

Ivy L. Lee on Increasing Costs of Operation

ELECTRIC RAILWAY JOURNAL

New York, June 30, 1917

McGraw-Hill Publishing Co., Inc. Vol. 49, No. 26 10c a copy

**Perfect Service
for Public Service**

rendered by

Waugh Glazing Construction

This power plant of the Public Service Corporation of N.J. represents an investment of hundreds of thousands of dollars in valuable machinery alone. Waugh Construction was selected for the skylights over this machinery as well as for other "Public Service" plants because it provides perfect, permanent service. Bulletin 56 G describes and illustrates other important structures upon which Waugh Construction is used.

Asbestos Protected Metal Co., Pittsburgh



Details of
Waugh Con-
struction.





Preparedness The Thought of the Hour

“EVERYBODY seems to be doing his bit,” exclaimed the General Manager, as he laid the morning paper on his desk, “and we must do ours, too, Joe!”

“Well, boss,” replied Joe, “what do you suggest? I’m ready and willing to exert every effort.”

“Joe,” continued the General Manager, “our latest equipment of Westinghouse No. 506 motors and HLD Control have shown an economy of 15 to 20 per cent compared with our older cars. These new cars make fast schedules—the safety devices have eliminated nearly all the expensive damage claims, and the public is satisfied with the service. The increased receipts on this line prove this.

“What I want you to do is—start in and work up data showing the reduction in operating cost and increased revenue which would result if we retired all our old heavy cars and installed all new low floor cars with Westinghouse No. 506 motors and HLD Control.”

“All right, boss,” answered Joe, “I will have the dope in about two days. You know the New York State Railways have just ordered 25 new cars with No. 506 motors and HLD Control.”

Westinghouse Electric & Manufacturing Company

Sales Offices in All
Large American Cities



East Pittsburgh
Pennsylvania

ELECTRIC RAILWAY JOURNAL

H. W. BLAKE, Editor

VOLUME XLIX, No. 25

NEW YORK, JUNE 30, 1917

PAGES 1173 TO 1214

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Ivy L. Lee gives significant data from various parts of the country which show the need of financial relief for electric railways. Business suffering from an economic disaster.....Page 1180

Features of a Non-Telescoping Car for the Erie

Provision against disastrous effects of collisions has been made by tying the sides together at floor and roof with heavy plates connected by vertical beams, making a complete box frame for either end of the carPage 1185

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—By H. E. Weyman.
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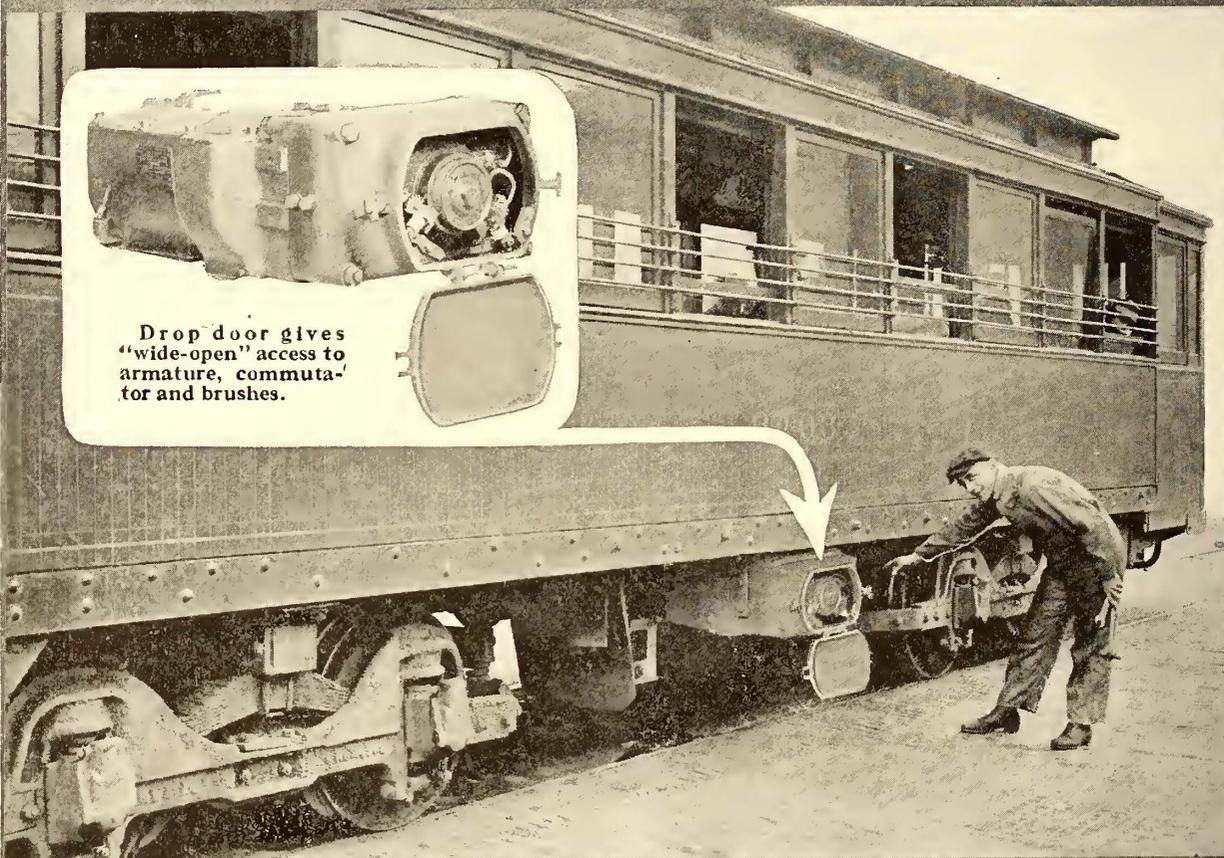
The Westinghouse "Bungalow"

