns-Manville Co., H. W.  
Western Electric Co.  
Westinghouse Elec. & M. Co.  
Weston Elec'l Instrument Co.
- Insulating Cloths, Paper and Tape.**  
Amer. Vulcanized Fibre Co.  
Anchor Webbing Co.  
Garton Co., W. R.  
General Electric Co.  
Hope Webbing Co.  
Imperial Rubber Co.  
Johns-Manville Co., H. W.  
Lord Mfg. Co.  
Massachusetts Chemical Co. Ohio Brass Co.  
Okonite Co., The  
Standard Paint Co.  
Walpole Tire & Rubber Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Insulations and Insulating Compounds.** (See also Paints and Varnishes.)  
Anderson M. Co., A. & J. M.  
Electric Service Co.  
Electric Service Supplies Co.  
Garton Co., W. R.  
General Electric Co.  
Imperial Rubber Co.  
Johns-Manville Co., H. W.  
Massachusetts Chemical Co. Okonite Co., The  
Sherwin-Williams Co. Standard Varnish Works.  
Sterling Varnish Co.  
Walpole Tire & Rubber Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Insulators (Including Third Rail).** (See also Line Material.)  
Anderson M. Co., A. & J. M.  
Creaghead Engineering Co.  
Electric Railway Equipment Co.  
Electric Service Supplies Co.  
Electrose Mfg. Co.  
Garton Co., W. R.  
General Electric Co.  
Johns-Manville Co., H. W.  
Klein & Sons, Mathias.  
Macallen Co.  
Ohio Brass Co.  
Union Electric Co.  
Western Elec. Co.  
Westinghouse Elec. & M. Co.
- Lock Nuts and Washers.** (See Nuts and Bolts.)
- Lock Washers.**  
National Lock Washer Co.
- Lockers, Metal.**  
Edwards Co., Inc., The O. M.
- Locomotives, Electric.**  
Baldwin Locomotive Works.  
Brill Co., The J. G.  
General Electric Co.  
Jeffrey Mfg. Co.  
McGuire-Cummings Mfg. Co.  
Westinghouse Elec. & M. Co.
- Lubricating Engineers.**  
Galena Signal Oil Co.
- Lubricants, Oil & Grease.**  
Borne, Scrymser Co.  
Dearborn Chemical Co.  
Dixon Crucible Co., Jos.  
Galena-Signal Oil Co.  
Graphite Lubricating Co.  
Universal Lubricating Co.  
Whitmore Mfg. Co.
- Lumber.** (See Poles, Ties, Posts, etc.)
- Machine Tools.**  
Lobdell Car Wheel Co.  
Niles-Bement-Pond Co.  
Watson-Stillman Co.
- Mail Bags.**  
American Railway Supply Co.
- Mats.**  
Massachusetts Chemical Co.  
Walpole Tire & Rubber Co.
- Mechanical Draft Apparatus.**  
Crocker-Wheeler Co.
- Meters.** (See Instruments.)
- Meters, Car Current.**  
Railway Improvement Co.
- Mica.**  
Long Co., E. G.  
Macallen Co.
- Mirrors for Motormen.**  
Drew Electric & Mfg. Co.
- Monorail Systems.**  
Johnston & Jennings Co.
- Motor Leads.**  
Dossert & Co.
- Motor Repair Parts.**  
Columbia Machine Works & Malleable Co.
- Motormen's Seats.**  
Elec. Service Supplies Co.  
Wood Co., C. N.
- Motors, Electric.**  
Allis-Chalmers Manufacturing Co.  
\*British Westinghouse Electric & Mfg. Co. Ltd.  
Crocker-Wheeler Co.  
\*Dick, Kerr & Co.  
General Electric Co.  
National Brake & Elec. Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Multiple Unit Control.** (See Control Systems.)
- Nut Locks.**  
Grip Nut Co.  
National Lock Washer Co.
- Nuts and Bolts.**  
Allis-Chalmers Manufacturing Co.  
Barbour-Stockwell Co.  
Grip Nut Co.  
Long Co., E. G.  
Standard Motor Truck Co.  
U. S. Metal & Mfg. Co.
- Oils.** (See Lubricants.)
- Oils, Paint.**  
Sherwin-Williams Co.  
Standard Paint Co.  
Sterling Varnish Co.
- Ovens, Drying, Baking, Japanning, etc.**  
Oven Equipment & Mfg. Co.
- Overhead Equipment.** (See Line Material.)
- Ozonators.**  
General Electric Co.  
Westinghouse Electric & Mfg. Co.
- Packing for Car Journals and Parts of Steam Machinery.**  
Electric Service Supplies Co.  
Garton Co., W. R.  
Imperial Rubber Co.  
Johns-Manville Co., H. W.  
Post & Co., E. L.  
Power Specialty Co.
- Packing Rings, Piston Head.**  
McQuay-Norris Mfg. Co.
- Padlocks.**  
Edwards Co., Inc., The O. M.
- Paints and Oils.**  
Sherwin-Williams Co.
- Paints and Varnishes.** (Insulating.)  
General Electric Co.  
Long Co., E. G.  
Massachusetts Chemical Co.  
Sherwin-Williams Co.  
Standard Paint Co.  
Sterling Varnish Works.  
Union Electric Co.  
Walpole Tire & Rubber Co.
- Paints and Varnishes.** (Preservative.)  
Dixon Crucible Co., Jos.  
Long Co., E. G.  
Massachusetts Chemical Co.  
Sherwin-Williams Co.  
Standard Paint Co.  
Sterling Varnish Co.  
Walpole Tire & Rubber Co.
- Paints and Varnishes for Woodwork.**  
Sherwin-Williams Co.  
Willey Co., C. A.
- Paving Material.**  
Am. Brake Shoe & Fdy. Co.  
Barrett Mfg. Co.  
International Creol. & Constr. Co.  
U. S. Metal & Mfg. Co.
- Paving Pitch.**  
Barrett Mfg. Co.  
U. S. Wood Preserving Co.
- Pickups, Trolley Wire.**  
Electric Service Supplies Co.  
Ohio Brass Co.
- Pinion Pullers.**  
American General Eng. Co.  
Columbia Mach. Wks. & M. I. Co.  
General Electric Co.  
Wood Co., Chas. N.
- Pinions.** (See Gears and Pinions.)
- Pins, Wood & Iron.**  
Elec. Service Supplies Co.  
National Malleable Castings Co.  
Ohio Brass Co.
- Pipe.**  
National Tube Co.
- Pipe Fittings.**  
National Tube Co.  
Power Specialty Co.  
Standard Steel Works Co.  
Watson-Stillman Co.
- Planers.** (See Machine Tools.)
- Platforms, Extension, Car.**  
Edwards Co., Inc., The O. M.
- Pole Clamps.**  
Bayonet Trolley Harp Co.
- Poles and Ties, Preserved.**  
International Creosoting and Construction Co.  
Lindsley Bros. Co.  
Valentine-Clark Co.  
Western Electric Co.
- Poles, Metal Street.**  
American Bridge Co.  
Creaghead Engineering Co.  
Electric Railway Equipment Co.  
Garton Co., W. R.  
National Tube Co.  
U. S. Metal & Mfg. Co.
- Poles, Ties, Posts, Piling and Lumber.**  
Carney & Co., B. J.  
Garton Co., W. R.  
Henderson Lumber Co.  
Lindsley Bros. Co.  
Naugle Pole & Tie Co.  
Valentine-Clark Co.  
Western Electric Co.
- Poles, Trolley.**  
Anderson M. Co., A. & J. M.  
Columbia Mach. Wks. & M. I. Co.  
Elec. Service Supplies Co.  
Garton Co., W. R.  
Holland Trolley Supply Co.  
Long Co., E. G.  
National Tube Co.  
Nuttall Co., R. D.  
Ohio Brass Co.
- Presses, Hydraulic Wheel.** (See Machine Tools.)
- Pressure Regulators.**  
General Electric Co.  
Ohio Brass Co.
- Pumps.** (See also Condensers.)  
Allis-Chalmers Manufacturing Co.  
Watson-Stillman Co.
- Punches, Ticket.**  
Am. Railway Supply Co.  
Bonney-Vehslage Tool Co.  
International Register Co.  
Lord Mfg. Co.  
McGill Ticket Punch Co.  
Woodman Mfg. & Supply Co., R.
- Punching Machinery.**  
Watson-Stillman Co.
- Purifiers and Dryers, Oil.**  
Hunt, Edw. J.
- Purifiers, Air, for Brakes.**  
Lord Manufacturing Co.
- Purifiers, Feed - Water.**  
Scaife & Sons Co., Wm. B.
- Pushers, Car.**  
Woodman Mfg. & Supply Co., R.
- Rail Welding.**  
Falk Co., The.  
Goldschmidt Thermit Co.  
Indianapolis Switch & Frog Co.
- Oxweld Acetylene Co.**  
Ralls, New.  
Cambria Steel Co.  
Lorain Steel Co.
- Rails, Relaying.**  
Hyman-Michaels Co.  
Zelnicke Supply Co., W. A.
- Rattan.**  
Brill Co., The J. G.  
Electric Service Supplies Co.  
Hale & Kilburn Mfg. Co.  
McGuire-Cummings Mfg. Co.  
St. Louis Car Co.
- Registers & Register Fittings.**  
Brill Co., J. G.  
Cincinnati Car Co.  
Dayton Fare Recorder Co.  
Drew Electric & Mfg. Co.  
Electric Service Supplies Co.  
International Register Co.  
Long Co., E. G.  
Ohmer Fare Register Co.  
Rooke Auto. Register Co.  
Sterling Fare Register Co.  
Union Electric Co.  
Woodman Mfg. & Supply Co., R.
- Repair Shop Appliances.** (See also Coils, Machines for Banding and Winding.)  
American Gen'l Eng'g Co.  
Cleveland Armature Works.  
Columbia M. W. & M. I. Co.  
Elec. Service Supplies Co.
- Repair Work.** (See also Armature and Field Coils.)  
Brill Co., The J. G.  
Cleveland Armature Works.  
Cleveland Coil & Mfg. Co.  
Columbia M. W. & M. I. Co.  
General Electric Co.  
Independent Lamp & Wire Co.  
McLeer Electric & Mfg. Co.  
Standard Steel Works Co.  
U. S. Metal & Mfg. Co.  
Van Dorn & Dutton Co.  
Westinghouse Elec. & M. Co.
- Replacers, Car.**  
Buda Co., The  
Elec. Service Supplies Co.  
U. S. Metal & Mfg. Co.
- Re-Seating Machines.**  
\*Hadfield's Steel Fdy. Co.
- Resistances, Wire and Tube.**  
General Electric Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Retrievers, Trolley.** (See Catchers and Retrievers, Trolley.)
- Rheostats.**  
General Electric Co.  
Westinghouse Electric & Mfg. Co.
- Rollers, Shade.**  
Edwards Co., Inc., The O. M.
- Stewart Hartshorn Co.**
- Roofing, Building.**  
Johns-Manville Co., H. W.  
Standard Paint Co.
- Roofing, Car.**  
Keyes Products Co.  
Pantasote Co.
- Rubber Specialties.**  
Imperial Rubber Co.  
Massachusetts Chemical Co.  
Walpole Tire & Rubber Co.
- Sand Blasts.**  
Curtis & Co. Mfg. Co.
- Sanders, Track.**  
Brill Co., The J. G.  
Electric Service Supplies Co.  
Holland Trolley Supply Co.  
Jewett Car Co.  
Jones' Sons Co., J. M.  
Lord Mfg. Co.  
McGuire-Cummings Mfg. Co.  
Nichols-Lintern Co.  
Ohio Brass Co.  
Railway & Traction Supply Co.  
St. Louis Car Co.
- Sash Fixtures, Car.** (See also Curtains.)  
Brill Co., The J. G.  
Edwards Co., Inc., The O. M.  
National Lock Washer Co.
- Sash, Metal, Car Window.**  
Edwards Co., Inc., The O. M.
- Hale & Kilburn Mfg. Co.**
- Sash Operating Apparatus.**  
Drouvé Co., The G.  
Lord & Burnham Co.



**SHERWIN-WILLIAMS**

**AJAX**

**INSULATING VARNISH**  
(CLEAR AIR-DRYING)

For armatures, field and magnet-coils, mouldings, switches and fibre-sheet insulation, etc. Especially useful where baking facilities are lacking. It is a high insulator possessing extreme penetrating qualities and dries in six hours to a uniform, elastic, oil-proof, moisture-proof film.

*Send for our Insulating Catalog*

**DISTRIBUTORS**

UNION ELECTRIC Co., Pittsburgh, Pa.  
 NEWARK ELECTRICAL SUPPLY Co., Newark, N. J.  
 WHEELER-GREEN ELECTRIC Co., Rochester, N. Y.  
 W. G. NAGEL ELECTRIC Co., Toledo, Ohio.  
 GEO. WORTHINGTON Co., Cleveland, Ohio.  
 VARNEY ELECTRICAL SUPPLY Co., Indianapolis, Ind.  
 ELDERFIELD-HARTSHORN HARDWARE COMPANY,  
 Niagara Falls, N. Y.  
 PETTINGILL-ANDREWS Co., Boston, Mass.  
 W. R. GARTON Co., Chicago, Ill.

**THE SHERWIN-WILLIAMS CO.**  
INSULATING MATERIAL MAKERS  
601 CANAL ROAD CLEVELAND, OHIO



**Walpole**  
**Friction**  
**Tape**  
*Will not dry out*

**This Tape Cannot Corrode Copper**

This is an important consideration in tapes. Walpole Tape has this feature in addition to other characteristics such as smooth, holeless friction, and with ability to withstand extreme temperatures without drying out. Write for complete catalog of our line of insulations.

**Massachusetts Chemical Co's**  
**Products**

WALPOLE TIRE & RUBBER CO.  
WALPOLE, MASS.  
PIONEERS IN INSULATION ENGINEERING

**Sterling Insulating Varnishes**  
**Sterling Iron Enamel Paints**


There is a Sterling product best for every insulating purpose.



**The Sterling Varnish Co.**  
Pittsburgh, Pa.

**The Most Economical Surfacing Method**

This company is the originator of the "one color system." We surface from the new wood, metal or burned off surface through to the finishing varnish with but *Five Coats*. Write for our folder on the method.



**C. A. WILLEY CO.**  
Hunter's Point  
New York City

**IRCO FRICTION TAPES**  
are the Standard **TAPES**

For Electric Railway and Lighting Use  
**Economy and Efficiency Combined**  
**IMPERIAL RUBBER CO.**  
253 Broadway New York, U. S. A.





**INSULATING BLACK**

A black, quick-drying protective varnish made especially for electrical wiremen and contractors and telephone and electric light systems. It has high insulating properties and is not affected by the extremes of heat or cold. It also repels moisture and resists the action of alkalis, gases and acids.

**STANDARD VARNISH WORKS**  
New York Chicago London  
International Varnish Co. Limited,  
Toronto, Canada

**HEADQUARTERS**  
FOR  
**SHERWIN-WILLIAMS**  
Insulating Paints and Varnishes

**Union Electric Co.** Pittsburgh, Pa.



## CLASSIFIED DIRECTORY—Concluded

- Saws, Metal.**  
\*Hadfield's Steel Fdy. Co.
- Scrapers, Track.** (See Cleaners and Scrapers, Track.)
- Seating Materials.** (See Curtains and Curtain Materials.)
- Seats, Car.**  
Brill Co., The J. G.  
Hale & Kilburn Mfg. Co.  
Jewett Car Co.  
Peters & Co., G. D.  
St. Louis Car Co.
- Second-hand Equipment.**  
(See pages 68, 69.)
- Shades, Vestibule.**  
Brill Co., J. G.  
Electric Service Supplies Co.  
National Lock Washer Co.
- Shovels, Hand.**  
Wyoming Shovel Works.
- Shovels, Power.**  
Allis-Chalmers Manufacturing Co.  
Thew Auto Shovel Co.
- Shutters, Steel, Rolling.**  
(See Doors, Steel Rolling.)
- Signal Systems, Block.**  
General Railway Signal Co.  
Nachod Signal Co.  
Northey-Simmen Signal Co., Ltd., The.  
Union Switch & Signal Co.  
U. S. Electric Signal Co.  
Western Electric Co.  
Wood Co., Chas. N.
- Signals, Car-Starting.**  
Consolidated Car-Heating Co.
- Signals, Highway Crossing.**  
Cook Railway Signal Co.  
Elec. Service Supplies Co.  
Nachod Signal Co.  
Protective Signal Mfg. Co.  
U. S. Electric Signal Co.
- Signs, Car and Track.**  
Columbia M. W. & M. I. Co.  
Creaghead Engineering Co.  
Elec. Service Supplies Co.  
Western Electric Co.
- Sklds, Car.**  
Garton Co., W. R.  
Lord Manufacturing Co.
- Skylights.**  
Drouvé Co., The G.  
National Ventilating Co.
- Slack Adjusters.** (See Brake Adjusters.)
- Sleet Wheels and Cutters.**  
American General Eng'g Co.  
Anderson Mfg. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Bonney-Vehslage Tool Co.  
Drew Electric & Mfg. Co.  
Garton Co., W. R.  
Holland Trolley Supply Co.  
Nuttall Co., R. D.
- Sleeving.** (See Insulating Cloths, Paper and Tape.)
- Snow Plows, Sweepers and Brooms.**  
Brill Co., The J. G.  
Columbia M. W. & M. I. Co.  
Consolidated Car Fender Co.  
McGuire-Cummings Mfg. Co.
- Soaps.**  
Sherwin-Williams Co.
- Solder and Solder Flux.**  
Lord Mfg. Co.  
Westinghouse Electric & Mfg. Co.
- Speed Indicators.**  
Woodman Mfg. & Supply Co., R.
- Splicing Compounds.**  
American Gen'l Eng'g Co.  
Imperial Rubber Co.  
Massachusetts Chemical Co.  
Walpole Tire & Rubber Co.
- Westinghouse Electric & Mfg. Co.**
- Splicing Sleeves.** (See Clamps and Connectors for Wires and Cables.)
- Springs, Car & Truck.**  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Hanna Co., J. A.  
Jones' Sons Co., J. M.  
Long Co., E. G.  
McGuire-Cummings Mfg. Co.  
Niles Car & Mfg. Co.  
Railway Steel Spring Co.  
Standard Steel Works Co.  
Taylor Electric Truck Co.  
Union Spring & Mfg. Co.
- Sprinklers, Track & Road.**  
Brill Co., The J. G.  
McGuire-Cummings Mfg. Co.  
St. Louis Car Co.
- Steps, Car.**  
American Mason Safety Tread Co.  
Universal Safety Tread Co.
- Stokers, Mechanical.**  
American Engineering Co.  
Babcock & Wilcox Co.  
Green Eng. Co.  
Jeffrey Mfg. Co.  
Murphy Iron Works.  
Westinghouse Machine Co.
- Storage Batteries.** (See Batteries, Storage.)
- Strike Breakers.**  
Drummond's Det. Agency.
- Structural Iron Work.**  
(See Bridges & Buildings.)
- Superheaters.**  
Babcock & Wilcox Co.  
Power Specialty Co.
- Sweepers, Snow.** (See Snow Plows, Sweepers and Brooms.)
- Switchboard Mats.**  
Imperial Rubber Co.  
Massachusetts Chemical Co.  
Walpole Tire & Rubber Co.  
Western Electric Co.
- Switch Stands.** (See also Track, Special Work.)  
The Buda Co.  
Indianapolis Switch & Frog Co.  
Ramapo Iron Works.  
Weir Frog Co.  
Wharton, Jr., & Co., Wm.
- Switches & Switchboards.**  
Allis-Chalmers Manufacturing Co.  
Anderson M. Co., A. & J. M.  
\*British Westinghouse Electric & Mfg. Co. Ltd.  
Consolidated Car-Heat'g Co.  
Cutter Electrical & Mfg. Co.  
Electric Service Supplies Co.  
General Electric Co.  
Nichols-Lintern Co.  
Ohio Brass Co.  
Western Electric Co.  
Westinghouse E. & M. Co.
- Switches, Automatic.**  
U. S. Electric Signal Co.  
Western Electric Co.  
Wharton, Jr., & Co., Wm.
- Switches, Track.** (See Track, Special Work.)
- Tanks, Water & Oil Storage.**  
American Bridge Co.
- Tapes & Cloths.** (See Insulating Cloths, Paper & Tape.)
- Telephones & Parts.**  
Electric Service Supplies Co.  
Western Electric Co.
- Terminals, Cable.**  
Lord Mfg. Co.  
Standard Underground Cable Co.
- Testing, Electrical.**  
Gulick-Henderson Co.  
Hunt & Co., Robert W.
- Testing Instruments.** (See Instruments, Electrical Measuring, Testing and Recording.)
- Thermostats.**  
Consolidated Car-Heat'g Co.  
Railway Utility Co.
- Ticket Choppers and Destroyers.**  
Patten Co., Paul B.
- Tickets & Transfers.**  
American Ry. Supply Co.
- Tie Plates.**  
Elyria Iron & Steel Co.
- Ties & Tie Rods (Steel).**  
American Bridge Co.  
Barbour-Stockwell Co.  
Carnegie Steel Co.
- Ties, Steel Cross.**  
Carnegie Steel Co.
- Ties, Wood Cross.** (See Poles, Ties, Posts, Etc.)
- Time Systems.**  
Calculagraph Co.
- Tools, Track & Miscellaneous.** (See also Grinders and Grinding Wheels.)  
American Gen'l Eng'g Co.  
The Buda Co.  
Chicago Pneumatic Tool Co.  
Columbia M. Wks. & M. I. Co.  
Drew Electric & Mfg. Co.  
Electric Service Supplies Co.  
\*Hadfield's Steel Fdy. Co.  
Johns-Manville Co., H. W.  
Klein & Sons, Mathias.  
Ohio Brass Co.  
Railway Track Work Co.  
Union Electric Co.  
Van Dorn & Dutton Co.
- Tower Wagons and Automobiles.**  
McCardell & Co., J. R.
- Towers & Transmission Structures.**  
American Bridge Co.  
Archbold-Brady Co.  
Ohio Brass Co.  
Scaife & Sons Co., Wm. B.  
Westinghouse Electric & Mfg. Co.
- Track, Special Work.**  
\*Allen & Co., Ltd., Edgar.  
American Frog & Switch Co.  
Barbour-Stockwell Co.  
The Buda Co.  
Cambria Steel Co.  
Carnegie Steel Co.  
Cincinnati Frog & Switch Co.  
Cleveland Frog & Cross. Co.  
Falk Co.  
Goldschmidt Thermit Co.  
\*Hadfield's Steel Fdy. Co.  
Indianapolis Switch & Frog Co.  
Kilby Frog & Switch Co.  
New York Sw. & Cross. Co.  
Railway Track Work Co.  
Ramapo Iron Works.  
St. Louis Steel Fdy.  
Weir Frog Co.  
Wharton & Co., Wm., Jr.
- Transfer Issuing Machines.**  
Ohmer Fare Register Co.
- Transfer Tables.**  
American Bridge Co.  
Archbold-Brady Co.  
Nichols & Bro., G. P.
- Transformers.**  
Allis-Chalmers Manufacturing Co.  
Crocker-Wheeler Co.  
General Electric Co.  
National Brake & Elec. Co.  
Western Elec. Co.  
Westinghouse E. & M. Co.
- Trap Doors.**  
Edwards Co., Inc., The O. M.
- Treads, Safety Car Step.**  
American Mason Safety Tread Co.  
Imperial Rubber Co.  
Universal Safety Tread Co.
- Treads, Stair.**  
American Mason Safety Tread Co.  
Imperial Rubber Co.  
Universal Safety Tread Co.
- Trolley Bases.**  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Elec. Service Supplies Co.  
General Electric Co.  
Holland Trolley Supply Co.  
Lord Mfg. Co.  
Nuttall Co., R. D.  
Ohio Brass Co.  
Sterling-Meaker Co.  
Trolley Supply Co.  
Union Electric Co.
- Trolley Wagons.** (See Wagons, Tower.)
- Trolleys & Trolley Systems.**  
Case Crane & Engineering Co.  
Curtis & Co. Mfg. Co.  
Northern Engineering Wks.  
Trucks, Car.  
Baldwin Locomotive Works.  
Bemis Car Truck Co.  
Brill Co., The J. G.  
Cincinnati Car Co.  
Hanna Co., J. A.  
Long Co., E. G.  
McGuire-Cummings Mfg. Co.  
Niles Car & Mfg. Co.  
St. Louis Car Co.  
Standard Motor Truck Co.  
Taylor Electric Truck Co.
- Tubing, Steel.**  
National Tube Co.
- Turbines, Hydraulic.** (See Hydraulic Machinery.)
- Turbines, Steam.**  
Allis-Chalmers Manufacturing Co.  
General Electric Co.  
Western Electric Co.  
Westinghouse Machine Co.
- Turbines, Water.**  
Allis-Chalmers Manufacturing Co.
- Underframes. (Steel.)**  
Brill Co., The J. G.  
St. Louis Car Co.  
Standard Motor Truck Co.
- Uniforms.**  
Abrahams & Co., S.
- Union Couplings.**  
National Tube Co.
- Vacuum Drying & Impregnating Apparatus.**  
Allis-Chalmers Manufacturing Co.  
McLeer Electric & Mfg. Co.
- Valves.**  
Edwards Co., Inc., The O. M.  
National Tube Co.  
Ohio Brass Co.
- Varnishes.** (See Paints and Varnishes.)
- Ventilating Apparatus.** (See Heating and Ventilating Apparatus.)
- Ventilators, Building.**  
Drouvé Co., The G.  
Lord & Burnham Co.  
National Ventilating Co.
- Ventilators, Car.**  
Globe Ventilator Co.  
Gold Car Htg. & Lt. Co.  
Railway Utility Co.
- Vestibules, Portable.**  
Brill Co., The J. G.
- Voltmeters.** (See Instruments, Electrical Measuring.)
- Wagons, Tower.** (See Tower Wagons & Automobiles.)
- Washers.**  
Graphite Lubricating Co.  
Waste Boxes.  
Garton Co., W. R.
- Waste, Cotton and Wool.**  
Hagy-Waste Wks., J. Milton
- Water Filters.**  
Scaife & Sons Co., Wm. B.
- Water Softeners and Puffers.**  
The Buda Co.  
Scaife & Sons Co., Wm. B.
- Water Wheels and Governors.** (See Hydraulic Machinery.)
- Welding Car Wheels Truck Frames, Etc.**  
Goldschmidt Thermit Co.  
Oxweld Acetylene Co.
- Welding Rail.** (See Brazing, and Welding Processes.)
- Wheel Guards.** (See Fenders & Wheel Guards.)
- Wheel Presses.** (See Machine Tools.)
- Wheels and Bushings.**  
Trolley.  
American Gen'l Eng'g Co.  
Anderson M. Co., A. & J. M.  
Bayonet Trolley Harp Co.  
Columbia M. W. & M. I. Co.  
Drew Electric & Mfg. Co.  
Elec. Service Supplies Co.  
Garton Co., W. R.  
General Electric Co.  
Graphite Lubricating Co.  
Holland Trolley Supply Co.  
Indianapolis Switch & Frog Co.  
Johns-Manville Co., H. W.  
Long Co., E. G.  
Lord Mfg. Co.  
Lumen Bearing Co.  
More-Jones Brass & M. Co.  
Nuttall Co., R. D.  
Ohio Brass Co.  
Star Brass Works.  
Trolley Supply Co.
- Wheels, Cast Iron.**  
Bemis Car Truck Co.  
Griffin Wheel Co.  
\*Hadfield's Steel Fdy. Co.  
Lobdell Car Wheel Co.  
Long Co., E. G.
- Wheels, Steel & Steel Tired.**  
Bemis Car Truck Co.  
Carnegie Steel Co.  
\*Hadfield's Steel Foundry Co., Ltd.  
Railway Steel Spring Co.  
Standard Steel Works Co.
- Whistles, Air.**  
General Electric Co.  
Ohio Brass Co.
- Winding Machines.** (See Coll Machines for Banding and Winding.)
- Window Operating Devices.** (See Sash Operating Apparatus.)
- Wires and Cables.**  
Aluminum Co. of America.  
American Electrical Works.  
American Steel & Wire Co.  
Bridgeport Brass Co.  
D & W Fuse Co.  
Drew Electric & Mfg. Co.  
Garton Co., W. R.  
General Electric Co.  
Kerite Ins. W. & C. Co.  
Okonite Co., The.  
Roebbling's Sons Co., John A.  
\*Smith & Co., Frederick.  
Standard Underground Cable Co.  
Western Electric Co.  
Westinghouse Elec. & M. Co.
- Wood Preservatives.**  
Barrett Mfg. Co.  
C-A-Wood-Preserver Co.  
German Products Assn.  
Lindsay Bros. Co.  
Sherwin-Williams Co.  
U. S. Wood Preserving Co.  
Valentine-Clark Co.
- Woodworking Machinery.**  
Allis-Chalmers Manufacturing Co.
- Wrenches, Track.**  
Jeffrey Mfg. Co.

Every Genuine Roller has the name of manufacturer, STEWART HARTSHORN in inscription label



**HARTSHORN'S**  
TIN ROLLER

**HARTSHORN'S SPECIAL CAR ROLLERS**  
For street and steam railway cars. Brackets suitable for all classes of fittings. Used the world over, wherever cars are run.  
SPECIAL CAR LIST SENT ON REQUEST  
STEWART HARTSHORN CO., Office and Factory: Newark, N. J.  
NEW YORK: 382 Lafayette St. CHICAGO: 338-344 Wabash Ave.





# Barrett's PAVING PITCH



Manhattan Avenue, Brooklyn, looking east from Kent Street. Granite blocks filled with Barrett's Paving Pitch.

## Paving "Ifs"

**A**FTER the brick or wood block or asphalt block is decided upon for your streets, the next matter to settle is "what shall the joints be filled with?"

*If you choose sand* you risk having the pavement undermined, because sand permits the percolation of water down to the foundation, where it does damage in the form of frost and ice and eventually destroys the pavement.

*If you choose asphalt* you risk having it improperly used because asphalt with its high melting point is a ticklish job to apply correctly. You risk having the pavement undermined or otherwise damaged by frost, because in winter, when the bricks contract, the asphalt has so little adhesive power that it separates from the brick and leaves cracks running straight to the foundation.

*If you choose cement* you risk making your pavement slippery, because the joints are filled flush. You risk cracks, bulges and explosions resulting from expansion and contraction, which the cement does not adequately provide for, and you are certain to have a noisy pavement.

*If you choose pitch* you risk getting a hard pitch which has been softened with oil and made of uncertain waterproofing effect.

*If you choose Barrett's Paving Pitch* you risk nothing, as the above difficulty is done away with; for Barrett's Paving Pitch is reliable in composition which makes "every joint an expansion joint," thus providing ideally for expansion and contraction; it maintains a perfect waterproof seal throughout the whole pavement year after year, as long as the pavement lasts; it will not change in its chemical or water-resisting character in a generation—it provides grooved footing and it is cheaper than either asphalt or cement when they are properly applied. Booklets on request.

### BARRETT MANUFACTURING COMPANY

NEW YORK    CHICAGO    PHILADELPHIA    BOSTON    MINNEAPOLIS    ST. LOUIS    CLEVELAND  
PITTSBURGH    CINCINNATI    KANSAS CITY    SEATTLE    BIRMINGHAM

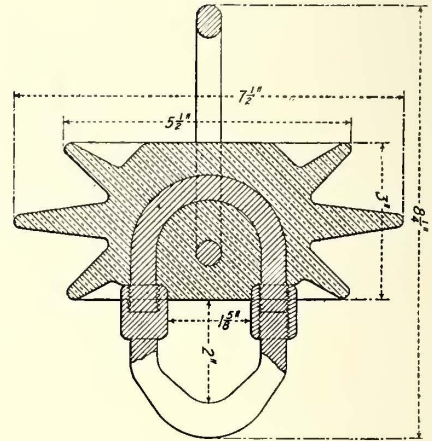
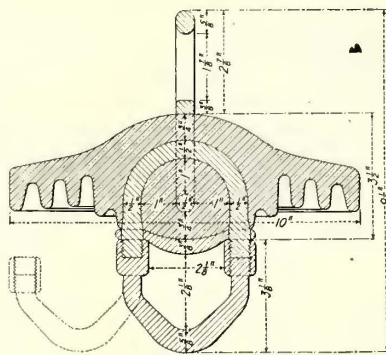
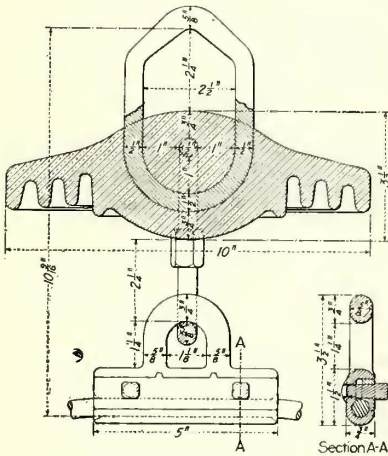


# ARRIVED!



## LIGHTNING-PROOF LINE and STRAIN INSULATORS

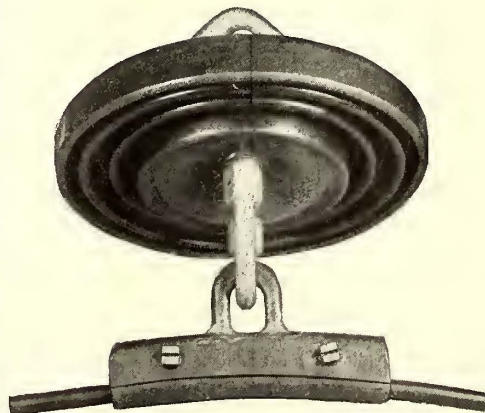
Louis Steinberger's Patents



### The Best Insulators are the Cheapest in the End

#### Points of Superiority

1. Electrical Values.
2. Mechanical Values.
3. Electroze insulation possesses a uniform texture and density of body. This quality is an absolute necessity for line insulators, to insure safe, continuous and reliable service.
4. Swivel form of connecting terminals. Units may be connected and securely interlocked in a fraction of a minute. No separate connecting member required.
5. Absence of projections on metal parts, thereby avoiding corona effects, and consequent loss of power.
6. Drop forged steel galvanized suspension and strain members.
7. The most perfect disk form of design combined with highest efficiency and light weight.



No. 9302

#### No. 9302

#### 10-inch Suspension Line and Strain Insulator

|                   |       |         |       |
|-------------------|-------|---------|-------|
| Puncture Value    | ..... | 150,000 | volts |
| Dry Arc           | ..... | 100,000 | "     |
| Tested to Dry Arc | ..    | 100,000 | "     |
| Rain Arc          | ..... | 55,000  | "     |
| Line Voltage      | ..... | 25,000  | "     |
| Weight            | ..... | 11      | lbs.  |

#### No. 162

#### 7 1-2 Inch Disk Strain Insulator

|                   |       |         |       |
|-------------------|-------|---------|-------|
| Puncture Value    | ..... | 120,000 | volts |
| Dry Arc           | ..... | 75,000  | "     |
| Tested to Dry Arc | ..    | 75,000  | "     |
| Rain Arc          | ..... | 55,000  | "     |
| Line Voltage      | ..... | 25,000  | "     |
| Weight            | ..... | 6       | lbs.  |

SOLE MANUFACTURERS

60 to 72 Washington St.  
66 to 76 Front St.

## Electroze Mfg. Co., Brooklyn, N.Y.

New York  
Buffalo  
Philadelphia  
Boston  
Winnipeg

Pittsburgh  
Atlanta  
Chicago  
Indianapolis  
Vancouver

Cincinnati  
Minneapolis  
St. Paul  
Milwaukee

Also For Sale By  
**Western Electric Company**  
Antwerp London Berlin

St. Louis  
Kansas City  
Denver  
Dallas

Omaha  
Oklahoma City  
San Francisco  
Oakland  
Paris

Los Angeles  
Salt Lake City  
Seattle  
Portland  
Johannesburg



# THE COLLIER SERVICE

CAR ADVERTISING ALMOST EVERYWHERE

## Apply Efficiency Principles to Car Advertising Contracts

A machine may deliver big production at low cost and still be inefficient unless it can keep up that production at low maintenance cost.

It's the same with the contractor for your car advertising space.

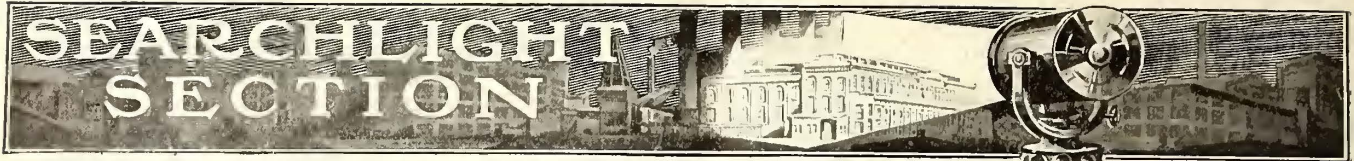
That space has a definite value and it is impossible to make it permanently yield more than its value. The contractor who pays higher than the established value is a loser—and you cannot afford to place your hope of getting cash returns on a losing proposition.

There is more than merely hope in a Collier contract. It is an established certainty of maximum permanent revenue as regular as bank interest.

*Barron G. Collier*  
INCORPORATED 175

Fifth Avenue  
NEW YORK





## FOR SALE

- 7—Brill 36' Interurban cars complete with four G. E. 87 motors, Brill 27E-1½ M. C. B. Trucks.
- 4—Kuhlman 32' Interurban cars complete with four G. E. 74 motors, Brill 27E-1 Trucks.
- 16—Brill 23' Closed Cars, Brill 21E Trucks.
- 2—18' Jackson and Sharp Car Bodies.
- 20—Cincinnati 20' 6" single end car bodies.
- 10—Brill 21' closed cars, West. 68 motors, Peckham Trucks.
- 5—Brill 30' Express Cars.
- 22—West. 56 Railway Motors, complete.
- 8—West. 38B Railway Motors, complete.
- 4—West. 112 Railway Motors, complete.
- 8—West. 68C Railway Motors, complete.
- 12—West. 49 Railway Motors, complete.
- 80—West. 12A Railway Motors, complete, four and five turn.
- 38—G. E. 800 Railway Motors, complete.
- 22—G. E. 1000 Railway Motors, complete.
- 16—G. E. 57 Railway Motors, complete, three turn.
- 8—G. E. 58 Railway Motors, complete.
- 12—G. E. 87 Railway Motors, complete.
- 21—G. E. 57 Armatures, second hand, two turn.
- 9—G. E. 80 Armatures, Brand New.
- 4—G. E. 87 Armatures, Brand New.
- 2—G. E. 75 Armatures, Brand New.
- 8—G. E. 67 Armatures, Brand New.
- 3—West. 101B Armatures, Brand New.
- 3—West. 93A Armatures, Brand New.
- 1—West. 93A-2 Armature, Brand New.
- 8—K28II Controllers.
- 12—K6 Controllers.
- 9—Type M. Equipments, C-6-A Master Control.
- 20—K2 Controllers.
- 20—K11 Controllers.
- 60—K10 Controllers.
- 12—K12 Controllers.
- 8—K14 Controllers.
- 4—Sets Brill 27G Trucks, 4' 6" wheel base.
- 16—Peckham No. 6-E Trucks, 7' 6" wheel base.
- 6—Brill 21E Trucks, 7' 6" wheel base.
- 16—Dupont Trucks, 7' 6" wheel base.
- 4—Sets Peckham 141-3 Trucks.
- 200—Brill Draw Bars.
- 2—Single Truck Electric Locomotives.
- 150—International Fare Registers, complete, type R-7.

ALL OF THE ABOVE APPARATUS IS IN FIRST CLASS CONDITION FOR IMMEDIATE SERVICE.

FOR FURTHER PARTICULARS APPLY TO

**W. R. KERSCHNER,** 50 Church Street  
NEW YORK, N. Y.

## Rails Rails Rails

35 lb., 40 lb., 48 lb., 52 lb., 56 lb., 60 lb., 65 lb., 80 lb., 85 lb., and other weights of No. 1 relaying rails with necessary bars at various points throughout entire country, possibly tributary to your locality. Same can be inspected before or at time of loading. Prompt attention will be given to your inquiry.



The Hyman - Michaels Co.  
533 Peoples Gas Bldg., Chicago, Ill.

## Direct Connected Railway Units

| K.W.  | Make       | Gen. Elec. | Volts | Speed                   | Engine Des. |
|-------|------------|------------|-------|-------------------------|-------------|
| 200   | Gen. Elec. | 550        | 120   | Allis Corliss Tand. C.  |             |
| 250   | Westge.    | 600        | 100   | Hamilton Cor. Tand. C.  |             |
| 300   | Westge.    | 550        | 120   | 24 x 30 Fitchburg.      |             |
| 2,400 | Ft. Wayne  | 600        | 125   | Russell Tand. Comp.     |             |
| 500   | Gen. Elec. | 650        | 90    | Cooper Cor. Cross Comp. |             |

ROTARIES, A.C. UNITS, ETC.  
417 Pine St. Harold R. Wilson Machinery Co. St. Louis

## Do You Want a Salesman or Other Assistant?

If so, send us copy for a card under "Positions Vacant" in the Searchlight Section. The cost will be slight and the result will be both quick and satisfactory.

*Get your Wants into the Searchlight*

ELECTRIC RAILWAY JOURNAL, 239 West 39th St., New York

FRANK MACGOVERN  
Pres.-Gen. Mgr.

## MACGOVERN AND COMPANY, Inc.

JOHN MAYER, JR.  
Vice Pres.-Treas

114 Liberty Street, New York City  
Rotary Converters—25 Cycle, 3 Phase

- 1 500 Kw., Bullock, 375 volts, a.c., 770 amp., 600 volts, D.C., 833 amp., 500 RPM.
- 1 300 Kw., Allis-Chalmers, 6 pole, 650 volts, 462 amp., 500 RPM.
- 2 300 Kw., Westinghouse, 650 volts, D. C., 462 amp., 500 RPM.

'Phone 3375-3376 Rector  
Street Railway Motors

- 10—Westinghouse No. 68 C Motors, 10 K.O. Controllers.
- 500 KW., 25 Cycle Westinghouse Motor-Generator Set  
Generator: 500 Kw., 600 volt, comp. wd., 8 pole type.  
Motor: 3 ph., 25 cy., synchronous motor, 11,000 or 2300 volt, 375 RPM. A.C. starting motor & D.C. exciter mounted on shaft. Switchboard equipment.

## CARS FOR SALE

OPEN and CLOSED  
MOTOR and TRAIL

Write for Price and Full Particulars to

**ELECTRIC EQUIPMENT CO.**  
Commonwealth Bldg., Philadelphia, Pa.

## COMPLETE ARMATURES FOR SALE

FOR ALL THE STANDARD  
STREET RAILWAY MOTORS

GET OUR PRICE WE CAN SAVE YOU MONEY

America's Greatest Repair Works

**CLEVELAND ARMATURE WORKS, Cleveland, O.**

## Box Cars Flats Gondolas

Prompt attention to your requirements. Excellent opportunities to effect savings in purchasing equipment.

**Indiana Car & Equipment Co.**

1302-3-5 Gt. Northern Bldg., Chicago, Ill.

*Get your Wants  
into the  
Searchlight*

## MONEY-MAKING CHANCE

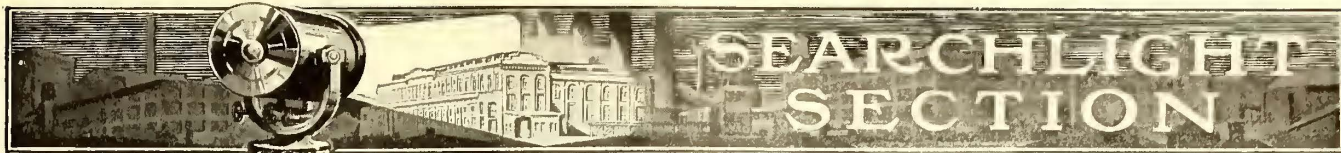
for some Traction Company, Lighting Company, or Contractor to get a

**Complete Set of Tools**  
including sufficient equipment for overhead trolley work or outside construction.

**At a Low Price**  
and in excellent condition. Write for inventory and price.

M. B. Foster Electric Co., 238 Devonshire St., Boston





**25-CYCLE ROTARY CONVERTER**

1—200-KW., General Electric, Rotary Converter, 3-phase, 25-cycle, 750 RPM., Type T.C-4-200-750, 600 volts, D.C., 370 volts A. C.  
 3—75-KW., General Electric OISC, single-phase Transformers, 13,200/12,540/11,880-370/185 volts.  
 Also Reactance Coil, A.C. and D.C. Panels, Lightning Arresters and Choke Coils.

**60-CYCLE ROTARY CONVERTER**

1—200-KW., Westinghouse, 3-phase, 60-cycle, 550-600 volts, 720 RPM.  
 3—110-KW., General Electric, single-phase, 60-cycle, 2300-370 volts.

**RAILWAY MOTORS**

4—Westinghouse, 112 Motors. Rewound armatures.  
 2—G.E., 57 Motors.  
 20—Westinghouse, 68 Motors.

**TYPE "M" CONTROL**

4—Type M, single or double end control. Fine condition. Can make very low price. For use with 4-75 HP. motors.

**RAILWAY UNITS 500-600 VOLTS**

1—750-KW., G. E., with C. C. Allis-Chalmers Corliss, 110 RPM.  
 1—500-KW., G. E., with T. C. Wetherill Corliss engine, 100 RPM.  
 1—425-KW., G. E., with C. C. McIntosh-Seymour engine, 120 RPM.  
 1—400-KW., Cro-Wheeler, with Russell engine, 110 RPM.  
 1—400-KW., G. E., with C. C. Allis engine.  
 1—300-KW., G. E., with T. C. Wetherill engine, 100 RPM.

**BOILERS**

4—360-HP., Heine, 160 lbs. pressure.  
 1—300-HP., Heine, 150 lbs. pressure.  
 2—250-HP., R. & W., 150 lbs. pressure.  
 1—200-HP., Heine, 150 lbs. pressure.

**ARCHER & BALDWIN, 114 Liberty St.,** ROOM 302  
 'Phone Rector 4337-4338-4339 **New York**

SEND FOR CATALOG—JUST OUT

**POSITIONS WANTED**

**AUDITOR;** 9 years' continuous experience in electric railway accounting, solicits position with railway requiring efficient man familiar with handling large properties, systematizing and consolidating companies a specialty. Wish to locate with growing concern where executive ability counts. Box 362, Elec. Ry. Jour.

**MANAGER-SUPERINTENDENT;** 18 years' experience, city, interurban, steam and lighting, desires position; hustler and economical operator; experience covers all departments; A-1 references. Box 352, Elec. Ry. Jour.

**MASTER MECHANIC** with wide experience on both city and interurban properties, 20 years of unquestioned ability of shop management, is open for engagement. A-1 references. Box 359, Elec. Ry. Jour.

**POSITION WANTED** as purchasing agent or assistant to president. Have occupied similar position for many years with one of the largest properties in the country. Have well-known record and can furnish highest references. Box 363, Elec. Ry. Jour.

**POSITION** as superintendent of equipment or master mechanic wanted by a man who has had 18 years' experience; A-1 references. Box 336, Elec. Ry. Jour.

**TRACTION CAR PAINTER** would like position, has had good experience and can do anything in the line of car painting. Understands thoroughly the treatment of both wood and steel cars, would take foremanship if opportunity presented itself. Steady position an object; have good recommendations. Box 351, Elec. Ry. Jour.

**POSITION WANTED** as master mechanic or general foreman, thoroughly competent. Familiar with all up to date equipment, both city and interurban; 15 years' experience in electric railway shops; A-1 references. Box 350, Elec. Ry. Jour.

**POSITIONS VACANT**

**CAR PAINTER** Wanted—Mr. Master Mechanic: If you know of a good car painter, one who is capable of painting a car, also striping and lettering, we wish you would put him in communication with us and oblige Phoenix Ry. Co., of Arizona, Phoenix, Ariz.

*Get your Wants  
 into the Searchlight*

**ADVERTISING RATES**

**Positions Wanted, Evening Work Wanted, 2 cents a word, minimum charge 50 cents an insertion, payable in advance.**

**Positions Vacant, Salesmen Wanted, Agencies, all undisplayed Miscellaneous ads, Machinery and Plants For Sale (with one line of display heading), 3 cents a word, minimum charge \$1.50 an insertion.**

**All advertisements for bids cost \$2.40 an inch. Advertisements in display type cost as follows for single insertions:**

|                   |                           |
|-------------------|---------------------------|
| 1-16 page, \$5.00 | 1 in. single col., \$3.00 |
| 1-8 page, 10.00   | 4 in. single col., 11.60  |
| 1-4 page, 20.00   | 8 in. single col., 22.40  |

*In replying to advertisements, send copies of testimonials, etc., instead of originals.*

**POSITIONS VACANT**

**FOREMAN** wanted for overhead maintenance and construction work. Must be familiar with general city conditions. About 100 miles of trolley, all direct current. Give references and salary in first letter. Location, New England. Box 356, Elec. Ry. Jour.

**MANAGER** for electric traction and lighting company in West Indies, serving 70,000 population. Must know Spanish. Give full particulars of experience and previous employment. Box 346, Elec. Ry. Jour.

**MISCELLANEOUS**

**Electric Track and Overhead Material Bargains**

30 sets 70 lb. switch material, 15' reinforced points, with No. 10 15' double spring wing rail frogs.

2000 AS & W form "A," 4/0 twin terminal bonds; large quantity suspensions, screw clamp ears, feeder ears, 20 degree frogs, galvanized strand guy wire and No. 8 smooth wire.

**The Above are Brand New and Will Be Sacrificed**

Write for our September 84-page Bulletin No. 142 containing real bargains in—

**Rails, Locomotives, Cars, Equipment**



**MISCELLANEOUS**



**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.

**The Classified Advertising in Electric Railway Journal**

is read carefully by men whose success depends upon thorough knowledge of means to an end—whether it be the securing of a good second-hand dinky engine at a moderate price, an expert draftsman or superintendent, or the services of a firm of engineers for designing a large modern plant.

**The Best Proof**

of this is the regularity with which such advertisements are carried—the extent and variety of the JOURNAL'S want ads. Without a constant and appreciable demand for such machinery or services, by the JOURNAL readers, the marketplace which these advertisements represent could not exist for any length of time.

**Electric Railway Journal**  
 239 W. 39th St. New York City



# The "RECIPROCATING" Track Grinder

## Offers No More Interruption than the Track Gang

The Reciprocating grinder does not delay schedules in the slightest and under reasonable headway, grinding is but slightly interrupted by the cars.

It requires only about 40 seconds' delay in grinding to "pass" a car.

This feature, however, is only incidental.

The chief excellence of the machine lies in the expeditious and perfect manner in which it trues up the rail, removing a minimum of metal but producing a surface so exact that defects removed are slow to return.

Let us place on your desk some actual data on grinding, which will prove helpful.

Your request brings it by mail.



Note the Big Derail Wheels

—the ease with which the Men are replacing Grinder

—the type of labor this Grinder makes possible to use

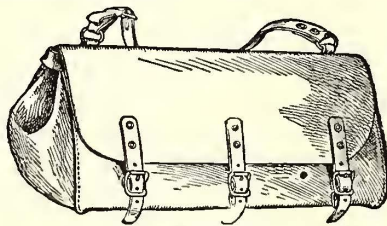
## Railway Track-Work Co., Heed Bldg., Philadelphia

### TOOL BAGS

FOR RAILWAY ELECTRICAL WORKERS AND CONSTRUCTION MEN

#### Inspectors' Russet Leather Bag

Made of good strong leather with extension ends and shoulder strap. Has saw receptacle. Sizes 16, 20 and 24 inches in length.



#### Inspectors' Black Leather Bag

Made of black harness leather. Strong and substantial. 15 and 20 inches long; height 12 inches.



#### Linemen's Heavy Canvas Bag

Has harness leather bottom studded with clincher studs that go through and clinch on the inside. Strong steel frame with heavy canvas sides. Length, 20, 16 and 12 inches.



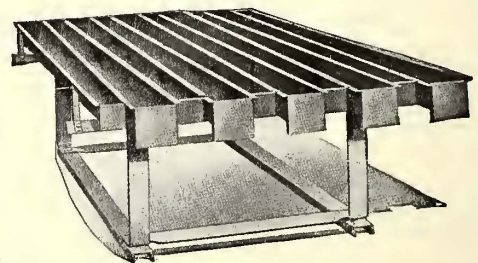
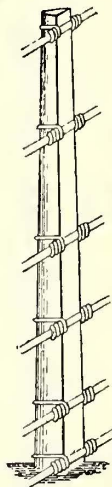
Write for illustrated catalog describing and pricing tools of every description.