compressor is an Air Brake Specialist's product and is adopted as standard on many electric railways, because:

First; best possible design to perform the work reliably and efficiently.

Second; best materials, careful workmanship, rigid inspection and test.

Third; maintenance facilities carefully considered and liberally provided.



Westinghouse Traction Brake Company

General Offices and Works: Wilmerding, Pa.

Atlanta, Ga.

Boston, Mass.

Chicago, Ill.

Columbus, O.

Denver, Col.

Houston, Tex.

Los Angeles,



Mexico City

New York, N. Y.

Pittsburgh, Pa.

Seattle, Wash.

San Francisco,

St. Louis, Mo.

St. Paul, Minn.

Westinghouse Underfeed Stoker

This list of Westinghouse Underfeed Stokers installed and on order was prepared to show their wide distribution throughout the United States:

Purchaser	Number of Units	Total Boiler H.P.
Duquesne Light Co., Pittsburgh, Pa.	8	4800
City of Detroit, Michigan	2	1370
Consumers Power Co., St. Paul, Minn.	4	2000
Firestone Tire & Rubber Co., Akron, O.	2	1750
" (Repeat Order)	2	1750
Norfolk & Western R. R. Co., Bluestone, W. Va.	10	6670
" (Repeat Order)	2	1334
Public Service Elec. Co., Jersey City, N. J.	5	3000
" (Repeat Order)	5	3250
Roanoke Railway & Electric Co., Roanoke, Va.	4	2100
" (Repeat Order)	2	1000
Spang-Chalfant Co., Pittsburgh, Pa.	2	1000
" (Repeat Order)	1 For Heating Furnace	"
" (Repeat Order)	1	"
United Gas & Elec. Engr. Corp., New Orleans, La.	1	900
" (Repeat Order)	2	1800
" (Repeat Order)	5	4500
U. S. Navy Yards, Brooklyn, N. Y.	12	5120
U. S. Proving Grounds, Indian Head, Md.	8	3812
West Penn Traction Co., Connellsville, Pa.	3	3900
Minneapolis General Elec. Co., (H. M. Byllesby & Co.), Minneapolis, Minn.	12	7200
" (Repeat Order)	5	6310
Cluett-Peabody & Co., Troy, N. Y.	2	1000
" (Repeat Order)	2	1000
American Gas & Elec. Co., Windsor, W. Va.	5	6310
" (Repeat Order)	3	3786
" (Repeat Order)	4	5048
" (Repeat Order)	4	5048
Harrison Bros. & Co., Philadelphia, Pa.	5	2500
Western Lt. & Power Co., Lafayette, Colo.	1	411
" (Repeat Order), Cheyenne, Wyo.	2	911
" (Repeat Order), Lafayette, Colo.	4	1644
Transit Supply Co., Minneapolis, Minn.	1	550
" (Repeat Order)	11	6050
Interstate Lt. & Pwr. Co. (H. M. Byllesby & Co.), Galena, Ill.	2	820
" (Repeat Order)	4	1640
" (Repeat Order)	2	820
Arkansas Valley Ry., Lt. & Pr. Co. (H. M. Byllesby & Co.), Canon City, Colo.	3	1800
Union Elec. Lt. & Pr. Co., St. Louis, Mo.	10	5580
" (Repeat Order)	6	3348
Merchants Heat & Lt. Co., Indianapolis, Ind.	8	4000
" (Repeat Order)	2	2000
Alabama Power Co., Birmingham, Ala.	5	6000
Edison Electric Illum. Co., Boston, Mass.	8	4096
" (Repeat Order)	6	3348
Union Gas & Elec. Co., Cincinnati, O.	8	10096
Duluth & Iron Range R. R. Co., Two Harbors, Minn.	4	1000
Little Rock Ry. & Elec. Co. (United Gas & Elec. Engr. Corp.), Little Rock, Ark.	2	1200