#### Mathias Klein & Sons

Mfrs. of Electricians' Linemen's and Construction Tools  
Canal Sta. 25, Chicago

### "D & A" FENCE POSTS cost less than Wood or Steel

- have the permanency not possessed by wood or steel
- are easier to install than wood or steel
- keep in alignment better than wood or steel
- are Reinforced Concrete Posts cast *ten-at-a-time* in the



### "D & A" Post Mold

Two men can easily make a batch of 10 "D & A" posts in 30 minutes. Our "Shaking System" makes tamping unnecessary, no pallets or planks used. "D & A" machines are in use on 22 roads, saving big money on the cost of fence posts. Catalog "E" describes the method of making and installing, giving actual costs. Write us for a copy today.

D & A POST MOLD CO. Box 74, Three Rivers, Mich.



# 1913 Brought About an Increased Use of

*Some of the roads that increased their installations of Pyrene Fire Extinguishers.*

- Hudson & Manhattan Ry.
- Interborough Rapid Transit.
- Lehigh Valley R. R.
- Long Island R. R.
- New York Railways.
- New York Central Line.
- New York, New Haven & Hartford.
- Pennsylvania Lines.
- Terre Haute I. & E. Traction.



## Fire Extinguishers

Not only did it bring about an increased number of roads that took advantage of Pyrene protection—but what is equally significant, roads under such efficient management as those named have increased their Pyrene installations.

Invariably, roads increase the number of Pyrene Fire Extinguishers in use after an emergency is encountered.

Let us answer your questions.

**Pyrene Mfg. Co., 1358 Broadway, New York**

- |            |            |              |             |               |                |
|------------|------------|--------------|-------------|---------------|----------------|
| Alton      | Buffalo    | Denver       | Louisville  | Oklahoma City | St. Louis      |
| Atlanta    | Chicago    | Detroit      | Memphis     | Philadelphia  | St. Paul       |
| Baltimore  | Cincinnati | Duluth       | Milwaukee   | Phoenix       | Salt Lake City |
| Boston     | Cleveland  | Honolulu     | New Orleans | Pittsburgh    | San Antonio    |
| Bridgeport | Dayton     | Jacksonville | Norfolk     | Richmond      | York, Neb.     |
- PACIFIC COAST DISTRIBUTORS: GORHAM FIRE APPARATUS CO., San Francisco, Los Angeles, Seattle.  
 Distributors for Great Britain and the Continent: The Pyrene Co., 29A Charing Cross Road, London, W. C.

**THE CELEBRATED**  
**TRENTON TROLLEY WAGON**  
**J. R. McCARDELL & CO.**

Patentees and  
 Sole Manufacturers

TRENTON, N. J.

CORRESPONDENCE  
 SOLICITED

It meets every requirement

## Buying as a Fine Art

The science of salesmanship has received considerable attention. The art of buying seems to flourish with less noise.

There are a few points, however, which some readers of the *Electric Railway Journal* may not have appreciated fully. Of these it is important for electric railway men to know—

**How the Electric Railway Journal Can Help When Purchases Are Contemplated**

The *Journal* is published primarily to interest and help electric railway men.

Whatever is of interest to executive and operating officials of electric railways is also interesting and helpful to the manufacturers, jobbers and supply dealers who sell to electric railway companies.

As a result, *Electric Railway Journal* is carefully read from week to week by these manufacturers and others in search of opportunities to make sales.

Readers of the *Journal* can make use of this fact. To help them do so

**The Journal's Searchlight Department is made to include a "Proposal" Column**

In this space an electric railway company contemplating purchases of any kind can, at a nominal cost, advertise for tenders or quotations. By making it standard practice to advertise their wants in this manner, roads frequently save thousands of dollars or secure better material and equipment or prompter deliveries.

Stirring up competition is one of the principles of scientific buying. Rightly used, it results in economies which no company can afford to overlook.

**Use the Journal's "Proposal" Columns**

when you are in the market for track, special work, cars, line material, machinery or plant equipment, or when you have construction work to be done. Use these columns when you contemplate extensions, new buildings or bridges; when you have a bond issue to place—in short, whenever you want to stir up healthy competition in your favor.

The *Journal* has a special rate of only \$2.40 an inch for "Proposal" advertising.

**Other Useful "Searchlight" Columns**

The whole Searchlight Section of the *Journal* provides opportunities which electric railway officials can grasp with profit.

There are columns which can be used in locating competent men or new positions, for selling at service-prices material that would otherwise be scrapped, for buying second-hand material or equipment at favorable prices, for exchanging what you have for what you want—in fact, the Searchlight Section of the *Journal* is the beacon which guides buyer and seller, employer and employee to the great central market of the electric railway industry.

**Try the "Proposal" Column on Your Next Purchases**

Electric Railway Journal, 239 W. 39th St., New York

# PANTASOTE

The National Standard  
 for Car Curtains and  
 Car Upholstery

## AGASOTE HEADLINING

The only headlining made in one solid piece. Will not separate, warp or blister. Waterproof and homogeneous.

**The Pantasote Company**

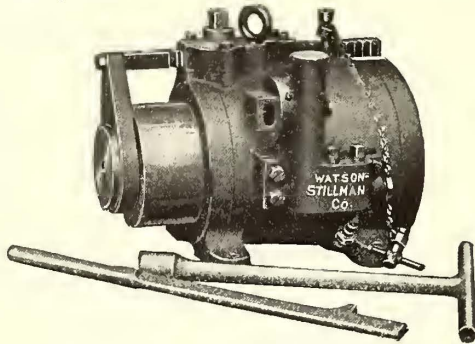
11 Broadway, New York      707 Fisher Bldg., Chicago, Ill.  
 797 Monadnock Bldg., San Francisco, Cal.



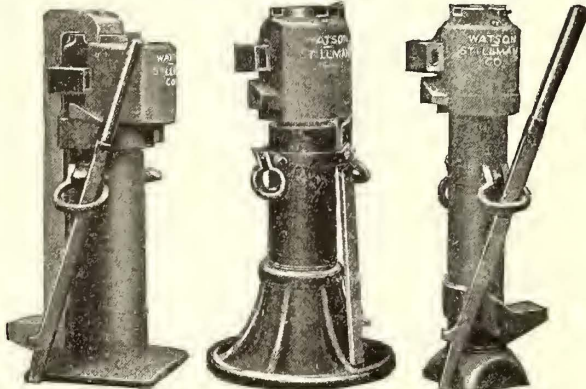
# HYDRAULIC JACKS

Below we show *just a few* that we make for special kinds of work. We build over 4000 types and sizes of hydraulic tools—presses, punches, shears, riveters, accumulators, benders, etc. 60 years' experience. Tell us your needs and ask for prices.

We build specials at reasonable cost.



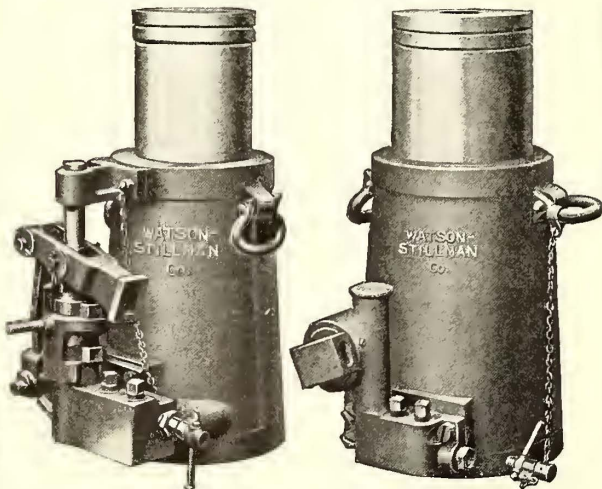
Outside Pump Horizontal Hydraulic Jack



Wrecking Hydraulic Jack

Broad Base Hydraulic Jack

Claw Hydraulic Jack



Outside Pump, Double Plunger Pump Hydraulic Jack

Outside Pump, Single Plunger Pump Hydraulic Jack

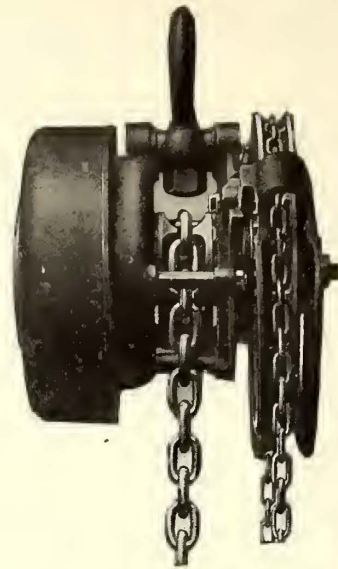
## The WATSON-STILLMAN CO.

Eng'neers and Builders of Hydraulic Tools

46 CHURCH STREET

NEW YORK

CHICAGO—McCormick Building.  
 PHILADELPHIA—The Bourse.  
 PITTSBURGH—Brown & Zortman.  
 ST. LOUIS—Corby Supply Co.  
 KANSAS CITY—Geo. T. Cook.  
 DENVER—L. C. Ullrich.  
 SEATTLE—Terminal Machinery Co.



# THE FORD TRIBLOC

A Chain Hoist that excels in every feature.

It has Steel Parts which mean long service—  
 Planetary Gears, which mean high efficiency—  
 Loop Hand Chain Guide, which means safety—  
 3½ to 1 factor of safety—  
 Eighty per cent of the power applied to the hand chain of a Ford Tribloc is converted into lifting energy.

No other chain hoist has all of these merits—you can get some of them in other stock chain hoists, but you cannot get all of them.

Write for Catalogue.

## FORD CHAIN BLOCK & MFG. COMPANY

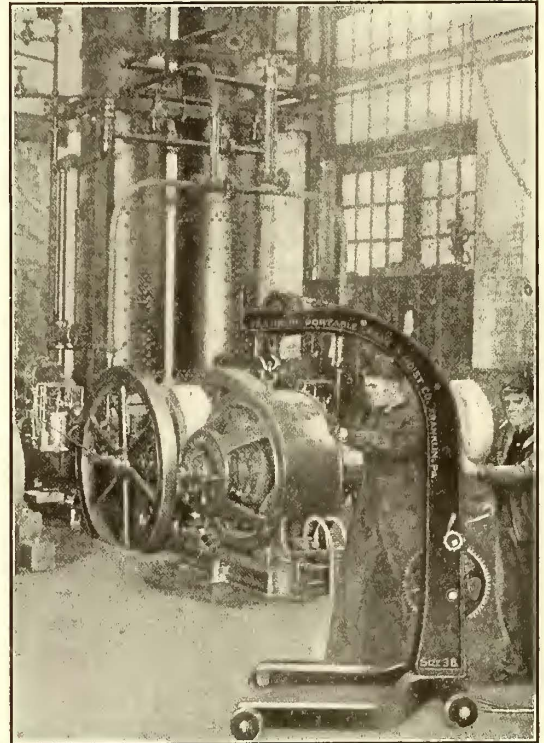
142 Oxford St., PHILADELPHIA, PA.



# “The Little Brother of the Crane”

## Will Save Money for Your Road Too

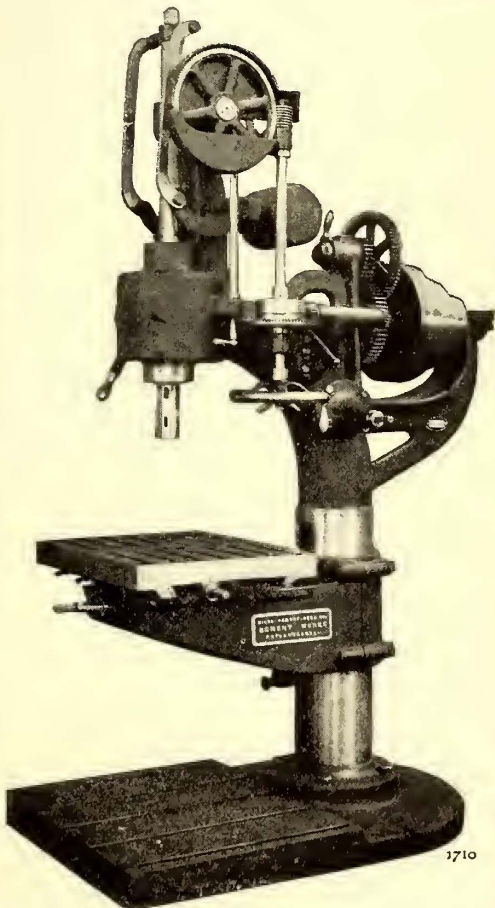
The largest shops in the United States are using the Franklin Portable Crane and Hoist. It is saving money for such roads even in shops where elaborate systems of overhead cranes and hoists are used. It is then obvious that it will save money for shops not so elaborately equipped. It makes all portions of the shops and car houses easily accessible. With it a weight of three tons is easily lifted and carried by two men. Its great lifting capacity and portability makes it in many cases much more convenient than an overhead crane or industrial railway. Franklins for different uses are explained and illustrated in our Booklet No. 2. Write us now for your copy.



### The Franklin Portable Crane and Hoist Company

FRANKLIN,

PENNSYLVANIA



## Are You Looking For a Good “All Around” Repair Shop Drill?

One that is easily and conveniently operated, of rigid construction and adapted to high speed drilling and tapping as well as average service. If so, don't fail to write us for information regarding

### BEMENT VERTICAL DRILLS

Easily and Conveniently Operated

Simply and Powerfully Constructed

When the operator stands in front of his work at the spindle, he can operate all the main levers and hand wheels without taking a step from this position. The rapid hand adjustment of the spindle, the fine hand feed, the power feed and throw-out are all controlled within easy reach of the operator.

Spindle reverse for tapping or automatic feed throw-out may be furnished on order.

These drills are of the “Goose Neck” Type, a design that gives great rigidity to the frames and renders them capable of withstanding heavy thrusts without strain.

Six positive geared feeds are provided, conveniently changed. Tables may be swung around the column out of the way, when it is desired to drill large pieces resting on the base plate.

### Niles-Bement-Pond Company

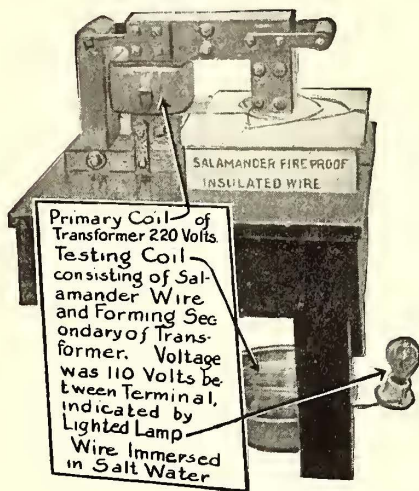
111 BROADWAY

NEW YORK

Boston, Philadelphia, Pittsburg, Chicago, St. Louis, Birmingham, Ala.; London



## Did You See This Test Of Salamander Asbestos Insulation



We conducted tests like this at the Atlantic City Convention to show how Salamander Asbestos Insulation is Fireproof where that of ordinary wire burns up.

Salamander Insulated Wire, therefore, withstands heat far above that encountered in any overload.

The test was not solely to show that Salamander Wire is fireproof.

It was also to show that we can provide such insulation for the wire in your burned out coils.

Simply send us your broken down coils—no matter in what condition—we remove the old insulation, and put in its place fireproof Salamander Asbestos Insulation.

This is a simple, inexpensive method of getting new coils—less the cost of wire.

Write us for details of our service.

## Independent Lamp and Wire Co.

1733 Broadway, New York

Works: York, Pa., and Weehawken, N. J.

**P&B Products**  
*Manufactured by*  
**The Standard Paint Co.**  
*100 William Street, New York*

FOR

### Reducing Shop Costs

#### Clear and Black Baking Varnishes

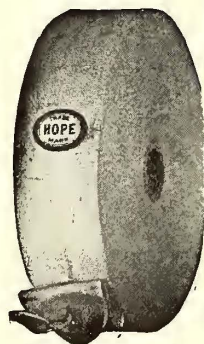
for armature and field coils and for transformer and magnet coils where high insulation is required.

#### Black Air-Drying Varnish

for quick repairs to dynamos and motors and for taped connections, feed wires, overhead and underground work and for under-frame work of cars.

#### Black Finishing Varnish

a quick-drying spirit Varnish absolutely oil-proof. Our booklet, "Insulation," will point the way to sound insulation economy. A copy will be mailed upon request.



# HOPE

## TAPES AND WEBBINGS FOR ELECTRICAL WORK

Tapes in any width, thickness or texture. Samples in accordance with suggestions gladly submitted.

**HOPE WEBBING CO.**  
PROVIDENCE, R. I.

Consumers' Rubber Co., 829 Superior Ave. N.W., Cleveland  
Belden Mfg. Co., 23d St. and Western Ave., Chicago

**Awebco**  
TRADE MARK  
REG'D



**Anchor Webbing Co.**

Mill & Office, Woonsocket, R. I.

Representatives: Chicago—Frank T. Finney, 614 W. Adams St. St. Louis—W. D. Wooley, 103 North 11th St. Cleveland, Ohio—R. S. Mueller, 423 High Ave., S. E.

## Tapes and Webbings

are Standard Materials produced under Specifications of Railway Motor Manufacturers.

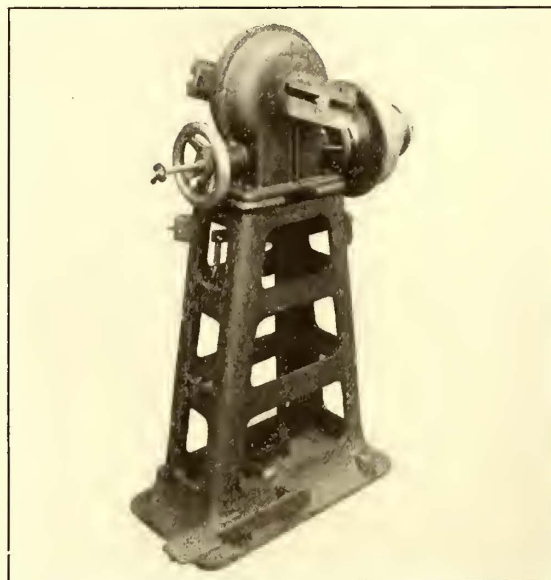
These specifications cover permissible variations in width and thickness, state required breaking strength, specify particular yarns, requisite warp ends, picks per inch filling to produce required strength and thickness. Extensively used by manufacturers of motors because material and price are right.



# Cut Expense of Armature Repairs

Equip your shop with

## COLUMBIA Labor-Saving Machines



### Columbia Armature and Field Coil Winder

Started and stopped instantly at any desired position.

Foot lever giving absolute control.

Occupies only four feet of floor space.

Worm driven, all parts enclosed in oil-tight, dust-proof casings.

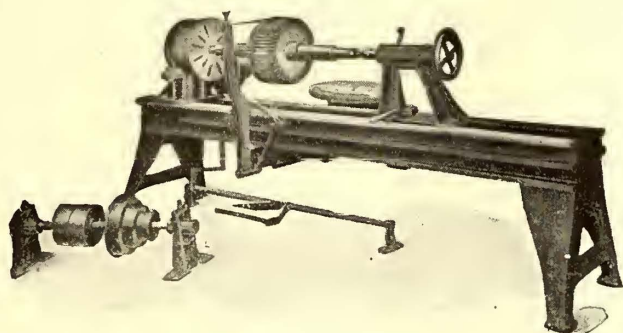
Cone Pulleys and Countershafts allow three changes of speed.

Extension spindle for winding small armature and field coils. Spools or magnets.

Handwheel expedites turning back to any point.

Machine is worm driven, with bronze bearings.

### Columbia Armature Heading and Banding Machine



Special tension mechanism permits instant adjustment to any degree of tension required. All parts securely housed.

Foot lever gives absolute control.

Have you seen it used with our tension stand for holding reels?

### Shall We Send Bulletins?

Coils for Armatures and Fields  
Coil Taping Machines for Armature Leads  
Car Trimmings and Car Signs—Day and Night  
Commutators, Controller Handles and Door Locks  
Gear Cases—All Steel and M. I. and Pit Jacks

Pinion Pullers, Trolley Poles—Steel  
Trolley Wheels, Tension Stands  
Banding and Heading Machines  
Coil Winding Machines for Field and Armature Coils  
Babbiting Moulds, Lathe Chucks

Axle and Armature Straighteners  
Bearings for Armatures and Axles  
Armature Stands, Armature Buggies  
Car Hoists, Car Replacers  
Brake Appliances, Handles, Forgings for Rigging, etc.

Columbia Machine Works & Malleable Iron Co.

ATLANTIC AVE. and CHESTNUT ST., BROOKLYN, N. Y.



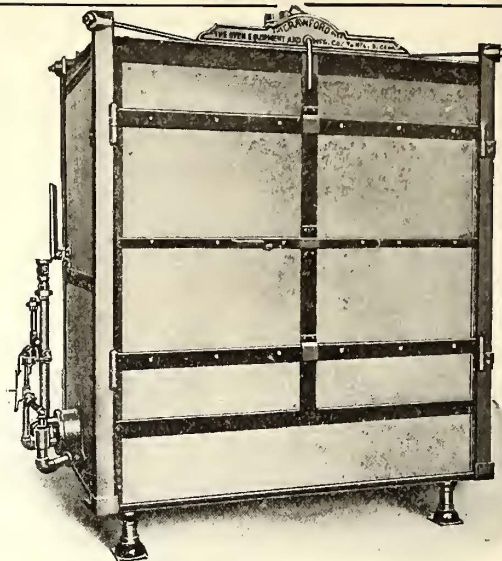
## The Enclosed Flame Gas Burner

heating a Crawford Sectional Oven can be installed in any building, with the full approval of the Underwriters.

# CRAWFORD Sectional Ovens

are made especially for baking and drying coils and armatures, and for japanning and lacquering all kinds of electrical equipment.

You can get any arrangement you want for operation—endless chain for continuous baking—trays running on roller bearings—tracks for trucks—overhead tram—rotating bluing barrels—swing or lift doors, single or double, at



one end or side, or at both ends for operating trucks through the oven.

Send today for leaflet,  
"Drying out Armature Coils."

The Oven Equipment and Manufacturing  
Company  
NEW HAVEN, CONN.



54-27



## Are You Taking Advantage of "Cleveland Coil Service"?

With all the equipment and workmen of the Van Dorn & Dutton Electrical Department, together with our own added facilities, we are enabled to offer superior service in supplying

### ARMATURE and Field Coils

and in repairing or rewinding coils.

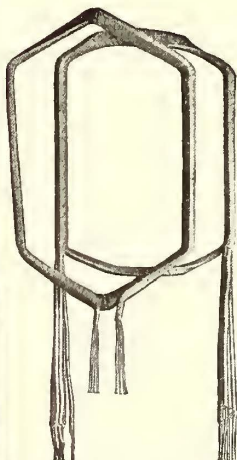
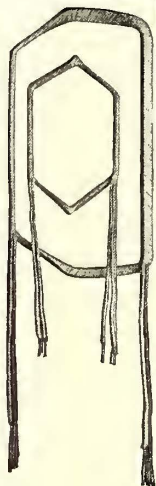
#### QUICK SERVICE

is the basis of our claim for your inquiries and of course thorough work at reasonable prices will be maintained as in the past.

Get the details of our proposition.

### CLEVELAND COIL & MFG. CO.

R. P. PASCOE, Mgr.  
1011 Power Avenue, N. E.  
CLEVELAND OHIO



You are interested in increasing the Efficiency of your Equipment  
You are looking for every opportunity to cut down Peak Load  
Here are two reasons why you should make your coils of

## Salamander Fireproof Wire (Heavy Pure Asbestos)

And Ask Our Representative for More Information



THE  
W. R. Garton Company  
CHICAGO



## Get Better Coil Service

for much less than the expense of rewinding we can mummify your old coils. They will then give the service of new coils. Write for our proposition.



McLeer Electric & Mfg. Company  
BUSH TERMINAL  
254-36th St., Brooklyn, New York

## FORMICA Commutator Rings

are better yet cheaper than mica rings. Try them.

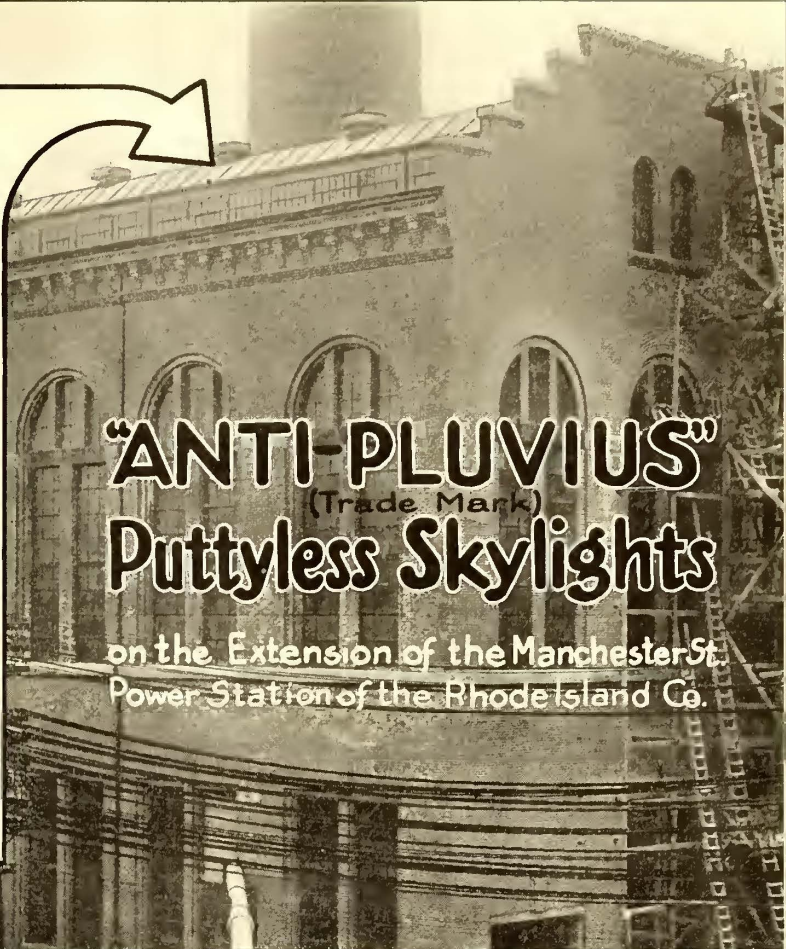
THE ELECTRIC SERVICE CO., Cincinnati, O.