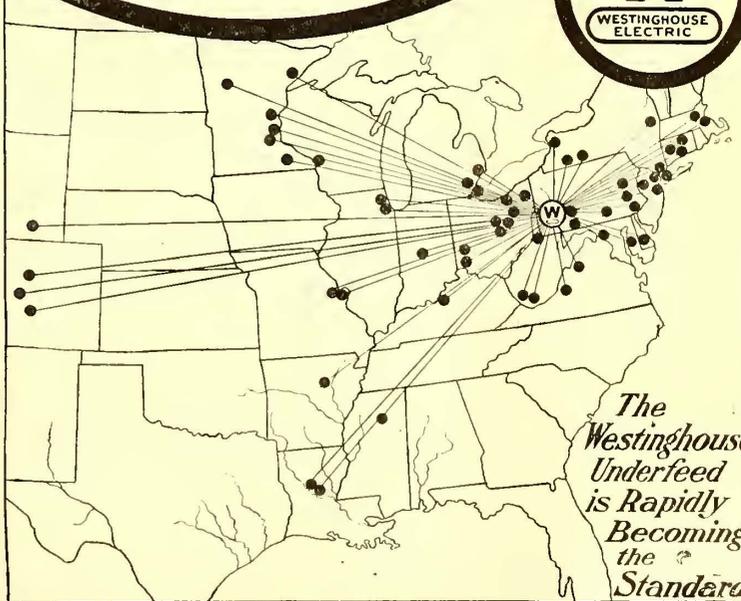
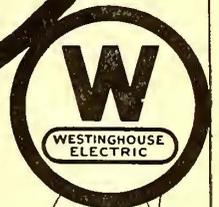
Write for descriptive circular

Wonderful Reserve Power

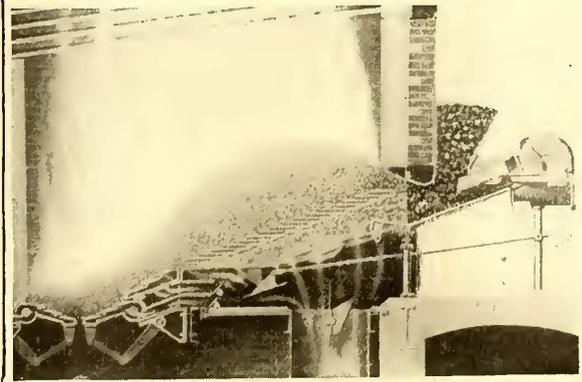
—NO waste—NO idle equipment
 —NO banked fires—NO spare boilers
 to be held in readiness for the daily peaks. For the Westinghouse Underfeed Stoker embodies IN ITS DESIGN a wonderful flexibility—a gigantic overload capacity.