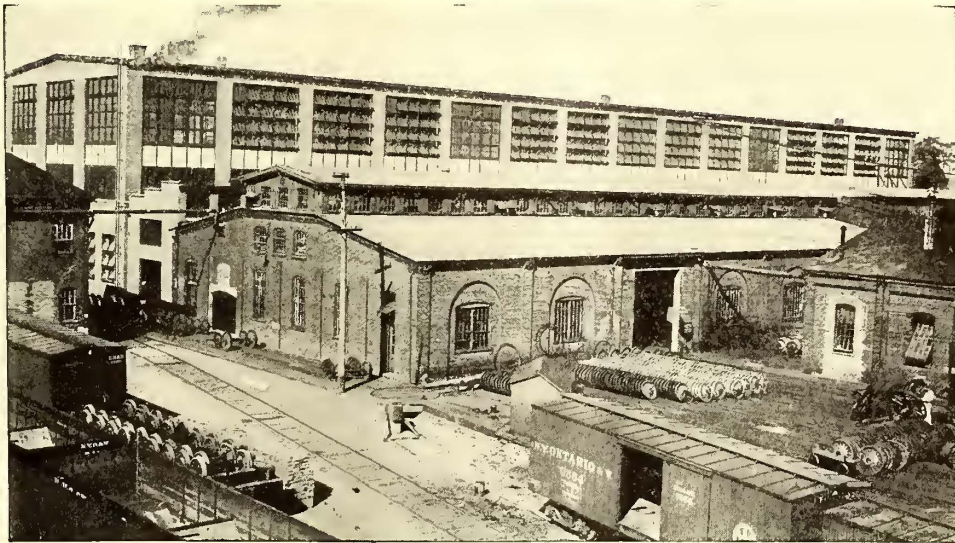
Not alone Price, but a full knowledge of the advantages and disadvantages of the various types of skylights and ventilators led to the installation of Drouvé Products in the extension of this station. We will be glad to submit sketches in connection with *your* buildings, without obligation. WRITE.

**The G. Drouvé Co.**  
 Bridgeport, Conn.  
 180 N. Dearborn St., Chicago, Ill.



**"ANTI-PLUVIUS"**  
 (Trade Mark)  
**Puttyless Skylights**

on the Extension of the Manchester St.  
 Power Station of the Rhode Island Co.



**Our Sash Operating Apparatus Used In Ontario & Western R. R. Shops At Middletown, N. Y.**

**E**RECTING shop—foundry—paint shop—round house—and all are equipped with it. Both the Rack and Pinion and

Rocker Shaft apparatus are used. Send for catalog showing this and many other complete installations.

**Lord & Burnham Co.** SALES OFFICES: New York, St. James Bldg. Philadelphia, Franklin Bank Bldg. Boston, Tremont Bldg. Chicago, Rookery Bldg. FACTORIES: Irvington, N.Y. Des Plaines, Ill.



## There's a Shop Record with the "Human Element" removed

Think what it would mean to you if you were enabled to get just that information on every operation of every man in the shop:

The figuring of time elapsed on the job is made by metal brains.

You do not have to pay a clerk to do it.

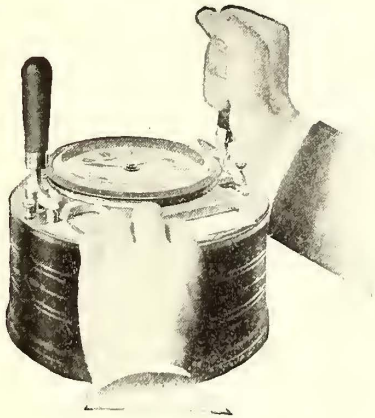
You are not trusting to the memory of "Workman 38" to give you a correct report.

He is not wasting his time each day on a job of book-keeping.

| TIME EMPLOYED |          |            |          |                | Job No. 530                    |
|---------------|----------|------------|----------|----------------|--------------------------------|
| Drilling      | Grinding | Finishing  | Tapping  | Time Allowed   | MACHINE SHOP<br>Workman No. 38 |
| Chipping      | Facing   | Milling    | Roughing | Premium Credit |                                |
| Cutting Off   | Filing   | Machining  | Shaping  | Turning        | Foreman                        |
| Quantity      |          | Total Time |          | Rate           | Cost                           |

This *Calculagraph* record shows that workman No. 38 commenced work at 9:45 A. M., March 5, 1906, that he was performing a milling operation on Job No. 530, and that he was employed two hours and eight-tenths of an hour.

Full size of card 3" x 5".



The *Calculagraph* automatically records the time of starting a job and when the work is completed it stamps the *time elapsed*.

Without extension or figuring you see the exact time spent, right there in figures.

One machine takes care of the entire shop.

Our booklet "Accurate Cost Records" describes it and shows exactly how it would apply to your shops.

Write us for a copy today.

### Calculagraph Company

1470 Jewelers Bldg.

New York

# KINNEAR Steel Rolling Doors for Car Houses

Many of the largest roads in this country have installed Kinnear doors in their car houses and shops.

That is significant.

It is also a significant fact that large numbers of small roads have installed Kinnear doors.

The rolling door meets the conditions of both kinds of roads.

They roll up at the top of the door opening, and thus are free from the awkwardness of doors swinging across the sidewalks or back into the building.

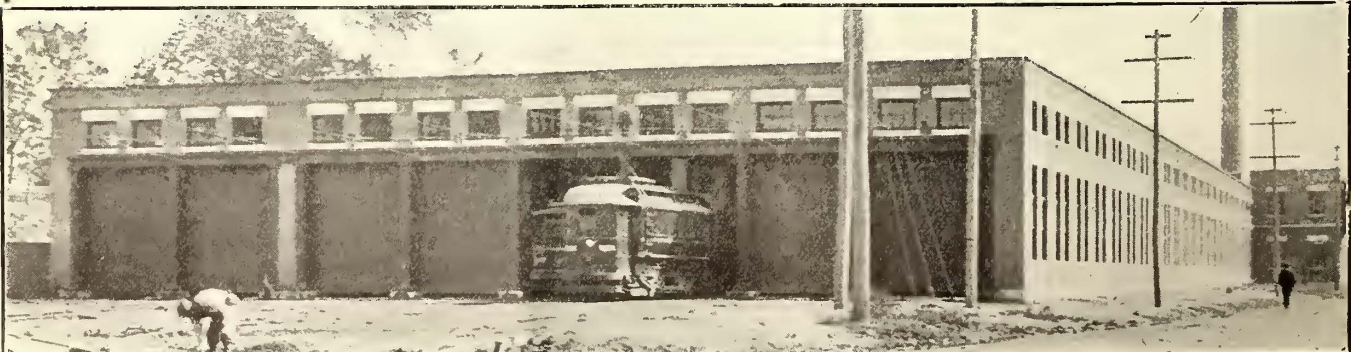
One man operates them by means of a chain hoist.

Let us show you how they can be applied to your buildings.

**The KINNEAR Mfg. Co.,**

**Columbus, O.**

Illustration shows East Street Car House of Berkshire St. Ry. Co., Pittsfield, Mass., equipped with Kinnear Steel Rolling Doors





NOW is the TIME

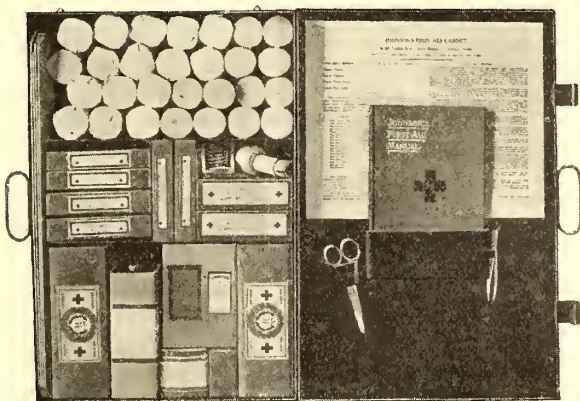
*Order it to-day*

*You may need it to-morrow*



# When Will the Doctor Arrive?

(METAL CABINET)



The size of Johnson's First Aid Cabinet No. 1 is 20x13x3½ inches  
Price: \$6.00 f.o.b. New Brunswick

The time between the accident and the doctor's arrival is "First Aid" time.

In these precious moments the use of **JOHNSON FIRST AID CABINET NO. 1** may save a limb—a life—will keep the little hurt from getting big—will reduce sick lists and damage claims.

Johnson First-Aid Cabinets No. 1 installed in the shop, car house, power house, line and work cars represent a dividend-paying investment.

Circular No. 110 tells about it—write us for a copy.

**Johnson & Johnson,**  
 DEPT. 27    NEW BRUNSWICK,    NEW JERSEY, U. S. A.



*Tested by Analysis*

## Oxweld Supplies

### For Use in Welding Metals

The importance of using the best supplies in Oxy-Acetylene Welding cannot be over-estimated. Good welding cannot be produced if Fluxes and Filling Materials of inferior quality or improper chemical composition are used.

Being the largest makers of Oxy-acetylene Apparatus and supplies in the United States and having constantly under our observation the varied applications of the Process both in this country and abroad, we have been able to accurately determine the needs of all users of the Process and to provide supplies to suit all requirements most efficiently.

### Oxweld Supplies

embrace everything needed in the art, all of the highest quality best suited to each class of work. Oxweld Supplies are furnished at the lowest prices consistent with the highest quality and are guaranteed, when used by competent operators, to produce better results than any other known to the art to-day.

### Oxweld Fluxes

for use in welding Cast Iron, Aluminum, Sheet Aluminum, Brass, Bronze, Copper and Malleable Iron. They are prepared from special formulas which have been exhaustively tested both in the laboratory and in actual use and have been found most efficient.

### Oxweld Filling Rods and Wire

for welding Gray Iron, Steel, Heavy Steel Castings, Cast and Sheet Aluminum, Brass, Bronze, Malleable Iron, Copper and all other Fusible Metals.

The strength, machining qualities and structure of the finished weld depend almost entirely upon the filling materials used and the skill with which they are fused together. The results of the exhaustive experiments, research and tests made by our Engineering and Research Department are embodied in Oxweld Supplies.

### Send for New Catalog

Our new 32-page Supply Catalog—the largest and most comprehensive ever issued—is now ready for distribution. It gives much valuable information that every one interested in this subject should be familiar with.

We shall be glad to send a copy to you for the asking.

## Oxweld Acetylene Company

Newark, N. J. Chicago Los Angeles

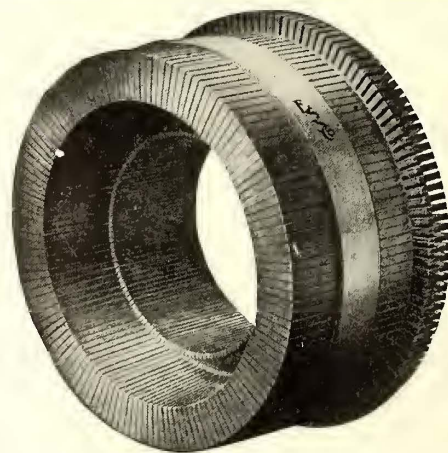
*Largest Makers of Oxy-Acetylene Apparatus and Supplies in the United States*



It is About Here that "Deltatape" Begins to Decompose

Think of having your coils insulated with a material which stands temperatures up to 500° Fahr. "Deltatape" does not retain heat like ordinary asbestos insulation. In addition it has great mechanical strength and flexibility, combined with high dielectric strength. These are important considerations if you want heatproof coils. Ask for samples. Nothing better for ribbon wound field coils.

D & W Fuse Co.  
PROVIDENCE, R. I.



### CONSIDER THE MATERIALS in Cameron Commutators

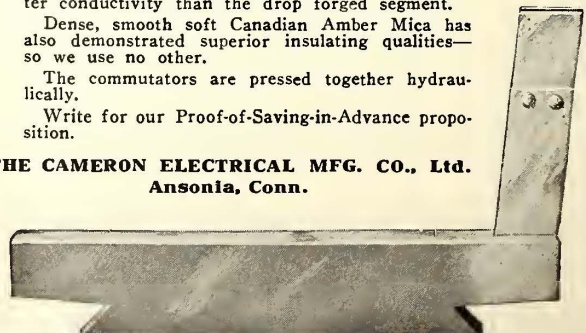
We use nothing but Hard Drawn Copper, because in service we have found that it gives better service, being more dense, more uniform and has better conductivity than the drop forged segment.

Dense, smooth soft Canadian Amber Mica has also demonstrated superior insulating qualities—so we use no other.

The commutators are pressed together hydraulically.

Write for our Proof-of-Saving-in-Advance proposition.

THE CAMERON ELECTRICAL MFG. CO., Ltd.  
Ansonia, Conn.

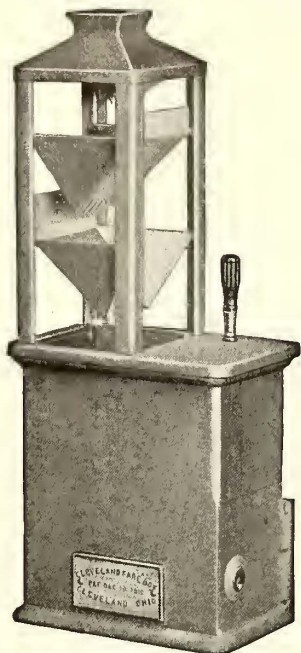








# The Cleveland



**Satisfaction Guaranteed**

*Write for catalog*

**Cleveland Fare Box Company**  
5310 St. Clair Ave. Cleveland, Ohio

# A Word About Car Heating

It is easy enough to get heat into the cars—simple, too.

The stove is a simple way—but expensive when you figure the attention required and the adverse advertising it gives a road.

The Consolidated Electric Heater way is simpler still, and what is equally important, gives YOU complete control over heat regulation.

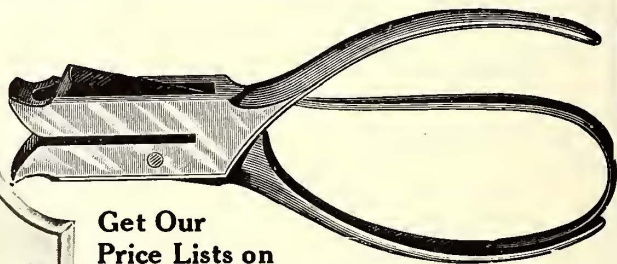
You arrange for a specified temperature, and that temperature is maintained.

Write for bulletins on heating systems.

**Consolidated Car-Heating Co.**  
Albany New York Chicago

CONDUCTOR  
**1912**

AMER. RY. SUPPLY CO.



Get Our Price Lists on  
**BADGES** and  
**PUNCHES**

**AMERICAN RAILWAY SUPPLY CO., 134-136 Charles St., NEW YORK**

## REDUCE YOUR ELECTRIC HEATING COST

GOLD'S THERMOSTATIC CONTROL will switch off the electric heaters the moment the car reaches a desired temperature. Did you ever stop to consider how long the heaters would remain switched off, especially when the car is full of passengers? The saving in current is enormous and will offset the first cost in a very short time.

GOLD'S VENTILATED CORE ELECTRIC HEATERS are perfectly ventilated and give the best possible efficiency. Let us bid on your next requirements.

**GOLD CAR HEATING & LIGHTING CO., Whitehall Bldg., 17 Battery Place, New York**

## Ventilation—Sanitation—Economy—Safety

*All Combined in*

**THE COOPER FORGED VENTILATION HOT AIR HEATER**

*Patented September 30, 1913. Ask for the full story.*

We Also Manufacture Pressed Steel Hot Water Heaters

**THE COOPER HEATER CO., CARLISLE, PA.**

When writing to Advertisers in this publication you will confer a favor on both publisher and advertiser by mentioning the **Electric Railway Journal.**





## This is the International Money-Counting FARE-BOX

It is similar in character to the International Coin Register except that the car register is omitted and the totalizer showing the amount of money deposited is located just above the money counting mechanism.

This fare box is smaller, of less weight and faster in operation than other types of money-counting fare boxes, the figures are one-half inch high and read in dollars and cents.

The advantages of a registering fare box over the locked box method are so clearly apparent that they need but little emphasis.

Among them may be mentioned absolute security, all fares being deposited direct by passenger and registered before being accessible to the conductor; a quick and simple accounting which obviates the necessity of a large force of clerks and a saving in expense and risk of handling the locked boxes between carhouses and auditor's office.

One or the Other of These Machines Will Fill ANY Requirement in Cash Fare Collection

## This is the International COIN REGISTER

This is the only machine combining in one mechanism the three absolutely essential features of correct registration of fares in prepayment cars.

It combines a fare box, a coin counting machine and a car register.

Besides safeguarding the company's revenue, it greatly simplifies the duties of the conductor and enables him to make better time on his trip.

The International Coin Register facilitates counting, as there is but one totalizer reading for both money counter and fare register, instead of two, and sometimes three, as with other systems.

It counts and registers coins in denominations of nickels, dimes or pennies. The one crank opens trap door to drop money into pan after inspection, counts the money, registers on trip and totalizer and rings bell.



Fare Box, Coin Counting Machine and Car Register all combined.

Over one thousand of these in use on two of the largest roads in the country.

We can fill orders promptly.

Write Us Stating Your Requirements.

# The International Register Co.

15 South Throop Street

CHICAGO, ILLS.

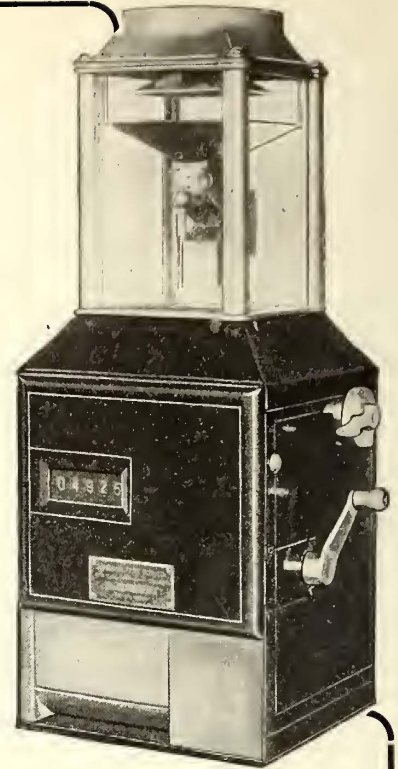


**The Fare Box That Has Been  
Developed Step by Step  
to Meet YOUR Needs  
Not OUR Theories!**

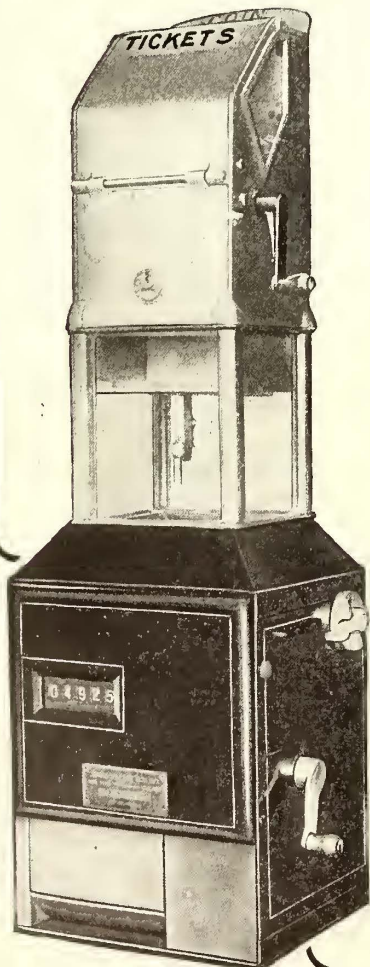
***FIRST in the Field—FINAL  
in Practical Results!***

**5000 of Them in Actual  
Service on 60 LEADING  
Railways of The Country!**

Those Are The Things That Count  
In Favor of The



# JOHNSON Registering Fare Box



—The box that does things in practice instead of promising things in theory.

—The box that has proven its value with upwards of 5,000 installations in three years of actual service on 60 leading railways of the country.

That's what talks,—not experiment.

The Johnson Registering Fare Box is the pioneer in the field. It blazed the way.

It was developed step by step only through the most intimate co-operation with the railway companies.

It was perfected to meet every condition that could arise.

It stands to-day the absolute triumph in fare box construction—the perfect registering fare box—the box that can't be "beaten"—the box that can't be made to register falsely or skip or jump.

The Johnson Registering Fare Box is actually demonstrating its ability to effect increases up to 15 per cent in fare collections.

In many cases this box pays for itself in ninety days.

Why "live in hopes" and lose thousands of dollars waiting for somebody to perfect something?

We'll start you off with a tried and practical system of fare collection that has *made good*, and we'll do it within a week from receipt of your order.

**JOHNSON FARE BOX CO.**

30 Church St.  
NEW YORK

Jackson Boul. and Robey Sts.  
CHICAGO



# A New Year's Resolution:



Ring Out  
the  
OLD

Ring In  
the  
NEW

The above method of fare collection was good enough in the earlier days of street railway operation, but it is out of date today.

If you haven't as yet installed the registering fare box system, we offer you this suggestion:—

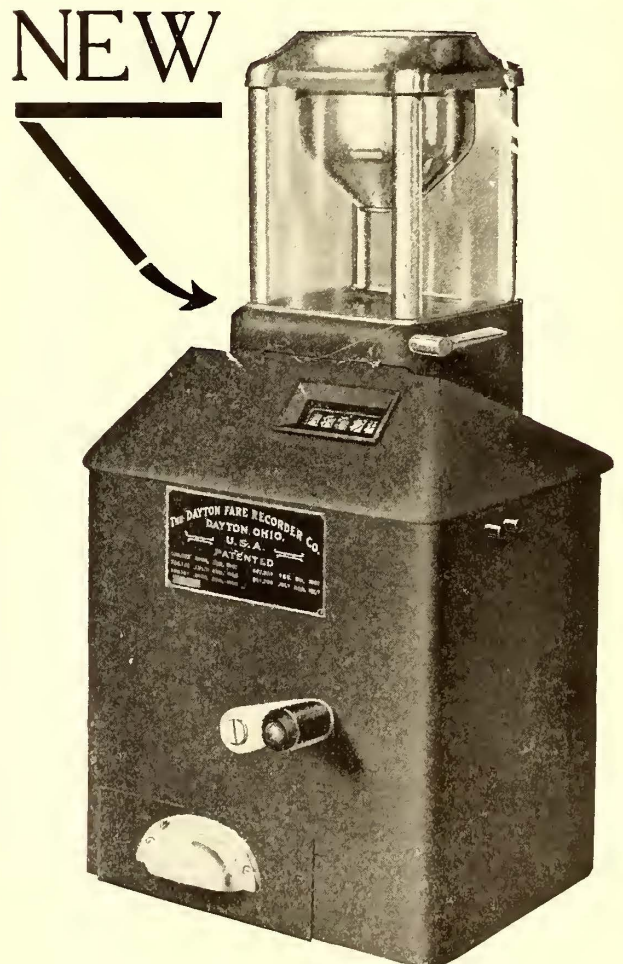
Start the New Year with the DAYTON REGISTERING FARE BOXES on your cars.

They will undoubtedly prove, in a very short time, a splendid investment.

Passengers deposit their fares direct into a registering box, each fare is secured as fast as it is received. There is no likelihood of the conductor becoming confused and failing to collect all the fares, or in the excitement of rush traffic, failing to ring them all up.

The Dayton Registering Fare Box protects the passenger, the conductor and your company. At the end of a day's run, as well as at the end of each trip, it automatically tells its own story of receipts.

It registers and protects nickels, dimes and pennies. It is fool-proof, cannot be tampered with, and is absolutely accurate. It will pay you to investigate.



The Dayton Registering Fare Box

Dayton Fare Recorder Co.  
DAYTON, OHIO



...anner for the road that had a very large per...  
 of tickets.  
 Frank H. Brown, Rhode Island Company, said he had been using the Rooke system for the last six years and had found it very satisfactory. The company did not register transfers and had no tickets and had never had any trouble with the Rooke system.  
 Mr. Boylan asked if the company used the Rooke system on its prepayment cars and Mr. Brown replied that it did do so.  
 ...ident Stevens said that his company in Ci...

*Extract from Report of Accountants Association Meeting at Atlantic City*

*"It did So"*

There

is the Rooke Register at work on Providence Prepayment Cars



These registers have proved in service to be the greatest help in speeding up the loading time of cars at congested points.

It is here that fare boxes fail utterly by reason of the fact that each passenger must come up to a given point in order to deposit the fare in the box.

The conductor on the back platform with a Rooke register in hand, eliminates the necessity of having the passengers form an orderly, single file procession into the car.

He can cover all passengers on the platform within reaching distance.

If a passenger is delayed by searching for a coin, the conductor reaches the register over to

others on the platform—keeps the crowd moving.

LOADING SPEED is a vital factor in prepayment operation. The Rooke system affords you a 100-point fare collecting method that will *facilitate* speed in loading—not retard it.

The register does not become a receptacle for worthless fare substitutes—it puts fare payment on a direct man-to-man basis as opposed to the man-to-box basis.

If *all* your cars are not operated on the prepayment principle—here is a uniform system of collection for the different types of cars—it's a "blanket" system that *fits*.

Write us for facts verified by results in service.

**Rooke Automatic Register Co.**  
 Providence, R. I.



# For 1914—THE OHMER SYSTEM

IT IS NOT ECONOMY TO PAY A MAN TO STAND ON THE REAR PLATFORM OF YOUR CAR IF YOU ARE USING ONLY A PART OF THAT MAN'S ABILITY TO SERVE YOUR INTERESTS.



Under the OHMER SYSTEM the conductor becomes an effective diplomat in winning public opinion favorable to his company. He feels that he has been made the company's representative and agent. He will plug for his boss and for the business.

The OHMER SYSTEM shows just how hard a man is working to be accurate and just how faithful he is trying to be. It appeals to the best there is in him because it enables him to be a *real conductor* instead of merely a gate-man and trolley cord tender.

## OHMER FARE REGISTER CO.

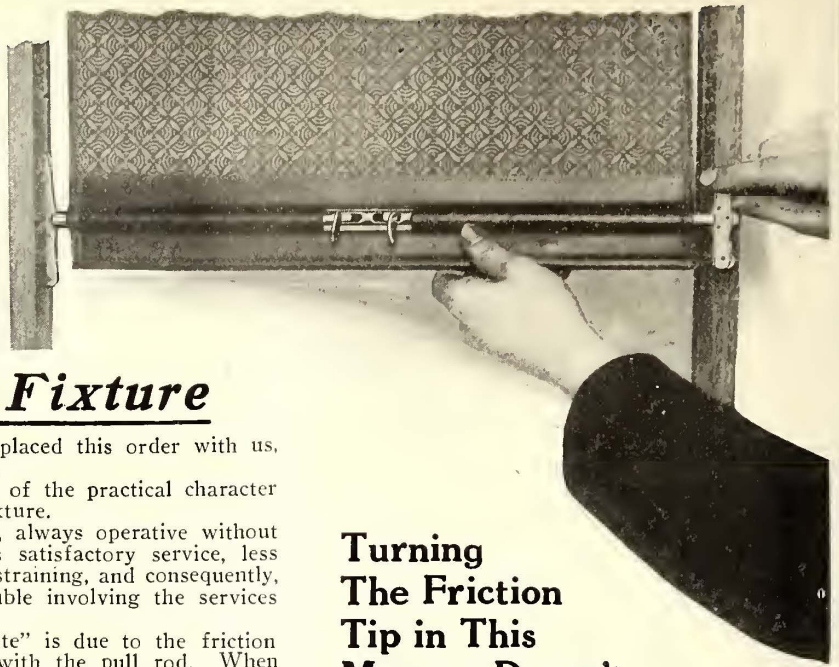
Dayton

Ohio



3,700 of these curtains have just been ordered by The Chicago City Railway

*The*  
**"STA-RITE"**  
**Car Curtain and Fixture**



The Chicago City Railway Company placed this order with us, after careful investigation of our curtain.

That in itself is pretty good evidence of the practical character and economy of this car curtain and fixture.

Among its advantages: once adjusted, always operative without further care or attention. That means satisfactory service, less handling, less tilting, less cracking, less straining, and consequently, freedom from constantly recurring trouble involving the services of repairmen.

Fool-proof adjustment of the "Sta-Rite" is due to the friction tip being normally out of connection with the pull rod. When necessary, an adjustment can be made by simply pressing in the tip, thus connecting it to the rod, then turning it.

The tips can be withdrawn from the grooves by your own men, without tilting, by simply pinching handles up and out beyond the lugs.

Investigate this curtain for your road. Write for literature.

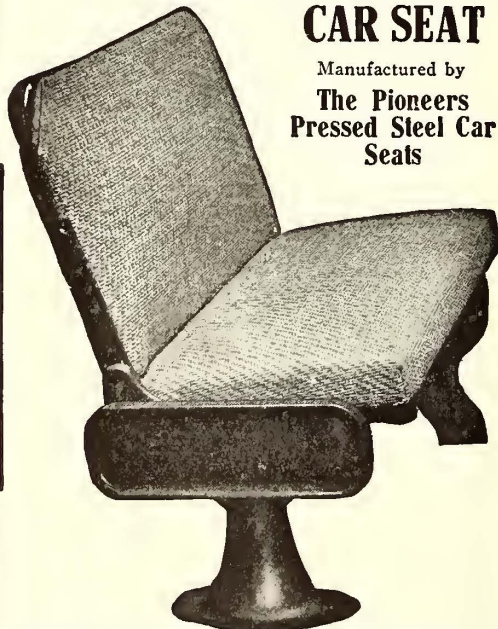
**Turning  
The Friction  
Tip in This  
Manner Doesn't  
Affect the Adjustment—  
It is FOOL PROOF**

**THE RAILWAY SUPPLY & CURTAIN CO., 612-618 So. Canal St., CHICAGO**

**PRESSED STEEL**

TRADE **WALKOVER** MARK  
**CAR SEAT**

Manufactured by  
**The Pioneers  
Pressed Steel Car  
Seats**



**PRESSED STEEL**

**PRESSED STEEL**

The leading seat; gives more room, more comfort and more money-value than any other. Specify and insist on our seats for your new Electric Cars.

**The Hale and Kilburn Co.**  
NEW YORK PHILADELPHIA CHICAGO

**PRESSED STEEL**

**COMFORTABLE RIDING  
MEANS PATRONAGE**

INSTALL  
**"Globe" Ventilators**

and make it comfortable for your passengers and easy on your heating system.

This means money to you.

**GLOBE VENTILATOR CO., TROY, N. Y.**



**CAR CURTAINS  
CURTAIN FIXTURES  
SASH LOCKS  
SASH BALANCES  
NUT LOCKS**

In Any Section of Steel for All Sizes of Bolts

**THE NATIONAL LOCK WASHER CO.**  
CHICAGO, ILL. NEWARK, N. J.



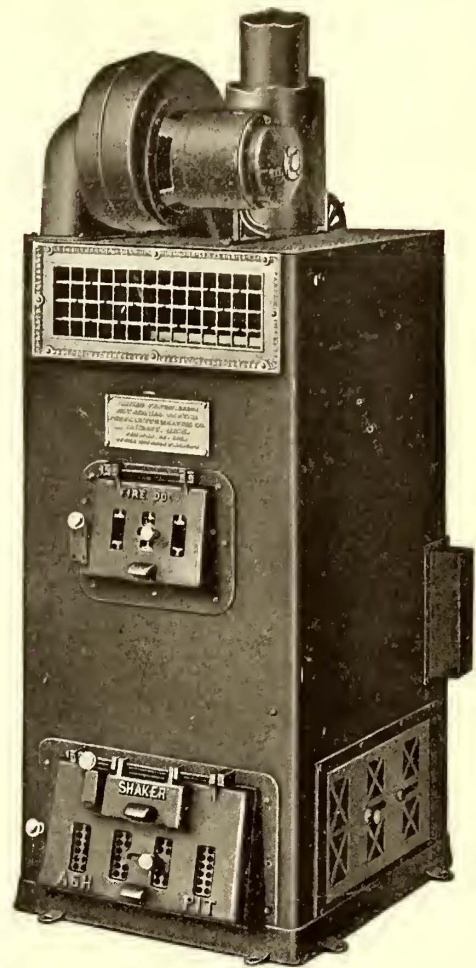
It isn't the installation cost  
of a heating system  
that hits a road's  
finances—

*It's the operating  
cost of the heaters!*

Some kind of heating system must be installed, and the initial cost of the installation may not vary greatly.

But how about the cost of operating the heaters? That's the point for you to consider seriously.

And in considering that point, remember that



## *THE PETER SMITH*

*Forced-Ventilation*

*Hot-Air Car Heater*

**HAS THE LOWEST OPERATING COST** of any heating system on the market.

And coupled with that advantage it is the simplest to install, the lowest in maintenance cost, the lightest in total weight, the easiest to remove in the "off" season, the only heating system that is guaranteed to maintain a temperature of 60 degrees in zero weather, and the only heating system that combines ventilation with heat.

We will make it easy for you to investigate these claims. Ask us to. Circular and blue prints showing installation mailed on request.

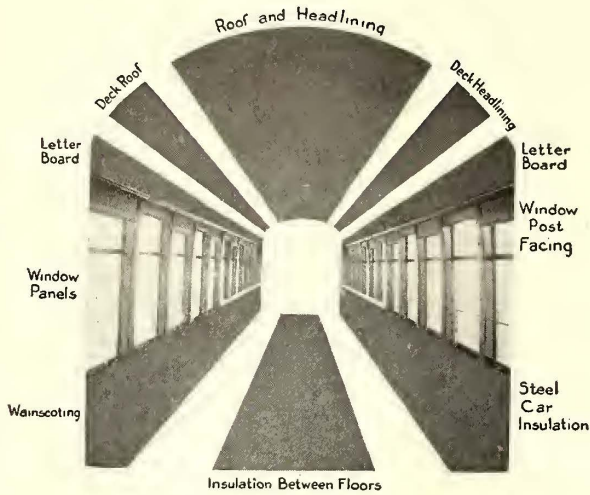
**The Peter Smith Heater Co.**

88 Isabella Street

DETROIT, MICH.



## It is Right HERE in Car Construction that Nevasplit Helps



Have you ever given thought to the amount of weight that can safely be saved in car construction through the use of Nevasplit? Have you ever considered that this saving in weight is accomplished without sacrifice of strength or durability?—rather with an increase in these items.

Have you ever considered that the saving in weight with greatly increased insulation against heat or cold in no way adds to the cost of the car?—in many cases it has decreased the cost. Ask us to go into detail.

## Keyes Products Company

71 West 23rd Street

New York City

Fisher Bldg., Chicago, Ill.  
J. E. Simons

50 Church St., New York  
W. R. Kerschner

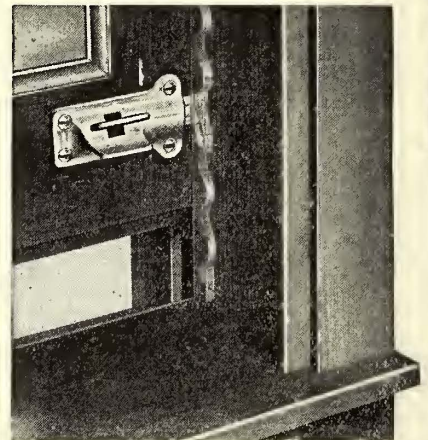
Louisville, Ky.  
T. C. Coleman & Son

## Edwards Devices

### For Windows

Our line of window fixtures is the largest in the world. The designs are exclusive and made in a most thorough manner and of the very best of materials.

There is more than 20 years' experience behind the product. Our big catalog describes them a little more thoroughly than is usual in catalogs.



### For Trap Doors

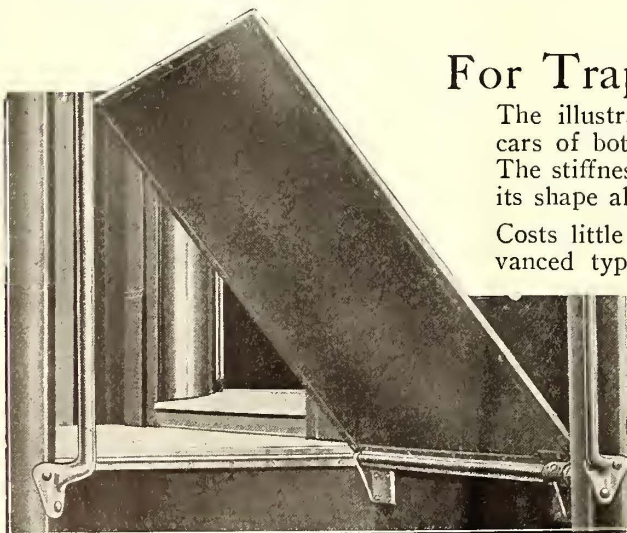
The illustration shows the Edwards All-Steel Trap Door for cars of both wood and steel construction. The stiffness, rigidity and strength of the door causes it to retain its shape always.

Costs little to buy, little to install, and is used on the most advanced types of car construction. All adjustments are made from the outside.

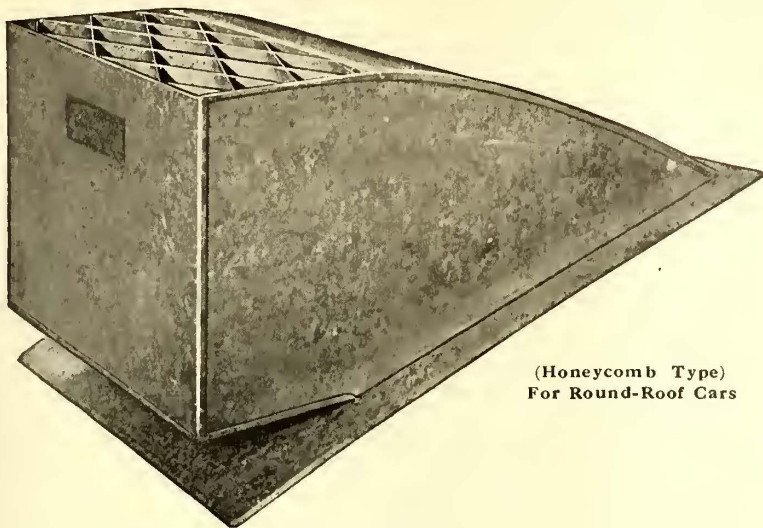
Write for prices and details.

**The O. M. Edwards Company, Inc.**  
SYRACUSE, N. Y.

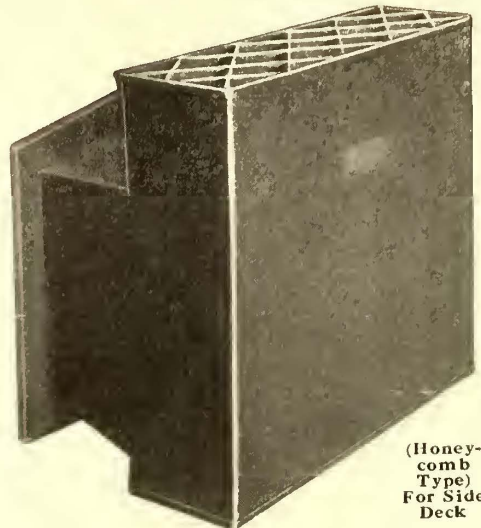
|                          |                                     |
|--------------------------|-------------------------------------|
| Window Fixtures          | Metal Extension Platform Trap Doors |
| All Metal Sash Balances  | All Metal Shade Rollers             |
| Metal Sash and Mouldings | Railway Devices                     |



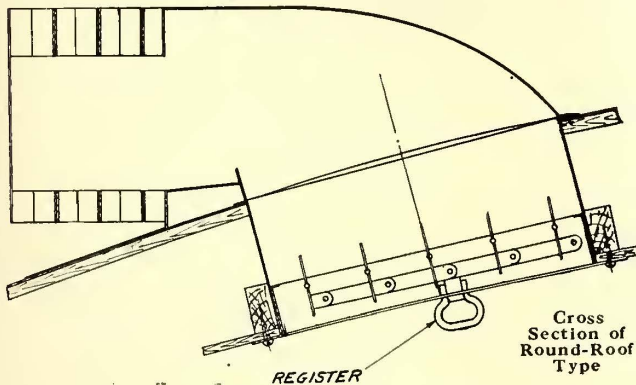




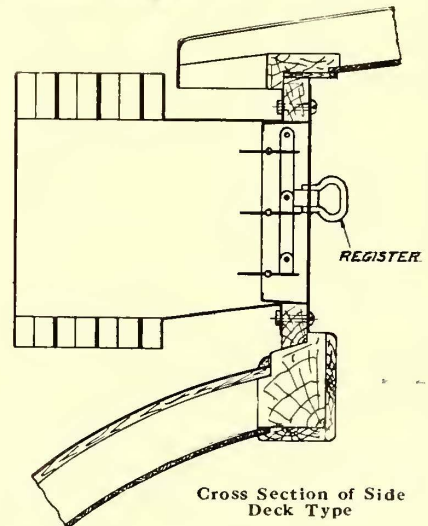
(Honeycomb Type)  
For Round-Roof Cars



(Honeycomb Type)  
For Side Deck



Cross Section of Round-Roof Type



Cross Section of Side Deck Type

## What Is Your Ventilating Problem?

Whatever it is, there's a

# UTILITY VENTILATOR

to meet it

A ventilator is one thing—ventilation is quite another.

You can't lay down a hard and fast rule for ventilating a car with a hard and fast type of ventilator.

It may seem all right in theory, but it doesn't always work out in practice.

In short, successful car ventilation is not simply a question of buying ventilators and installing them; it is an engineering problem and one involving widely varying conditions.

It is a problem that must be met scientifically with the type of ventilator and the number of ventilators best adapted to the work to be performed.

Utility Ventilators are made in different types to successfully meet just such widely varying conditions.

Through constant study of the field our engineers can tell you the type best suited to meet your particular ventilating conditions.

Put your problem up to us.

The Utility Ventilator is simple and rugged in construction, light in weight, easily and cheaply applied, low in first cost, free from maintenance expense, waterproof, weatherproof, dust-proof and cinder-proof.

It is highly efficient in action, exhausting the air whether the car is running or standing.

Charts and full technical data sent to any road interested, on request.

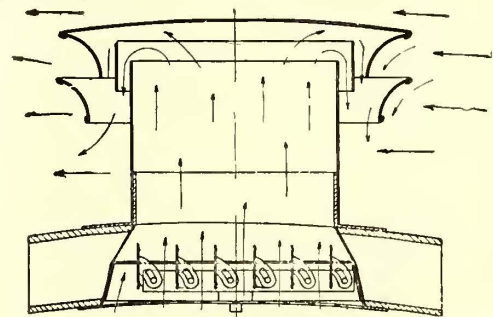
## Railway Utility Co.

General Offices  
226 So. La Salle St.  
CHICAGO, ILL.

Eastern Offices  
1328 Broadway  
NEW YORK CITY



Round "Jet" Type



Cross Section of Round "Jet" Type

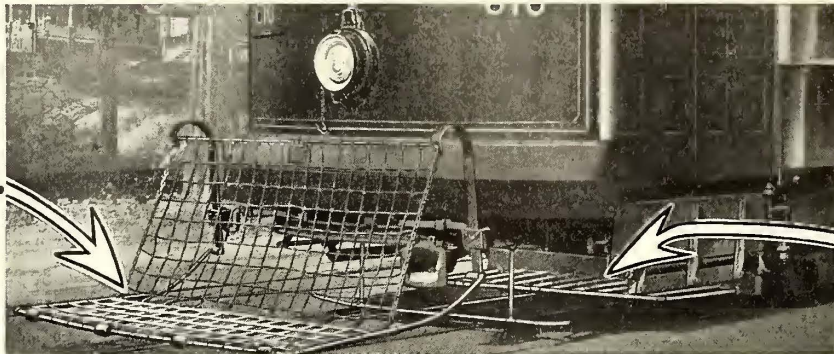


## AUTOMATIC SENTINELS OF PROTECTION

are safer to trust than the quickest eye or most agile pair of legs. The eye may not see and confusion may paralyze the legs, but if the cars are equipped with

# PARMENTER

Fenders

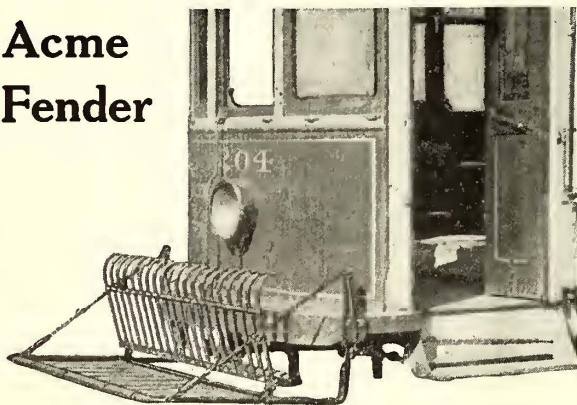


Wheel  
Guards

there'll be no expensive "avoidable accidents" on *your* line. Parmenter Fenders are carried "always ready" and dropped at the will of the motorman. Our 1913 model is equipped with a new dropping device so that any one of four movements operate the fender, making it impossible to miss operation. Parmenter Wheel Guards attached to the trucks protect both rails on the sharpest curve a car can take. This cannot be done by a body suspended guard. Parmenter Fenders and Wheel Guards are two insurance policies which will repay multi-fold the negligible first cost and maintenance expense. Both devices have been standard for 16 years.

Parmenter Fender & Wheel Guard Co., 89 State Street  
BOSTON, MASS.

## Acme Fender



### Gives Immunity from Accident Suits

When front of fender strikes anything the apron moves backward and downward. Highly efficient in picking up prostrate forms. Damage from collision with vehicles also prevented. Highest record in St. Louis municipal tests on upright and prostrate bodies.

Upright Cushion in front of car bumper is of best open-hearth steel. Hangings and fittings of best malleable iron. Can be folded close to dash, so as not to interfere with coupling. Low maintenance, as there are only four possible breakable points.

Send for descriptive booklet of Acme Fender, Eclipse Life Guard, Eclipse Wheel Guard and Eclipse Retriever.

Eclipse Railway Supply Co  
Cleveland, O.

## PASSENGERS MADE SAFER

By equipping passageways with



## UNIVERSAL SAFETY TREAD

Extensively used upon the principal electric railways throughout the United States for car steps, platforms, stairways, etc.

Write for catalog showing installations.

Universal Safety Tread Co., 141 Milk St., Boston  
New York Philadelphia Chicago



**MASON SAFETY TREADS**—prevent slipping and thus obviate damage suits. They have been used on the car steps and platforms of the leading Railroads for the past 18 years. We are still receiving repeat orders—pretty good recommendation for efficiency—**DON'T YOU THINK SO?** They reduce your accident costs and insure against wear. We also make **STANWOOD** steps and treads and **KARBOLITH** fireproof composition car flooring.

American Mason Safety Tread Co. Lowell, Mass.

## "ROOT SCRAPERS"

will keep your cars running on schedule time through the snow season.

PROMPT SHIPMENT

The Root Spring Scraper Co., Kalamazoo, Mich.



Messrs. Wendell & MacDuffie Co.,  
 #165 Broadway,  
 New York, N. Y. Attention Mr. H. E. Oesterreich, V. Pres. & Gen. M.

Gentlemen:-

Replying to your favor of October 21st, the circumstances of the incident referred to were about as follows:

A gentleman was going down a cross street very rapidly on a motor cycle and ran immediately in front of one of our cars that is equipped with an H. B. Life Guard. The operation of this Guard at that time was perfect, as the Guard dropped to the pavement, picked up both man and motor cycle, and was the means of saving the mans life, and I don't believe he would have been seriously injured had it not been for the fact that he was mixed up on the Life Guard with his motor cycle.

We have only had these Guards on a short time, and during that time, this is the first human being we have picked up, but we have picked up a number of dogs that have come out uninjured.

We believe that the results from the incident above referred to were worth the entire cost and maintenance of the Life Guards.

Yours very truly,

General Manager.

We shall be glad, upon request, to supply the name of road having this experience.

## The Consolidated Car Fender Company

Manufacturers of

The Providence Fender and H-B Life Guard

PROVIDENCE, R. I.

General Sales  
 Agents

# Wendell & MacDuffie Co.

165 Broadway  
 New York



## Car Sanders Built to Specifications

We were the originators of Pneumatic Sanders and thousands of our equipments are now in use in all parts of the country.

Building sanders is our specialty. That's why we are able to build the best. We build them to your specifications and guarantee them to work satisfactorily. All we want to know is the type of car (and truck) on which they are to be installed, clearances, etc., and whether the sander is to be located inside of the car or suspended below the floor. The size and shape is up to you. It doesn't matter to us. We will furnish the complete equipment or any part desired.

Our sand hoppers are made of rust-resisting American ingot iron, which will last a lifetime. When properly installed with Nichols-Lintern valves and traps, and connected up with Nichols-Lintern accessories, you have the most complete and reliable car sander on the market.

They are not expensive, are easily installed and will stay in service. Specify Nichols-Lintern Sanders for your new cars.

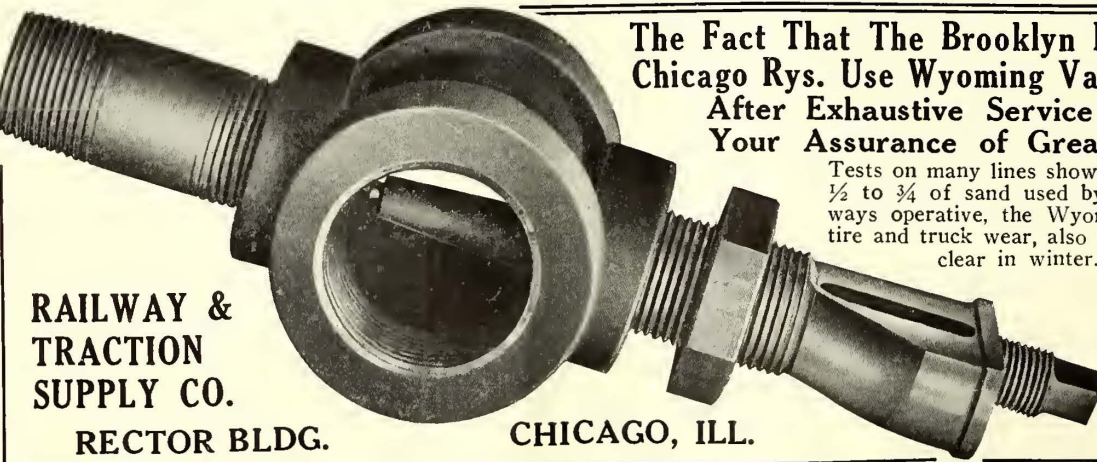
**The Nichols-Lintern Co.,**

Manufacturers of complete Sander Equipment.  
CLEVELAND, OHIO.

### Platform Hopper

We are prepared to furnish the following sander parts:

Sand Hoppers, any size and style. Valves in two types. Traps in two styles. Hose, Cotton and Wire. Floor Plate Hopper Covers and Seats. All Sander Accessory parts.



### The Fact That The Brooklyn R. T. and The Chicago Rys. Use Wyoming Vacuum Sanders After Exhaustive Service Tests Is Your Assurance of Great Savings

Tests on many lines show an actual saving of  $\frac{1}{2}$  to  $\frac{3}{4}$  of sand used by other makes. Always operative, the Wyoming saves slipping, tire and truck wear, also power. Keeps pipes clear in winter.

Can be applied to any box, either inside or out. We will send you a pair for service tests free of charge, freight prepaid.

Send to-day for samples, prices and cata

**RAILWAY &  
TRACTION  
SUPPLY CO.**

RECTOR BLDG.

CHICAGO, ILL.

### You'll Need These — to-morrow perhaps

and when you need them you'll need them badly. Their absence may mean a heavy repair bill and demoralized schedules.

#### HOLLAND SLEET WHEELS

cut sleet and hug the wire. Not only are they good wheels, but they're kept in stock for quick shipment.

Sizes 4, 4½, 5 and 6 inches.

State make of harp and size of axle bearing.

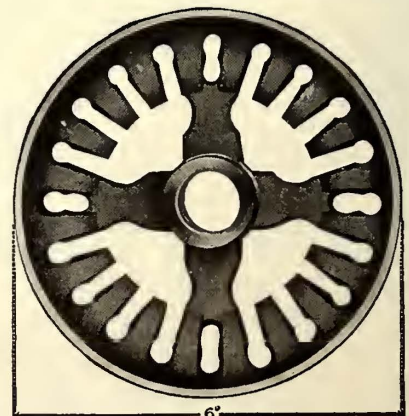
**The Holland Trolley  
Supply Co.**

Cleveland, Ohio



**HOLLAND  
Sleet Cutter**

is quickly attached by anyone as soon as sleet gets on the wire. Long end goes into harp and loop on trolley rope holds cutter in place. For 4, 4½, 5 and 6 inch wheels. State wheel and harp make.



6"



**It Picks Them Up  
Instead of  
Crushing Them  
Under!**

**FONGER Tip-Tilting  
Automatic Fender**

Observe the photos.

No. 1 shows child, unconscious of danger, crossing track in front of car.

No. 2 shows overturnable shield automatically tripped by contact with child's body and thereby instantly filling the space between fender and street surface, making it impossible for child to become wedged beneath fender.

No. 3 shows shield completely tripped, "scooping up" the child.

No. 4 shows the child safely landed in basket of fender.

One of the decided advantages of the Fonger Fender is the manner in which it prevents a person being caught under it. The tip-tilting or overturnable shield guards against this by automatically and instantly tipping back and dropping to street, thereby "scooping up" the person struck.

By depressing a plunger with his foot, motorman may quickly swing fender back under car in order to avoid contact with wagons or other obstructions.

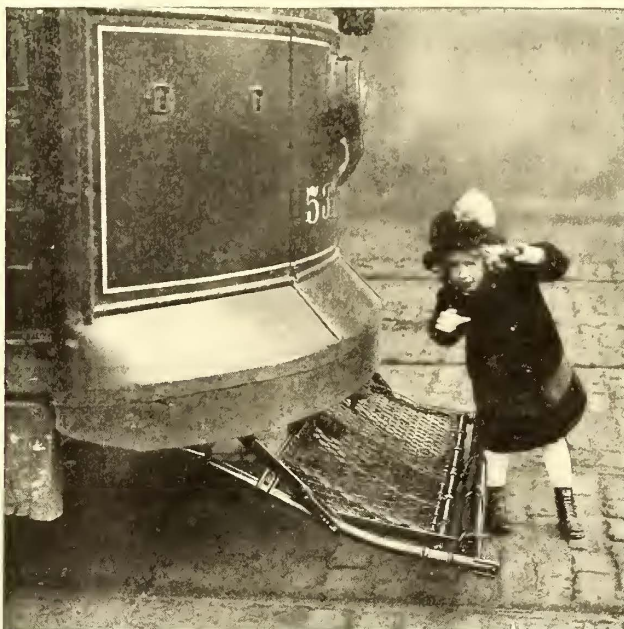
In normal running position, fender projects but 2 feet ahead of car, as shown in photo No. 1.

Trial set of these fenders sent on request free of charge and fitted to any type of car.

**Fonger Fender Company**

3852 Cottage Grove Ave.

CHICAGO, ILL.





**I**T has been truly said that "the alloy which may be best for use in Trolley Wheel service may be far from being the best for bearing use" and this is why the

# KALAMAZOO Trolley Wheels



are so satisfactory, the rims of which are made of a soft but tough metal having long life without injury to the wire, and the bushing of *bearing* metal, a combination impossible in a one-part wheel.

MADE BY

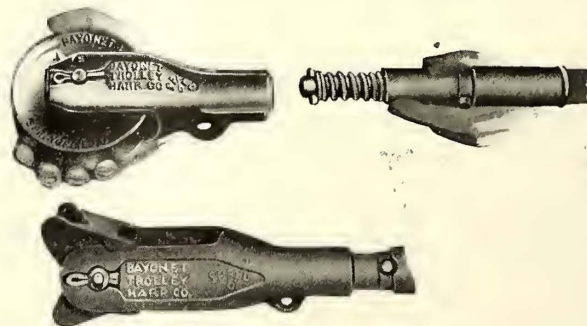
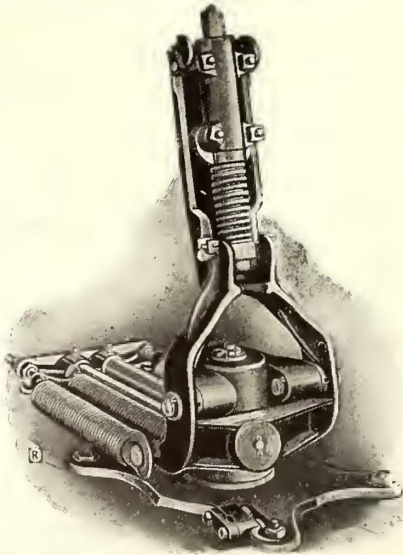
## THE STAR BRASS WORKS

Kalamazoo, Mich.

## DON'T BURN UP WHEELS IN SLEET STORMS

Remove them entirely from the pole by using the Bayonet Harp, and replace with the Bayonet Sleet Cutter, reducing pole-end weight, increasing pressure necessary to crush and scrape the ice clean from wire. Saves wheels, costs half as much, and lasts twice as long and has double the efficiency of any other cutter made. Never comes off in service, nor tears down overhead.

**Bayonet Anti-Friction Base** has all wearing parts bushed.  
Change from cutter to wheel in 20 seconds.  
Self-Lubricating. Non-Breakable.  
Poles Changed in One Minute.



No rusty nuts to unscrew, no hunting the monkey wrench to take off that damaged trolley pole. No tools. Just your hands. No special tools or hammers necessary to change a trolley wheel. No patching up or lubricating trolley on top of car. Do this at the work bench where it can be done right. Wheels running in Bayonet Harps give a third more mileage and if they are Bayonet wheels you will get double your present mileage. Bayonet stands for efficiency and economy. We give you better service and more improvements for your money than anyone. Sold subject to approval. Satisfaction or no money.

### Bayonet Trolley Harp Co.,

Springfield, Ohio, U. S. A.



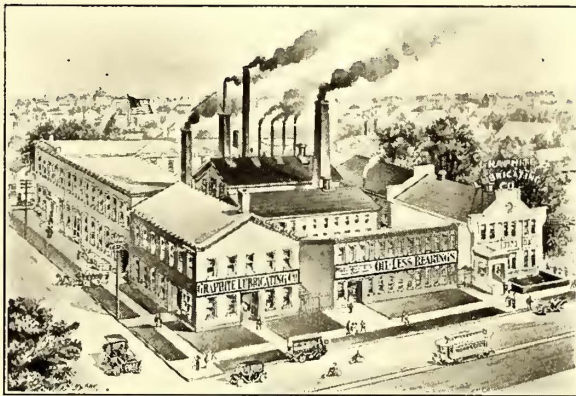
# OVER ONE MILLION

of these specified during 1913—

We use the word "specified" advisedly because it has got to a point where a railway man must specify "BOUND BROOK" when he orders trolley wheel bushings—that is, if he wants genuine



## "BOUND BROOK" Trolley Wheel Bushings



THIS ENTIRE PLANT IS USED FOR THE PRODUCTION OF "BOUND BROOK" BUSHINGS.

For more than 20 years it was possible to get "Bound Brook" bushings without specifying the name —it was possible to identify "Bound Brook" bushings by the green label on the box.

This holds good no longer

—you cannot be sure of getting "Bound Brook" bushings by merely ordering "trolley wheel bushings"

—you cannot identify them by the green label solely.

Specify "BOUND BROOK" when ordering bushings—that is our registered trade mark

—see that those words are on the green label

—the color can be copied, but the words can't be.

Uncle Sam protects us *there*.

# Graphite Lubricating Company

Main and John Sts.

Bound Brook, N. J., U. S. A.

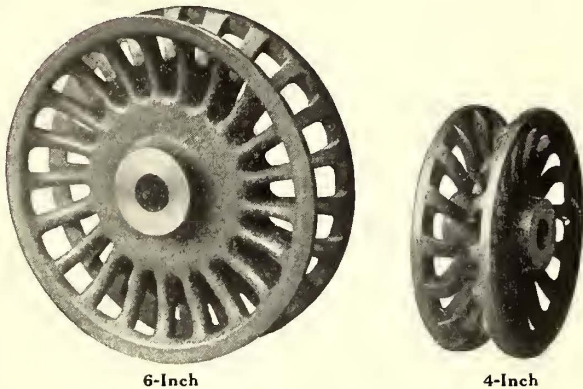


# Nuttall

## Sleet Wheels

&

### Scrapers



6-Inch

4-Inch

They will prepare you to meet the sleet storms that are coming. When your road is equipped with them you need not worry any more about sleet storms and their bad tie-ups.



6-Inch

4-Inch

### The Nuttall Sleet Wheel

takes the place of the ordinary trolley wheel in sleety weather.

### The Nuttall Sleet Scraper

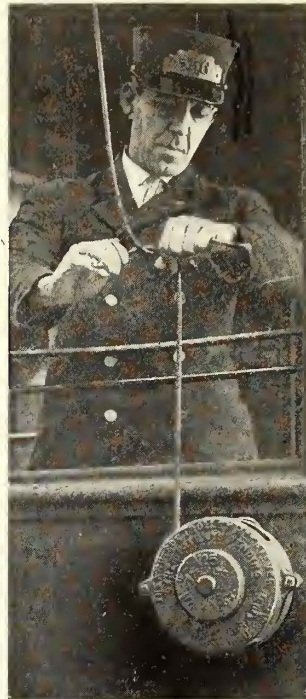
scrapes the sleet off the trolley wire, and can be slipped on at a moment's notice.

*Let Us Know Your Requirements.*

**R. D. Nuttall Co.**  
**Pittsburgh**



## Don't Stop the Car to Fix the Rope



It's a job for the shop when the rope breaks on an ordinary retriever or catcher and in the meantime the device is out of order.

With the **Knutson No. 5 Retriever** or **Ideal Catcher** the conductor simply pulls up the rope, winding the weak spring and ties the two ends of the rope together — no labor cost, no loss of service from car or retriever.

There are other exclusive features of our devices which are money savers.

Write for data.

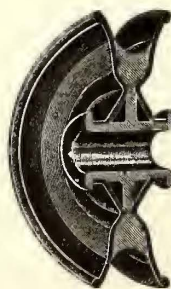
**TROLLEY SUPPLY CO.**  
Canton, O.

## U.S. Metal & Mfg. Co.

165 Broadway, New York City  
Chicago Atlanta

### RAILWAY SUPPLIES

*Selling Agents for Dunham Hopper Door Device—Feasible Drop Brake Staff—Columbia Lock Nut—Kling Bolts—Shop Cleaner—Traction Axles—Steel and Iron Forgings—"Texoderm." Sole Eastern Agents for St. Louis Surfacers & Paint Co. General Eastern Agents for Hutchins Car Roofing Co. Special Agents for The Tool Steel Gear & Pinion Co. Special Agents for The Pollak Steel Co. Special Agents for C & C Electric & Mfg. Co. General Agents for Anglo-American Varnish Co.*



Balance

Lightness

Conductivity

Strength

all contribute to make it an

**"Ideal" Trolley Wheel**


**Lumen Bearing Company**

Brass Founders

Buffalo

Toronto





## CHEAP TROLLEY CORD

should not be confused with **low priced** trolley cord, which is **cheap** by the pound, but **dear** by the year.

**Really cheap** trolley cord is made of uniform fine yarn, which can be **braided smoothly**—to prevent abrasion or choking the retrievers; **made hard**—to avoid stretching and swelling; **thoroughly waterproofed**—to avoid rotting, but not doped to add to the weight and therefore to the price.

## Samson Spot Cord

is cheap trolley cord, because it is smooth and hard and thoroughly waterproofed, and has good, uniform stock right through to the centre.

The Colored Spots, which are our trade-mark, used only in this quality, do not make the cord any better—they simply identify the cord as our best quality.

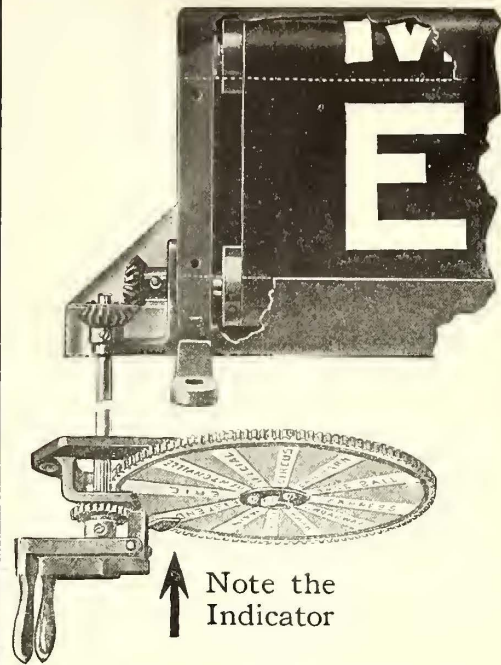
Look out for imitations which look something like Samson Spot Cord, but which are no better than any low priced cords.

If you use Samson Spot Trolley Cord and Samson Signal Cord you will spend less for trolley and signal cord during the year, and will not pay for extra labor in replacing so often.

Samples, prices and full information gladly sent.

Samson Cordage Works  
BOSTON, MASS.





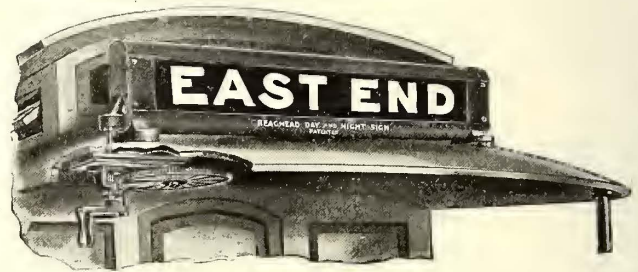
## This Indicating Sign assures proper placing

The indicator, placed above the motorman's head, enables him to change signs while the car is running, and to be certain that the right sign is showing. Because the device is operated by gears the drive is positive.

## The CREAGHEAD Destination Car Sign

always presents a proper appearance because the fabric is constantly under tension. For day and night service. Constant service does not rattle the sign apart. Its record on a large number of roads shows an exceedingly low service cost. Made for top, vestibule, dash or side mounting.

Let us show you how little it costs to provide your cars with destination signs that are distinct and sightly. Mention quantity and number of routes when writing.



**Creaghead Engineering Co.**  
CINCINNATI, OHIO

## A NEW HANDBOOK FOR THE PRACTICAL ELECTRICAL MAN



# American Electricians' Handbook

By TERRELL CROFT

*The book with the answer to the everyday questions*

### AIM OF THE BOOK

- I. To give the fundamentals—a plain statement of principles and theories, so that you can understand the workings of electricity.
- II. To cover all the practical phases, giving rules and solving specific problems for the proper application of these rules.
- III. To make every detail clear by careful statement and simple illustrations.

### WHO USES IT

The men who run the power plants, handle the machinery, wire the buildings, set up and operate dynamos, motors and transformers, install lighting systems, etc., etc.—the great body of practical men who carry out the designs and plans of the engineer.

WHAT IT IS—711 pages of the practical data, tables, charts, etc., in pocket size, with over 900 illustrations and diagrams. Thin paper, flexible leather, gold stamping, \$3.00 (12/6) net, postpaid.

### SCOPE

There are Six Main Sections:

- I. FUNDAMENTALS—A reference section on principles of electricity and electrical engineering.
- II. GENERATORS AND MOTORS—Characteristics and Management—Troubles and Remedies—Direct and Alternating Current Machinery—Starting and Controlling Devices—Installation.
- III. DISTRIBUTION—Pole Lines—Underground Conduits—Transformers—Design of Systems, etc.
- IV. INSIDE WIRING—Every detail for all kinds of wiring, including old buildings, signs, etc.
- V. TRANSFORMERS — Connections — Operation — Types — Special Forms — Installation.
- VI. ILLUMINATION — Interior and Street — Types of Lamps — Design — Installation, etc., etc.

**McGRAW-HILL BOOK COMPANY, INC.**

239 West 39th Street, New York.

Publishers of Books for Electrical Railway Journal



## ANNOUNCEMENT

We desire to announce that the *standard railway appliances* which for the past twenty years have been handled by the Sterling-Meaker Company of Newark, N. J., will hereafter be manufactured and sold by the Lord Manufacturing Company, Bush Terminal, Brooklyn, N. Y. These specialties are:—

Giant Brakes  
Sterling Safety Brake  
Sterling Roller-Bearing Trolley Bases  
Sterling Fenders and Wheelguards  
Sterling Sand Boxes  
Sterling Ticket Punches

The Sterling-Meaker products are extensively used and widely distributed in all parts of the world. With plenty of capital and unexcelled manufacturing facilities at our command, it is our determination to deliver the right goods at right prices and to give customers, both old and new, the very best of service. Orders for these devices or for parts will receive prompt attention.

**Lord Manufacturing Co.**

BUSH TERMINAL No. 7

BROOKLYN

NEW YORK



An Interesting Test of  
**Battersea and Other Brushes**  
 is being Conducted out in the Middle West

Brushes of all makes are being tried out by a big, progressive system, and, so far,

**Battersea Gives Best Results**

This is not in the least surprising, because the methods used in the manufacture of Battersea Brushes are such as must inevitably assure satisfaction, provided the grade used is suited to the service. Send for a trial set.

**The Morgan Crucible Company, Ltd., 114 Liberty Street, New York**

Factory: Brooklyn  
 Lewis-Roth Co., 312 Denkla Bldg., Philadelphia

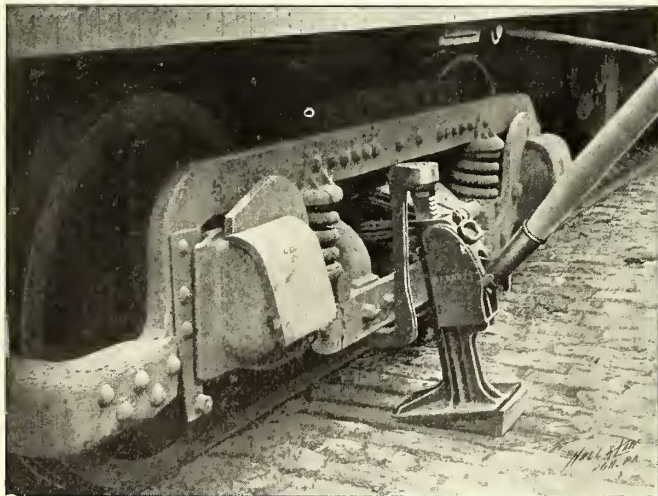
—that's Yearly Cost

There's Just One  
 Thing Which Tells  
 You that Your  
 Choice of Brushes  
 Was a Wise One

If you are using Speer Traction Brushes you can prove that their use is profitable by equipping a car with some cheaper brushes. If you are not using Speer brushes we will gladly supply a test set to work out their salvation against any other brush *in the world*; figures to be based on annual cost.

Do you want that set?

**SPEER CARBON CO., St. Marys, Pa.**



**BARRETT**  
 EMERGENCY CAR JACK

To equip an emergency wagon with this jack is one thing, and to equip every passenger car in operation on the entire railway system with it is quite another. What *economical* results have followed such a step? How *efficacious* has the jack proven in replacing a derailed car on the track? Has its adoption proven an expense or a saving? On these and similar questions we shall be pleased to shed some light which will be of interest to electric railway men.

**THE DUFF MFG. CO.**  
 ESTABLISHED 1883

50 Church St. New York  
 PITTSBURGH, PA.

A BRUSH WITHOUT A PEER

NON-CUTTING  
 NON-SPARKING  
 NOISELESS



PERMANENTLY  
 SELF LUBRICATING  
 CARBON BRUSHES

Le Valley Vitae Carbon Brush Co.  
 685 Tremont Avenue, New York

**LOUIS GEHLERT**  
 Wool Felts

for Mechanical purposes, etc. Lubrication of Journal Boxes, Dust Guards lining under rattan seats. Gear case Washers for the axle, etc.

204 East 18th Street NEW YORK

**Railroad and Tram Car Specialties**

New Inventions developed, perfected and worked for the English market

**Messrs. G. D. Peters & Co., Ltd.**

Moorgate Works, Moorfields, LONDON, E. C.









## Let 1914 Tell A Different Story—

from the 1913 record of scored cylinders, air compressor troubles, air brake failures, accidents and "overtime" wear and tear on compressor mechanism and motor equipment.

How?

By using LEAK-PROOF Air Compressor Piston Rings.

If your road has experienced the troubles above referred to—and most roads have to a greater or less extent—you will certainly be astonished at the immediate improvement after you have installed the LEAK-PROOF Ring on your cars.

You will notice at once the wonderfully increased compressor efficiency, the improved compression, the lessened activity of your motors (which normally should not have to work more than half the time), and you will also observe a most marked decrease in maintenance charges.

The remarkable efficiency of the LEAK-PROOF Ring is due to the manner in which the two component rings mate to form a single unit, with vents diametrically opposite each other and so arranged as to absolutely prevent leakage of air. Note how one vent is on the inside and the other outside. In this way you get the elasticity without the leakage.

Another advantage is the absence of springs to weaken or segments to work loose and leak, or worse still—score the cylinder walls.

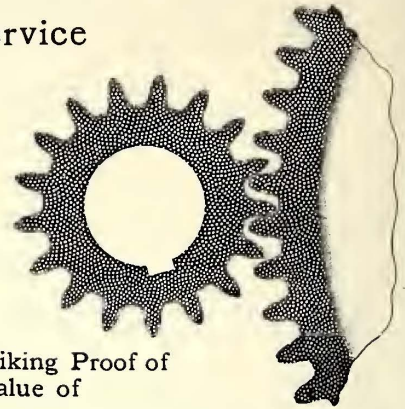
Try a set of these rings this month and you'll know how to solve the problem for the remaining 11 months of 1914 and thereafter.

**McQuay-Norris Mfg. Company**  
ST. LOUIS, MO., U. S. A.

## Note The Condition of This Common Steel Gear After 6 Years Service

during  
which it  
traveled

269,615.36  
Miles



It Affords Striking Proof of  
the Value of

### WHITMORE'S GEAR PROTECTIVE COMPOSITION

The gear illustrated was in service on a 37½-ton car of the Philadelphia Rapid Transit Company from March 4, 1907, to September 16, 1913. And after six years' continuous service, the gear is pronounced by experts as being able to duplicate the performance.

If Whitmore's Protective Gear Composition will thus double the life of an ordinary grade steel gear, what won't this protective lubrication do in the case of more expensive gears?

And those are the gears of all gears, because of their higher cost, which should be protected.

Think this over and then get our proposition on mile or pound basis. Ask also for Booklet "J."

**Whitmore Manufacturing Co.**

Lubricating Engineers

CLEVELAND, OHIO

Whitmore Product Sales Company

Monadnock Bldg., Chicago

Western Branch Office

# TULC

**Tulc Means Lubrication  
Lubrication Means Tulc**

A 100% lubricant saves labor and shop repairs.

The same in all seasons and under all conditions.

While these notices may not convince you—TULC will. Get your test amount early.

**The Universal Lubricating Co.**

Schofield Building

CLEVELAND, OHIO



# Lower Your Maintenance Costs

The cost of maintenance is the cost of repairing and replacing worn and worn-out equipment; and the best way to lower maintenance costs is to reduce the wearing-out elements in railroad operation. Chief among these is friction; and the most effective antidote to friction and its results is

## DIXON'S FLAKE GRAPHITE

The object of lubrication is to interpose between the bearing surfaces a layer of some medium which prevents metallic contact. Oil or grease may serve—temporarily. But it cannot be depended upon, for it works out, or runs out, or squeezes out—and then we have a dry, hot bearing, grinding friction, and wear.

Dixon's Flake Graphite, mixed with oil or grease as a medium, has the unique faculty of identifying itself with the bearing surfaces in a smooth, oily veneer of pure graphite of highest anti-friction quality.

**The gliding of one graphite surface over another is thus substituted for the grinding of one metal surface on another. This means minimized friction and wear, longer life, lower maintenance costs.**

### DIXON'S GRAPHITE CURVE GREASE

This mixture of Dixon's Flake Graphite in heavy-bodied grease is easily applied, spreads freely and sticks to the track. Warm weather will not make it run off nor can rain wash it off. It stops the noise and saves the wear on rails and wheel flanges.

### DIXON'S GRAPHITED WOOD GREASE

Used in closed gear cases, this mixture stops all noise, cushions the gears, never hardens or cakes, cannot drip out and furnishes the ideal lubrication which saves gears and pinions.

Send for "Graphite Products for the Railroad," No. 108, the guide to lower maintenance costs.

Made in JERSEY CITY, N. J., by the

# Joseph Dixon Crucible Company

Established 1827



# COST



“Built for  
Endurance”

as the railway man applies the term to motors and main journals means “cost per thousand car miles.”

Figured on this basis Hess-Bright Ball Bearings cost less than plain bearings and are MORE dependable.

They are saving many thousands of dollars for electric railways in conserving maintenance costs.

If you are considering or desirous of considering frictionless bearings, data from the pioneers in the field should be valuable.

Catalogs and Bulletins sent on request contain just the data you need.

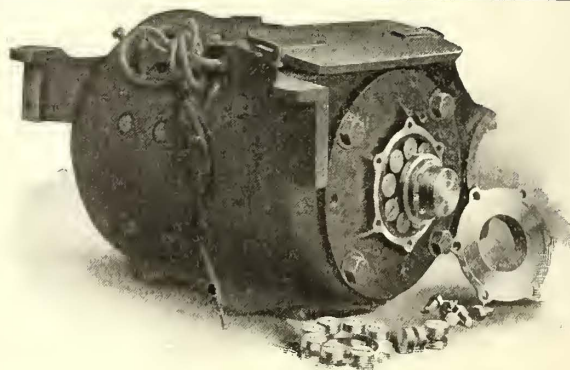
## THE HESS-BRIGHT MANUFACTURING COMPANY

Pioneers in the Introduction of Annular Ball Bearings

Front Street and Erie Avenue,

Philadelphia

**You can take  
advantage of  
Rollway Economy  
on Your present  
Equipment**



Rollway Bearing Frame-Heads

To install Rollway Journals does not require any change in trucks or axles.

The only change that is big is that of operating expense by an immediate saving in power, lubrication and car house attention.

Rollway Motor Bearings can be applied to new or old motors of the box frame type.

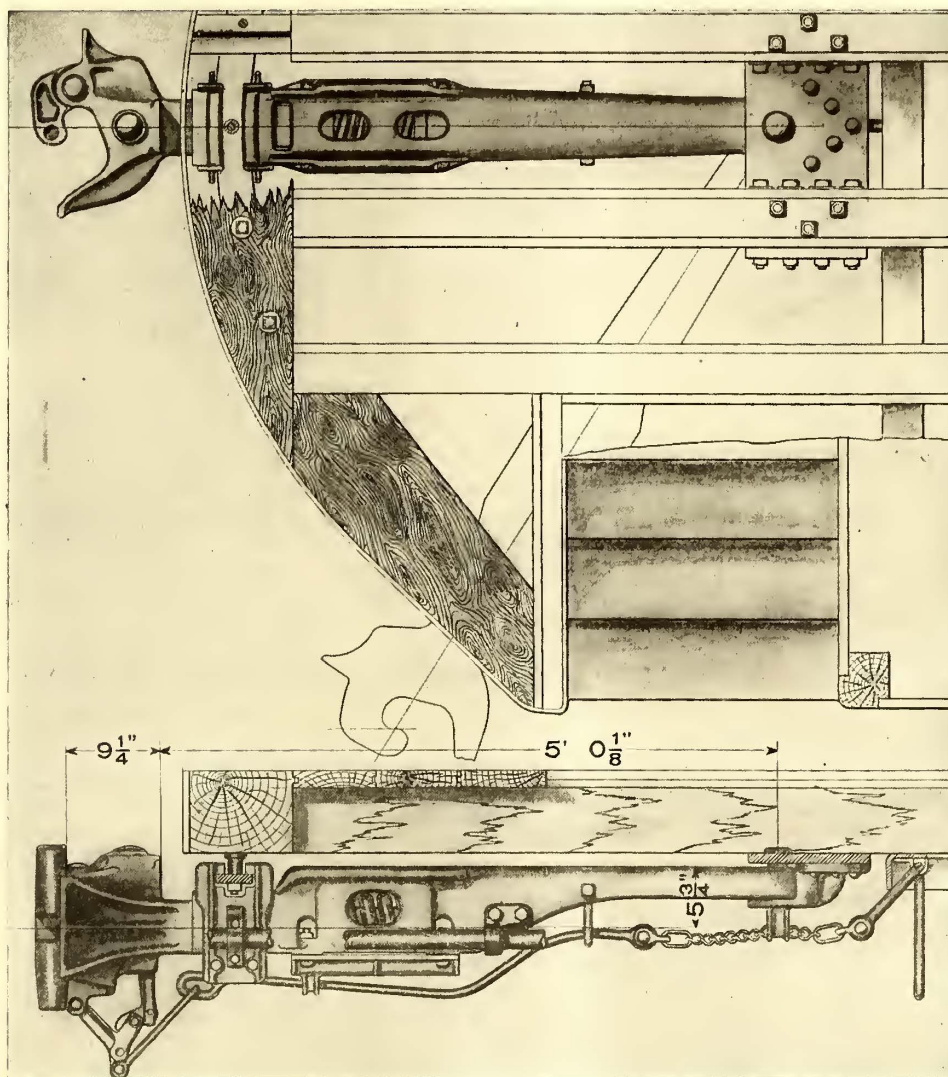
It will pay you to write for the highly interesting matter we have published, taken from the actual service results produced by Rollway Bearings.



**Railway Roller Bearing Co.**  
Syracuse, N. Y.



# National Radial Coupler and Draft Rigging for Electric Traction Cars



PATENTED

RADIAL connection between coupler and car, permitting maximum free lateral displacement when rounding curves, without strain on car body.  
 AUTOMATIC car couplers of approved M. C. B. type having lock set, lock-to-the-lock and knuckle throwing features—will couple automatically by impact and can be operated without going between cars.  
 DRAFT SPRINGS in radius bar absorb both buffing and pulling shocks.  
 WILL couple with steam road equipment.

*Blue Prints and Detailed Information Furnished on Request*

## THE NATIONAL MALLEABLE CASTINGS CO.

MALLEABLE IRON PLANTS  
 CLEVELAND                      CHICAGO                      INDIANAPOLIS                      TOLEDO  
 STEEL PLANTS  
 SHARON, PA.                      MELROSE PARK, ILL.



All Sizes  
and  
All Styles



We furnish gears and pinions for every style and size motor in service.

We have a grade for every service condition, each and every grade carries its own guarantee.

*Bliss Gears and Pinions*

E. W. BLISS CO.



Brooklyn, N. Y.

## When You Buy Babbitt Consider These Points:—

1. Has it a low coefficient of expansion?
2. Has it a high melting point?
3. Has it a low coefficient of friction?

If it has Point No. 1 it won't expand enough under heat to grip the shaft. If it has Point No. 2 it won't heat enough to expand at all. If it has Point No. 3 it will greatly reduce friction between shaft and bearing.

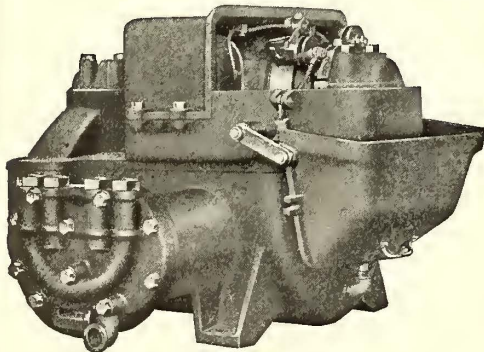
Those are some of the things we refer to when we say the right use of the right Babbitt is not a "hit-or-miss" proposition, but a matter of special knowledge.

We have been specializing in the treatment of Babbitt for a great many years. Our Babbitt and our experience are at your service.

**MORE-JONES BRASS & METAL COMPANY**  
ST LOUIS, MO.

4

Type AA7



Write for Bulletin

## Some of the advantages of the Allis-Chalmers AA7 Air Compressor

over other compressors of the same type—

One-Piece Herringbone Gear, insuring accurate meshing and great strength—Replaceable Bushing takes the wear in the cylinder and obviates the High Cost of Reboring—Pipeless Construction facilitating easy removal of Cylinder Head—Improved Brush Holder, adjustable with screwdriver. Oil supplied through one vent and distributed automatically.

**ALLIS-CHALMERS MANUFACTURING COMPANY**  
MILWAUKEE, WIS.

For all Canadian business refer to Canadian Allis-Chalmers Co., Ltd., Toronto, Ontario, Canada.

FOREIGN REPRESENTATIVES: H. I. Keen, 732 Salisbury House, London Wall, E. C., London, Eng. Frank R. Perrot, 883 Hay St., Perth, W. Australia. Frank R. Perrott, 204 Clarence St., Sydney, N. S. W. Mark R. Lamb, 87 Galeria Beeche, Casilla 2652, Santiago, Chile.

2

## For Low Bearing Cost

follow the lead of the large roads that use Post's Zero Metal on car axle bearings.

You simply can't get below Post's costs if service is taken into consideration.



For Armature Bearings use "Motor" Metal

**E. L. POST & CO., Inc.**

Sole Manufacturers

50 Cliff Street

New York



## "Hard Service" Railway Motor Gears and Pinions

have for years consistently represented SUPERIORITY, and appeal to the man who considers EFFICIENCY as well as first cost. Supplied in four grades: Standard, Special, Treated, Hardened.

**THE VAN DORN & DUTTON CO.**

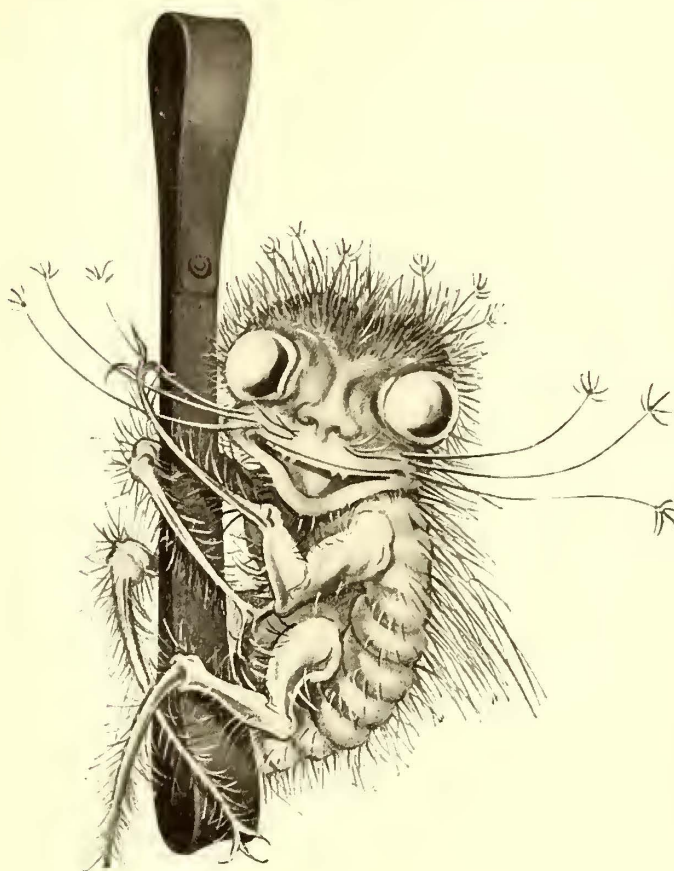
Gear Department

Gear Specialists

General Offices & Factories: CLEVELAND, OHIO



# The Strap "Microbe"



Eliminate  
Him  
By  
Using

## RICO SANITARY STRAP COVERS

=====(PATENTED)=====

Other RICO Specialties:

Coasting Recorders

Anti-Climbers

THE CAR BEAUTIFUL  
Booklet Describes Fully  
RICO STRAP COVERS



No. 1A  
3 inches  
50 cents



No. 2  
8 inches  
50 cents



No. 3  
11 inches  
60 cents



No. 4  
Stirrup  
75 cents



No. 5  
Steelkar  
\$1.00

### Railway Improvement Company

165 Broadway,

New York

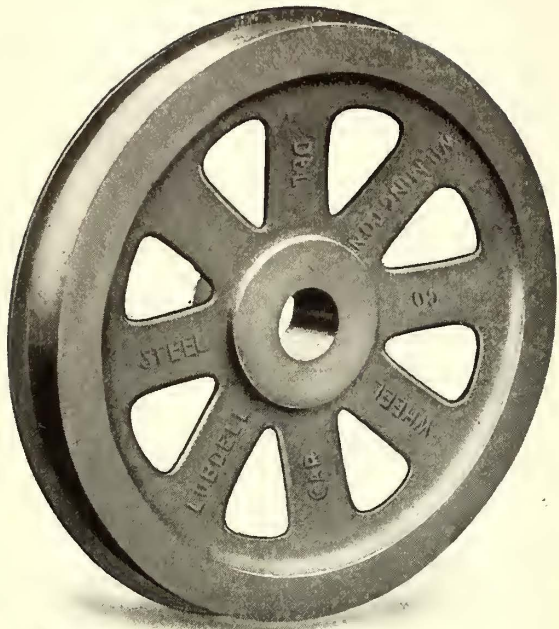
BRANCHES:

CHICAGO

LOS ANGELES

Send for a Copy.





## The Most Economical STEEL WHEEL

For All Classes of Electric Service

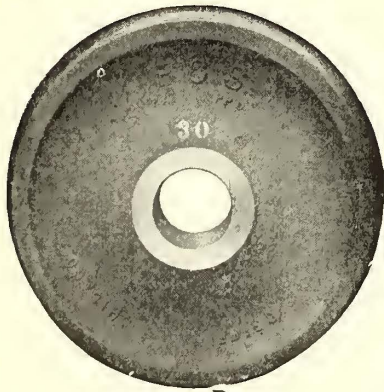
Light, Compact, Spoke Type Cast Steel Wheels, made by a special process to insure *hard, dense, homogeneous metal* in the tread section and the best possible service results.

*Get prices on our wheels loose or fitted on new or old axles, for comparison—  
They will interest you.*

# LOBDELL CAR WHEEL COMPANY

Wilmington, Delaware

## Guaranteed Mileage



With the uncertainties of traffic conditions, rolling stock, loads and trackage it might be considered a risk to guarantee wheel mileage.

Knowing the composition and actual results in service of F. C. S. Wheels, however, we do not hesitate to give users an iron-clad guarantee of wheel mileage and to protect the user in each case against deficient mileage (should such occur) by either a cash allowance or wheel replacements.

Aren't F. C. S. Wheels worth investigating if we will do *this*?  
For safety and economy specify the F. C. S. Wheel.

**F. C. S. Wheels**  
FOR ALL CLASSES OF SERVICE



## Griffin Wheel Company

PLANTS — Chicago, Detroit, Denver, St. Paul, Tacoma, Kansas City, Boston





“STANDARD” WHEELS MAKE GOOD CARS BETTER



## On Nashville Interurban Ry.

Efficiency demands maximum service from all equipment. This electric motor car is equipped with “Standard” No. 1070 rolled steel wheels.

THE STANDARD BRAND ON YOUR MATERIAL  
IS AN ASSURANCE OF EVENTUAL ECONOMY

# Standard Steel Works Co.

Morris Building, Philadelphia, Pennsylvania

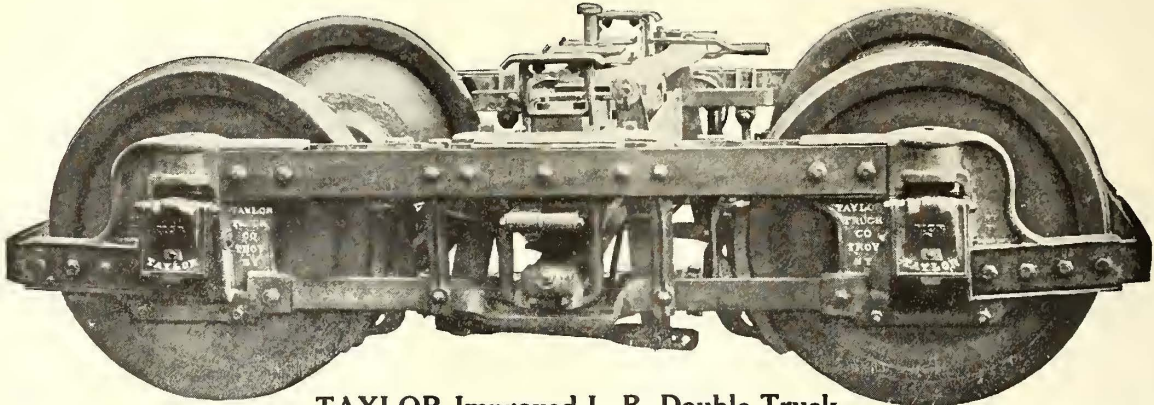
|                 |                |                     |                      |
|-----------------|----------------|---------------------|----------------------|
| New York, N. Y. | St. Louis, Mo. | San Francisco, Cal. | St. Paul, Minn.      |
| Portland, Ore.  | Richmond, Va.  | Chicago, Ill.       | City of Mexico, Mex. |
|                 |                |                     | Pittsburgh, Pa.      |
|                 |                |                     | Denver, Colo.        |

Steel Tires, Steel Tired Wheels, Solid Forged and Rolled Steel Wheels, Rolled Steel Gear Blanks, Steel and Iron Axles, Steel Springs, Steel and Iron Forgings, Steel and Iron Castings, Rolled Steel Rings, Steel Crusher-Rolls and Shells, Steel Pipe Flanges



# “Taylor - Made” Trucks

Simplicity of Construction—Low Cost of Maintenance—Ease of Riding



**TAYLOR Improved L. B. Double Truck**

This truck for city and interurban service is designed to carry low mounted car bodies weighing from 16,000 to 22,000 lbs. The motors are inside hung—brakes either outside or inside hung—wheel base 6 ft. to 6 ft. 3 in.—journals 3 $\frac{3}{4}$ x7 M. C. B. Type.

Wearing parts are made interchangeable with Taylor S. B. Double and E. H. Single Trucks.

We make trucks for every service and solicit an opportunity to quote you on your requirements for trucks. T. M. C. Steel Tired Wheels and Elliptical or Coil Springs.

Portfolio of Taylor Truck Photos on request.

## Taylor Electric Truck Co.

Main Office and Works:  
TROY, N. Y.

Troy, N. Y.

CHICAGO OFFICE:  
First National Bank Bldg.

### E. G. Long Company

EDWARD H. MAYS, President  
Offices, 50 Church Street, New York

SPRINGS  
CASTINGS  
FORGINGS

Peckham Truck Parts  
Diamond Truck Parts  
Car and Truck Accessories

ELECTRICAL REPRESENTATIVES

Union Spring & Mfg. Co.  
Leaf and Coil Springs

MCB Pressed Steel Journal Box Covers

Elliptical and  
Helical Springs  
and  
STEEL-TIRED  
WHEELS  
for  
Electric Railway  
Service

RAILWAY  
STEEL-SPRING

Chicago  
St. Louis  
St. Paul

CO.,

Washington  
Detroit  
Louisville

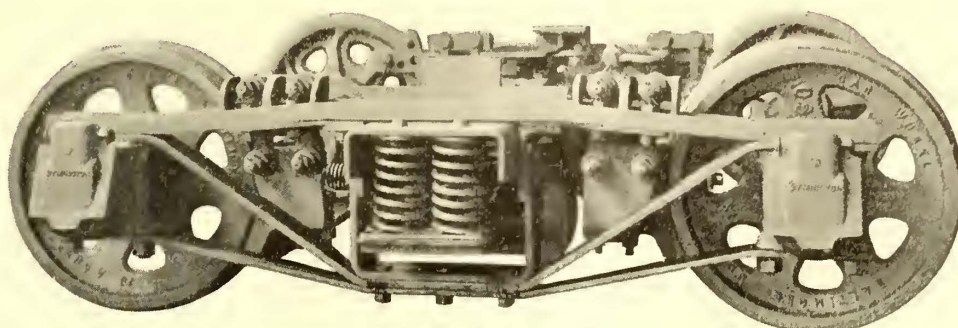
General Office

30 Church Street, New York

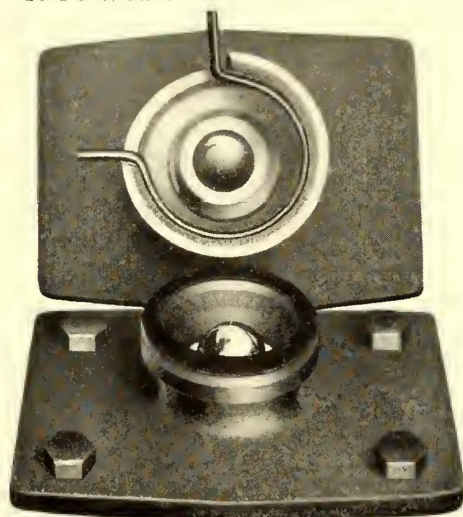


# 120 TRAILER TRUCKS

have recently been built by The Baldwin Locomotive Works for the Cincinnati Traction Co.



These are light weight, rigid center trucks of the arch-bar type. They are designed for a maximum center-pin load of 16,500 pounds, and are the lightest trucks ever built for this class of service. The bolster consists of open-hearth steel plate, bent to a channel form, and supported at four points by coil springs. These in turn rest on half elliptic springs, thus producing easy riding qualities. From the illustration, it will be noted that the brake hangers are of the double parallel type. This construction insures even brake-shoe wear.



An interesting feature is the ball-bearing center plate, which is shown in the accompanying illustration. It is fitted with a spring locking device, thus obviating the necessity of a king-pin.

For city service, this is an ideal trailer truck—simple, strong, light, easy riding and easily maintained. Further particulars regarding its construction will be furnished on application.

## THE BALDWIN LOCOMOTIVE WORKS

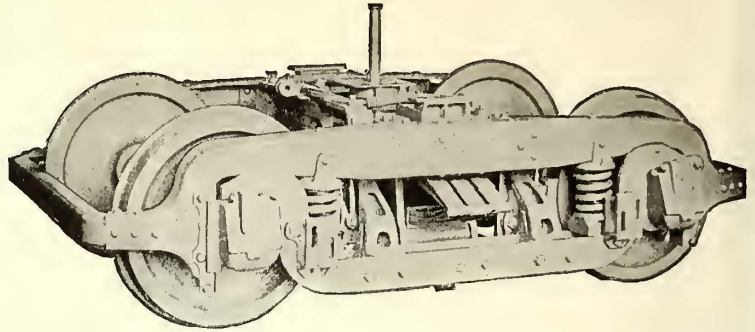
PHILADELPHIA, PA.

New York, N. Y.: Hudson Terminal BRANCH OFFICES: Chicago, Ill.: Railway Exchange  
St. Louis, Mo.: Wright Bldg. Richmond, Va.: Travelers Bldg. Portland, Ore.: Spalding Bldg.

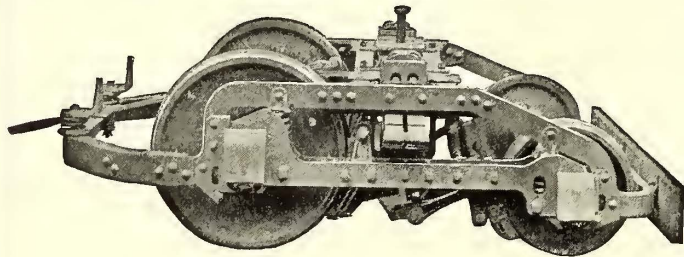


## STANDARD C-80-P "TRUNK LINE SERVICE" DOUBLE TRUCK

This truck is designed for extra high-speed "Trunk Line Service." Carrying capacity 80,000 pounds at king pins. Pressed steel channel side frames, end frames and transoms. Brake shoes hung on equalizer bars. All wearing holes steel-thimble and bolts case-hardened. 37" Forged Steel wheels. 5 x 9" M.C.B. journals. In service on N.Y. N.H.&H. R.R., Detroit United Railway, Western Ohio, Ohio Electric, Lake Shore Electric, Indiana Union Trac. Co., Terre Haute, Indianapolis & Eastern Traction Co., and Aurora, Elgin & Chicago Railway.



## STANDARD O-36 SINGLE MOTOR "LIGHT WEIGHT" (Maximum Traction) DOUBLE TRUCK



This truck is designed to meet the demand for a "Light Weight" Maximum Traction Double Truck. It weighs 4500 pounds (per truck) with one-wear steel wheels. The brake shoes are carried on the equalizer bars. The holes in the levers and brake rigging are steel-thimble and the bolts are case-hardened. The journals are carefully machined and burnished. The truck will carry safely car bodies weighing from 16,000 to 22,000 pounds; maximum load at king pins of 36,000 lbs. These trucks are in service in:—New York, Jacksonville, Springfield, Worcester, Savannah, Newark, Washington, Houston and Jackson, Michigan.

"Ask any of the roads using them"

**STANDARD MOTOR TRUCK COMPANY, Frick Bldg., PITTSBURGH, PENNSYLVANIA**

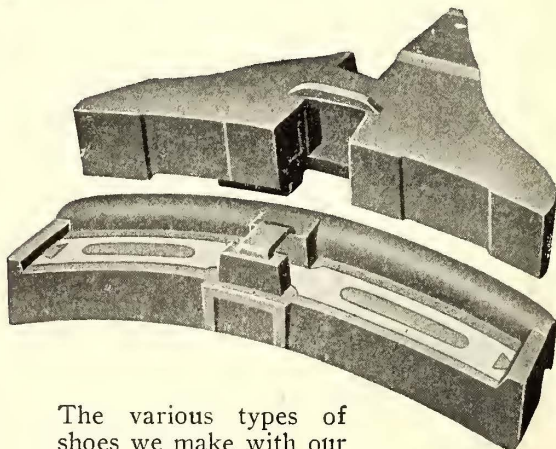
NEW YORK OFFICE: 170 BROADWAY

WORKS: NEW CASTLE, PA

CHICAGO OFFICE: FISHER BUILDING

Pacific Coast Agents: Eccles & Smith Co., Inc. Offices, San Francisco, Cal.; Los Angeles, Cal.; Portland, Ore.

# BRAKE SHOES



The various types of shoes we make with our special reinforcement improve the service obtainable from both shoe and brake mechanism—and at the very minimum of cost to you.

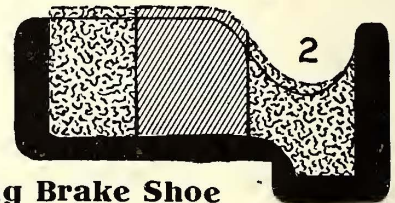
**American Brake Shoe & Foundry Co.**  
MAHWAH, N. J.

30 Church St., New York

McCormick Bldg., Chicago

## Wheel Condition No. 2

When the Flange and outer portion of tread need truing use this style of



### Wheel Truing Brake Shoe

You need not keep a crew of men for wheel removal and machines for wheel truing if you use our wheel Truing Shoes.

**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: Oliver Bldg.,  
PITTSBURGH, PA.

Works: New Kensington, Pa.

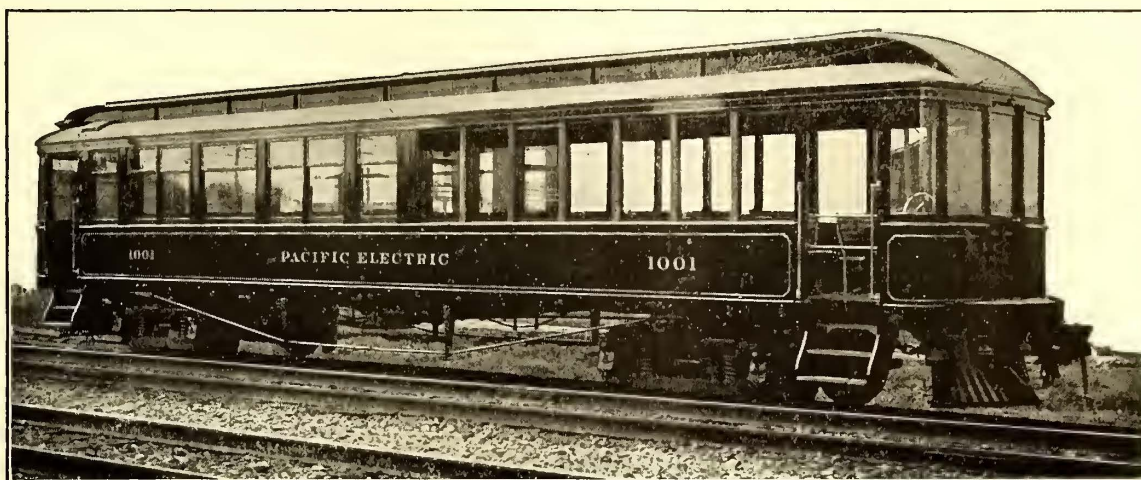
50 Church St., New York. 1204 Fisher Bldg., Chicago, Ill.  
Missouri Trust Bldg., St. Louis, Mo.



# **The Jewett Car Company**

## **Newark, Ohio**

**Builders of the Highest Grade City and Interurban Cars**



**Fifty-three of these  
Jewett - Built Cars  
Shipped on their Own  
Wheels to Los Angeles**

**Estimates Furnished  
on Your Standard  
Specifications**

**Let us Design a Car Which  
Will Economically Meet  
Your Operating Conditions**



# Prepayment Progress

IN 1913

**A**S in past years, the records for 1913 show that practically all city cars ordered were Prepayment Cars. This indicates progress, for the Prepayment idea could not have held its own from year to year if it had not kept up with the most modern developments. Looking back, we might enumerate the various types of Prepayment Cars which we have developed, but one factor in the progress of the Prepayment idea dominates the whole situation; namely, the fact that the basic Prepayment patent has been sustained by a United States Court.

This, we believe, is of the utmost importance in the development of efficient city cars. It is sufficient to insure complete success for every future Prepayment application, insuring, as it does, the **proper** application of the Prepayment idea in the light of experience with hundreds of roads.

If Prepayment progress had been confined solely to this one development, we should feel that the electric railway industry deserved congratulation.

We, as a part of that industry, take the decision not merely as a deserved business asset, but also as an added responsibility which we assume with a clear understanding that our progress can continue only in proportion to that of the industry as a whole.

*The Prepayment Car Sales Company owns or controls the cars, and grants a license to Car Builders and Railway*

## PREPAYMENT CAR

CHICAGO  
417 So. Dearborn St.

Principal Office:  
SOLE LICENSOR FOR THE PAY-AS-YOU-ENTER  
ELECTRIC SERVICE SUPPLIES



# Prepayment Progress

**FOR 1914**

**T**HE future development of the Prepayment idea is insured by the fact that our engineers are constantly studying operating conditions all over the world. They are developing new Prepayment applications as new sets of operating conditions demand them.

These engineers do not work in the light of experience limited to knowledge of a few roads. They draw upon the world for experience and apply this accumulated knowledge to every Prepayment application.

As a result, every licensed Prepayment road starts out right and continues along the right lines. Its operating conditions are met fully.

Progress in Prepayment Car operation during 1914 will depend directly upon the extent to which this engineering service is sought and applied.

Since the validity of the basic Prepayment patent has been upheld, we are able to limit Prepayment car operation to roads on which the operating conditions are met by the right kind of Prepayment cars.

This being the case, we believe that development of the Prepayment principle during 1914 will show marked vigor—to the advantage of the operating roads and their public.

We shall be glad to give you the benefit of all we know about Prepayment operation and show to what extent you can profit through it.

*patents which cover all forms of practical fare prepayment  
Companies for the building and operation of such cars.*

## SALES COMPANY

50 Church St., New York  
CAR CORPORATION—THE PAY-WITHIN CAR COMPANY  
COMPANY, GENERAL SALES AGENT

PHILADELPHIA  
17th and Cambria Sts.







# Prepayment Progress

**IN 1913**

**A**S in past years, the records for 1913 show that practically all city cars ordered were Prepayment Cars. This indicates progress, for the Prepayment idea could not have held its own from year to year if it had not kept up with the most modern developments. Looking back, we might enumerate the various types of Prepayment Cars which we have developed, but one factor in the progress of the Prepayment idea dominates the whole situation; namely, the fact that the basic Prepayment patent has been sustained by a United States Court.

This, we believe, is of the utmost importance in the development of efficient city cars. It is sufficient to insure complete success for every future Prepayment application, insuring, as it does, the **proper** application of the Prepayment idea in the light of experience with hundreds of roads.

If Prepayment progress had been confined solely to this one development, we should feel that the electric railway industry deserved congratulation.

We, as a part of that industry, take the decision not merely as a deserved business asset, but also as an added responsibility which we assume with a clear understanding that our progress can continue only in proportion to that of the industry as a whole.

*The Prepayment Car Sales Company owns or controls the cars, and grants a license to Car Builders and Railway*

## PREPAYMENT CAR

CHICAGO  
417 So. Dearborn St.

Principal Office:  
SOLE LICENSOR FOR THE PAY-AS-YOU-ENTER  
ELECTRIC SERVICE SUPPLIES

# Prepayment Progress

**FOR 1914**

**T**HE future development of the Prepayment idea is insured by the fact that our engineers are constantly studying operating conditions all over the world. They are developing new Prepayment applications as new sets of operating conditions demand them.

These engineers do not work in the light of experience limited to knowledge of a few roads. They draw upon the world for experience and apply this accumulated knowledge to every Prepayment application.

As a result, every licensed Prepayment road starts out right and continues along the right lines. Its operating conditions are met fully.

Progress in Prepayment Car operation during 1914 will depend directly upon the extent to which this engineering service is sought and applied.

Since the validity of the basic Prepayment patent has been upheld, we are able to limit Prepayment car operation to roads on which the operating conditions are met by the right kind of Prepayment cars.

This being the case, we believe that development of the Prepayment principle during 1914 will show marked vigor—to the advantage of the operating roads and their public.

We shall be glad to give you the benefit of all we know about Prepayment operation and show to what extent you can profit through it.

*patents which cover all forms of practical fare prepayment Companies for the building and operation of such cars.*

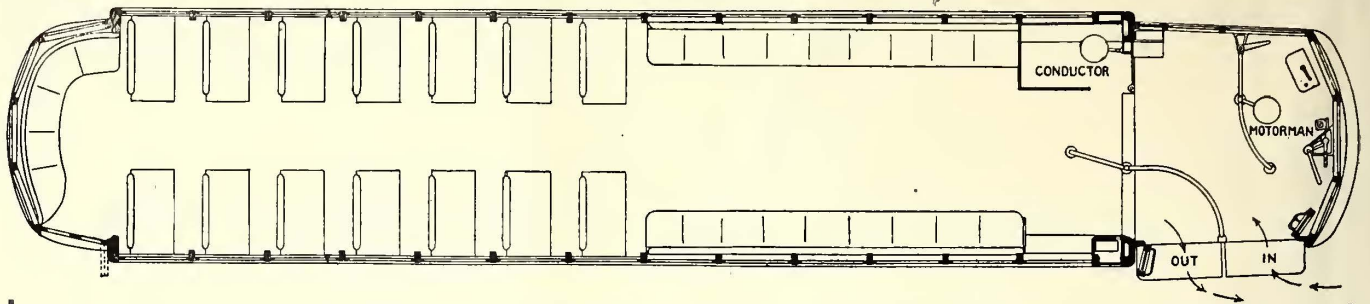
## SALES COMPANY

50 Church St., New York  
CAR CORPORATION—THE PAY-WITHIN CAR COMPANY  
COMPANY, GENERAL SALES AGENT

PHILADELPHIA  
17th and Cambria Sts.



## The "Near-Side" Way



The "Near-Side" principle in street car design is now presented to the attention of Progressive Managements as preeminently meeting the more exacting requirements of modern street railway conditions, by:

1. Prevention of accidents.
2. Maximum consideration for public health, comfort and convenience.
3. Greater operating efficiency including increased car capacity with decreased weight.
4. Making possible the collection of a fare from every passenger.

The use of the front platform for both entrance and exit makes possible the most effective division of duties between motorman and conductor.

The boarding and alighting of passengers take place directly under the eye of the motorman, who controls the entrance and exit doors. The motorman is there-

fore given entire responsibility for the safety of passengers entering and leaving, and is able to act promptly and safely in getting the car under way; this without the loss of time heretofore encountered, due to the necessity of waiting for the bell signal, under former systems in which the responsibility for safe boarding and alighting of passengers is divided between the motorman and conductor.

The conductor is relieved of the responsibility of watching the entrance and exit steps and giving the "go-ahead" signal and his duties are confined to the collection and registration of fares, issuance of transfers and call of streets.

The Near-Side Car Company is prepared to grant the right to use the patents necessary to this application of the "Near-Side" principle, and will protect its licensees in this right.

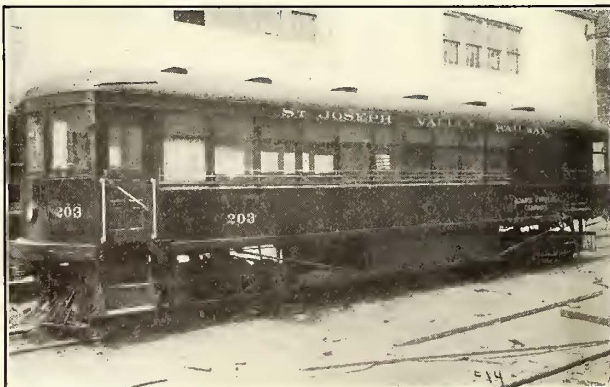
**THE NEAR-SIDE CAR COMPANY - 2 Wall St., New York City**

## "STORAGE BATTERY CARS ARE A DISTINCTIVELY PROGRESSIVE DEVELOPMENT"

This was a statement recently made in a large advertisement appearing in this Journal. If the subject interests you, you will find much valuable information in our bulletins Nos. 136 and 138. Copies will be sent you on request from our nearest Sales Office.

## THE ELECTRIC STORAGE BATTERY CO.

New York    Boston    Chicago    PHILADELPHIA, PA.    Denver    Portland, Ore.    San Francisco  
St. Louis    Cleveland    Atlanta    1888-1914    Seattle    Detroit    Los Angeles    Toronto



## Edison-Beach Battery Cars

*Cost 2 to 4 Mills per Car Mile*

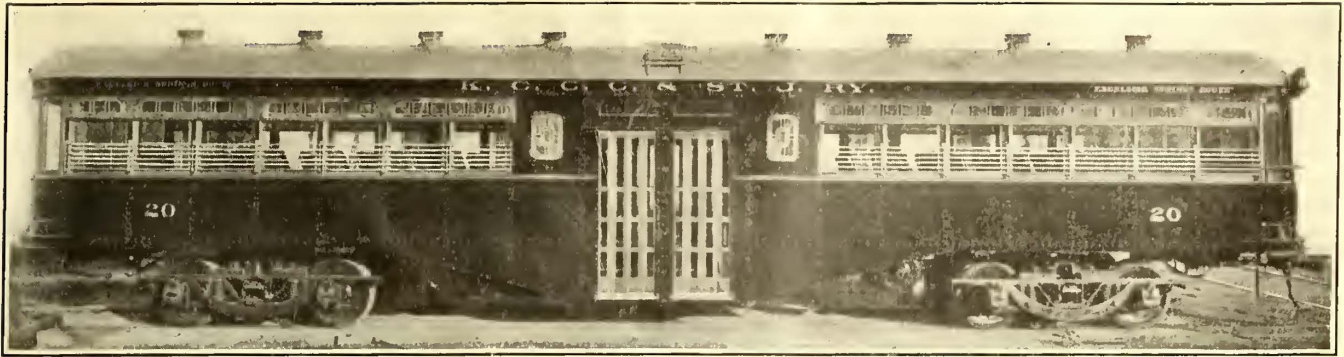
for all battery maintenance  
(materials and labor).

## Federal Storage Battery Car Co.

30 Broad Street, New York City

Fred A. Curtiss, Pacific Coast Representative  
Rialto Bldg., San Francisco, Cal.





# One of Sixteen Cars for the Kansas City, Clay County & St. Joseph Ry.

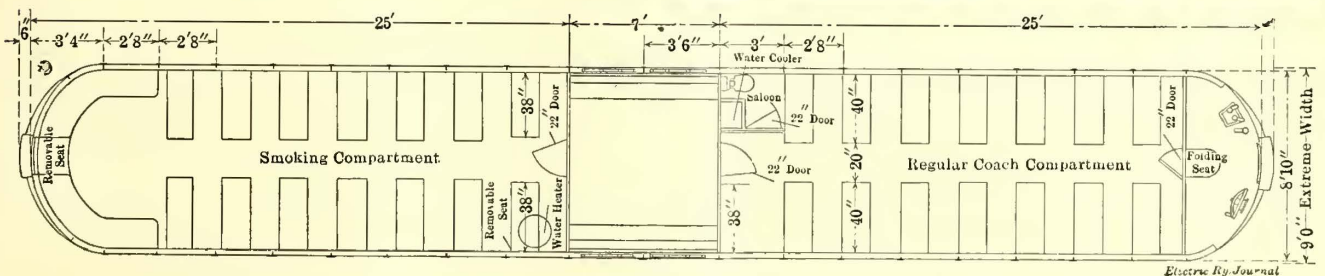
This new 80 mile line, recently completed, is one of the best built and equipped electric railways in the Central West.

The initial equipment consists of sixteen Cincinnati cars of the type illustrated. This car is built of steel practically throughout and in general is designed for single-end operation.

The road being a new one, had no precedent to follow in choice of equipment and was therefore free to adopt the most efficient equipment the country offered.

A description in detail of the construction of the cars was published in this Journal on Jan. 18th, and clearly shows the ability of The Cincinnati Car Company to produce construction of the highest order.

Designs and specifications of any type of car for electric or steam railway service will be furnished upon request.



**The Cincinnati Car Company**  
 Winton Place  
 Cincinnati, O.



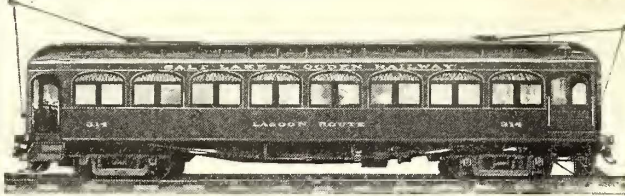
# NILES

CAR & MFG. CO.,

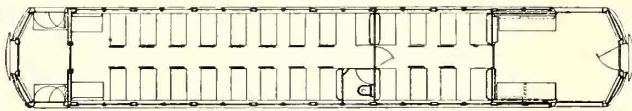
General Sales Office, 312 Electric Bldg., Cleveland, O.

Here are four recent products of Niles Car Works. Our catalog shows about 75 designs. We can make quick delivery, including any changes in details you may desire.

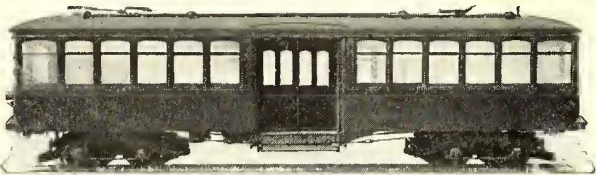
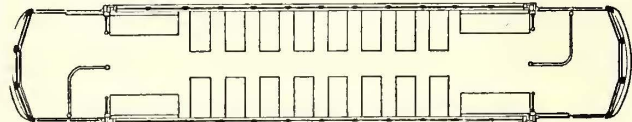
Write us for further information.



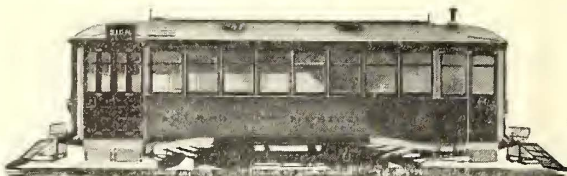
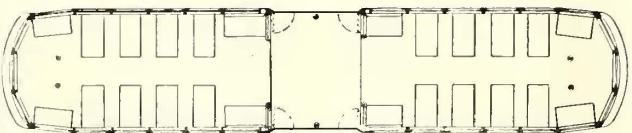
3 Compartment, Interurban Car, with Steel Frame. Length, 56' 0". Weight body, 37,000 lbs. Seating 60.



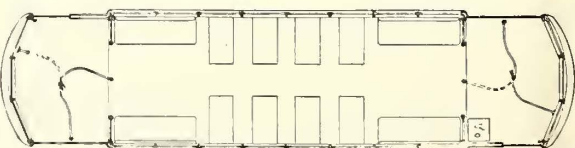
End Platform, Double End, City Car. Length, 45' 1". Weight body, 19,270 lbs. Seating 48.



Center Vestibule, Double End, City Car. Length, 41' 10". Weight, 14,000. Seating capacity, 52.



Double End Car of Steel below Windows. Length, 34' 0". Weight, 15,000. Seating capacity, 32.



## EXPERIENCE—

is THE factor in Car Building

We built good cars 30 years ago. Many are running yet. Economically too. The factor of experience has taught us how to build even better cars. We build *good* cars for any service—some types embodying *exclusive* features. We don't build cars to "meet" a price—but we *do* put more dollars into car value than our prices would ordinarily indicate. Get our figures.

The car illustrated on page 61, December 13, 1913, this publication, was built by us.

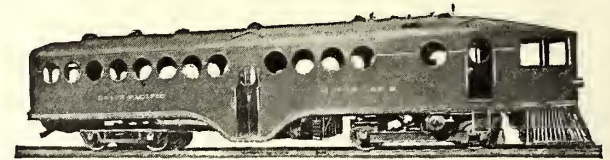
## J. M. Jones' Sons Company

*Builders of Cars for Electric Railways Exclusively*

Established 1839

Incorporated 1911

Watervliet, N. Y.



ECONOMY

SAFETY

### When the Power Fails

you will find it profitable to have a McKeen car to assure continuous service.

### McKeen Cars

are a profitable supplement to interurban equipment. They enable the power plant to shut down at night or during hours of light travel. Over fifty-seven different roads are profiting from the fast reliable service they give.

139 in Service

LUXURY

COMFORT

McKEEN MOTOR CAR COMPANY  
OMAHA, NEB.





# The Best Investment for Your Road in 1914 is Good Car Construction

An electric car is an investment.

Whether it be a good or bad investment depends upon whether it is well built or flimsily constructed.

Every railway must invest in cars to carry on its business and to earn its revenue—its dividends.

The **time** to safeguard that investment, to assure its being a sound one is when the cars are ordered.

The **way** to accomplish it is to secure good construction—well built equipment.

That is the kind, and the only kind of car construction turned out by the McGuire-Cummings Car Building Organization.

It is the type of equipment which makes your investment a sound one.

It is the kind of car which even after years of service, is still in excellent condition.

It is the quality of rolling stock that pays for itself many times over in dividends.

Isn't it the sort you want on your road?

## ***McGuire - Cummings Mfg. Company***

General Offices—HARRIS TRUST BUILDING, CHICAGO

**Builders of City and Interurban Cars and Trucks**



# SUPPLIES for City and Interurban Cars and Trucks

For years we have been making all types of city and interurban cars.

We have all the parts for these cars, from the hardware trimmings to the axles and trucks.

We have the patterns for all the parts of all the cars.

Do you realize what this means to our supply department and your mechanical department?

You are probably operating some old types of cars in addition to the newer types.

If quick time is a factor in getting parts for these cars our Supply Department is the logical place to send your order.

We maintain a "Hair-Trigger" Service in supplying all parts for all cars.

This service works directly to your dollars-and-cents advantage.

Make use of it.

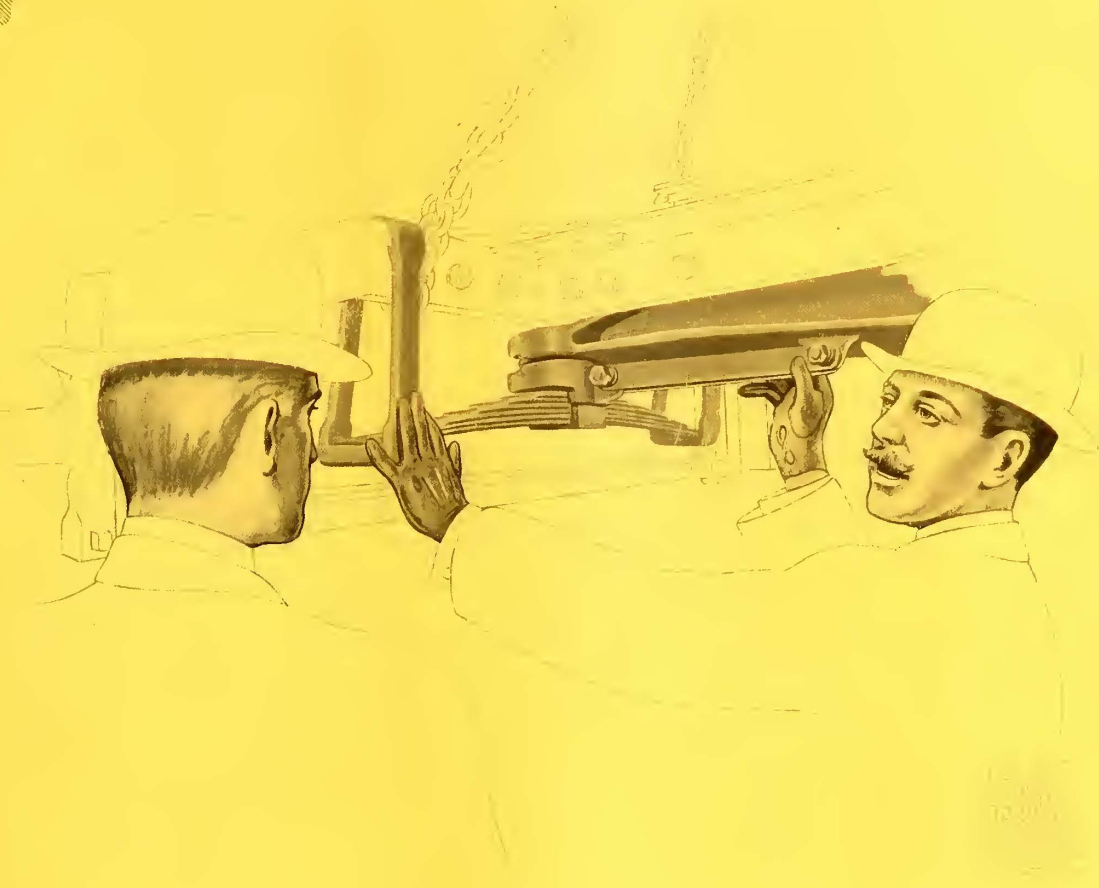
**ST. LOUIS CAR COMPANY, - ST. LOUIS**

Electric and Steam Railway Coaches, Steel Cars, Trucks and Journal Bearings,  
Curtains, Seats, Rattan, Bronze Trimmings, Miscellaneous Car Supplies.

Eastern Representative :  
**WENDELL & MacDUFFIE CO.**  
165 Broadway, NEW YORK

Pacific Coast Representative :  
**GUS KOCH**  
797 Monadnock Bldg., SAN FRANCISCO





*BRILL SINGLE MOTOR TRUCK SERIES NO. 2*

“**B**ESIDES automatically graduating the spring system for light and heavy loads, this new coil and semi-elliptic spring combination, adopted for the Brill Single Motor Truck, lowers the maintenance costs in a clever way. Formerly the semi-elliptics were given a twist whenever the bolster swung over, which, of course, made the ends of the springs wear into the castings at the bottom of the swing links. Now, because the links which connect the coil spring seat castings with the bolster are pivoted at each end, the coil springs take the twist off the semi-elliptics. The device is patented in this country and abroad.”

**THE J. G. BRILL COMPANY, PHILADELPHIA**  
AMERICAN CAR COMPANY, ST. LOUIS  
G. C. KUHLMAN CAR COMPANY, CLEVELAND  
WASON MANUFACTURING CO., SPRINGFIELD  
COMPAGNIE J. G. BRILL, PARIS



# 2700 Miles of Track—950 Cars—60 Locomotives—the G-E High Voltage Direct Current System Continues to Lead the Field

This system is now in service and giving highly economical results in practically every form of railway service.

**In heavy freight service** the Butte, Anaconda & Pacific Railway is giving highly satisfactory results at 2400 Volts—the highest D-C. voltage ever commercially employed.

**In combined passenger and freight service** the Southern Pacific has shown another year of efficient operation at 1200 Volts and the Washington, Baltimore & Annapolis is one of the many examples of a successful interurban change-over to 1200 volts.

The following is a partial list of the roads which have adopted the G-E High Voltage D-C. System.

|  |  |
|--|--|
| Indianapolis & Louisville Traction Ry. Co., Scottsburg, Indiana. | Nashville, Gallatin Interurban Ry., Nashville, Tenn. |
| Central California Traction Co., Stockton, California.           | Piedmont Traction Co., Charlotte, N. C.              |
| Pittsburg, Harmony, Butler & New Castle Ry., Eidenau, Pa.        | Butte, Anaconda & Pacific Ry., Butte, Mont.          |
| Washington, Baltimore & Annapolis Elec. Ry., Baltimore, Md.      | United Railways Co., Portland, Oregon.               |
| Milwaukee Elec. Ry. & Lt. Co., Milwaukee, Wis.                   | Southern Traction Co., Dallas, Texas.                |
| Aroostook Valley Ry. Co., Presque Isle, Me.                      | Pittsburg & Butler Ry. Co., Pittsburg, Pa.           |
| Oakland, Antioch & Eastern Ry., San Francisco, Cal.              | Tidewater Southern R.R., Stockton, Cal.              |
| Southern Cambria Ry. Co., Johnstown, Pa.                         | Portland, Eugene & Eastern Ry. Co., Portland, Ore.   |
| Shore Line Electric Ry. Co., Saybrook, Conn.                     | Southern Illinois Ry. & Pr. Co., Harrisburg, Ill.    |
| Southern Pacific (Oakland, Alameda & Berkeley Div.), Cal.        | Jefferson County Trac. Co., Beaumont, Texas.         |
| Ft. Dodge, Des Moines & Southern Ry., Boone, Iowa.               | St. Paul Southern Electric Ry., St. Paul, Minn.      |
| Southwestern Traction & Power Co., New Iberia, La.               | Michigan United Traction Co., Jackson, Mich.         |
| Oregon Electric Ry., Portland, Oregon.                           | Victorian Railways, Melbourne, Australia.            |
| Davenport & Muscatine Railway Co., Davenport, Ia.                | Canadian Pacific Railroad, Montreal, Canada.         |
| Kansas City, Clay County & St. Joseph Ry., Kansas City, Mo.      | Canadian Northern Railroad, Montreal, Canada.        |
|  | South Manchurian Railways, Manchuria, China.         |

## General Electric Company

Atlanta, Ga.  
Baltimore, Md.  
Birmingham, Ala.  
Boise, Idaho  
Boston, Mass.  
Buffalo, N. Y.  
Butte, Mont.  
Charleston, W. Va.  
Charlotte, N. C.  
Chattanooga, Tenn.  
Chicago, Ill.  
Cincinnati, Ohio

Cleveland, Ohio  
Columbus, Ohio  
Davenport, Ia.  
Dayton, Ohio  
Denver, Colo.  
Detroit, Mich.  
(Office of Agent)  
Elmira, N. Y.  
Fort Wayne, Ind.  
Hartford, Conn.  
Erie, Pa.  
Indianapolis, Ind.  
Jacksonville, Fla.

Largest Electrical Manufacturer in the World

General Office: Schenectady, N. Y.

ADDRESS NEAREST OFFICE

Joplin, Mo.  
Kansas City, Mo.  
Keokuk, Ia.  
Knoxville, Tenn.  
Los Angeles, Cal.



Louisville, Ky.  
Madison, Wis.  
Mattoon, Ill.  
Memphis, Tenn.  
Milwaukee, Wis.

Minneapolis, Minn.  
Nashville, Tenn.  
New Haven, Conn.  
New Orleans, La.  
New York, N. Y.  
Niagara Falls, N. Y.  
Omaha, Neb.  
Philadelphia, Pa.  
Pittsburg, Pa.  
Portland, Ore.  
Providence, R. I.  
Richmond, Va.  
Rochester, N. Y.

Salt Lake City, Utah.  
San Francisco, Cal.  
St. Louis, Mo.  
Schenectady, N. Y.  
Seattle, Wash.  
Spokane, Wash.  
Springfield, Mass.  
Syracuse, N. Y.  
Toledo, Ohio  
Washington, D. C.  
Youngstown, Ohio

For Texas, Oklahoma and Arizona business refer to Southwest General Electric Co. (formerly Hobson Electric Co.)—Dallas, El Paso, Houston and Oklahoma City.

For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.