Westinghouse Electric & Manufacturing Co.,
 East Pittsburgh, Pa.

The Choice of a Stoker Always Narrows Down to a Study of Plant Requirements



The Westinghouse Underfeed is Rapidly Becoming the Standard



Phono-Electric

—the trolley of long life



At Dead Man's Cut

Thus do the folk along the Norfolk & Western Railway call the cut illustrated because of the toll that it has taken in human lives.

Such an expression leads us to place emphasis on the **Safety** of Phono-Electric as a contact wire.

While the catenary construction of the Norfolk & Western would prevent a broken wire from touching the ground, it would not prevent contact with workers on the coal cars.

The use of Phono-Electric, however, is splendid safety insurance for this condition, because the toughness, homogeneity and non-crystallizing qualities of Phono-Electric assure a wire that will wear uniformly—a wire upon which actual measurements may be depended to indicate the danger point before breaking.

Bridgeport Brass Company
Bridgeport **Connecticut**

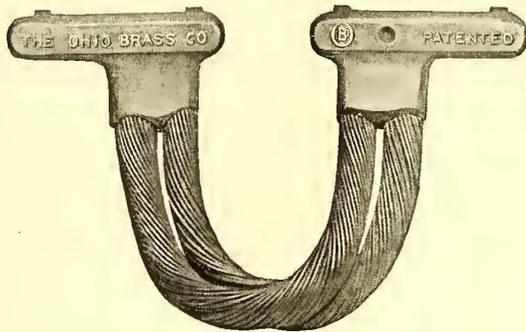
O-B Gas-Weld Rail Bonds

The Pioneer Gas-Weld Bonds with Exclusive Features

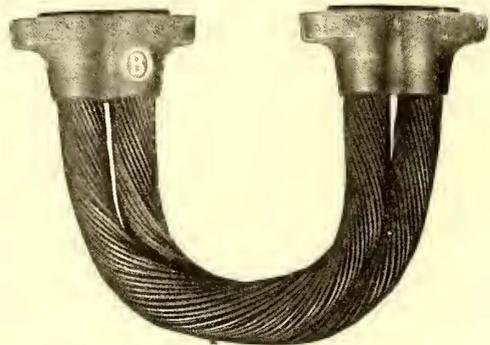
The third year since The O-B Company introduced Gas-Weld Bonding finds the O-B Bonds steadily gaining in popularity. Every buyer is a satisfied user. The frequent repeat orders are evidence of universal satisfaction.

The first purchaser installed over 10,000 bonds after he had investigated the thorough service trials made by the O-B Company. He has since made additional purchases of considerable quantity.

O-B Engineers follow and will continue to follow each installation. They will gladly demonstrate the process on your tracks.

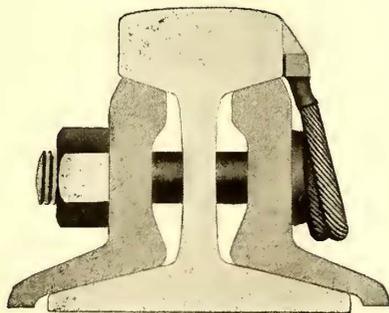


Type G-W Bond—Patented
All Copper



Type ST—Patented
Copper Strand—Steel-protected Terminal

Exclusive Patented Features of O-B Bonds



Section of O-B Bond on
Rail Showing Beveled Terminal

Before installation, the flat top of O-B Bonds forms a right angle with the face of the rail. In this angle the welder, with his work always in plain sight, builds up the beveled terminal which is almost immune to damage by downward blows from street traffic.

Small feet on the bond terminal hold it away from the rail, thus allowing room for the gases to escape and making possible a flawless weld at all points.

Numerous other patents

Our booklet, "Gas-Weld Bonding," tells all the details about this simple process. Write for a copy. The book or a demonstrator will be sent at your request.

The Ohio Brass Co., Mansfield, Ohio

New York Philadelphia Pittsburgh Chicago San Francisco Los Angeles

Western Red Cedar Poles

Used in this Great Electrification Project

The electrification of the mountain divisions of the Chicago, Milwaukee & St. Paul Railway is one of the greatest projects in the history of the electrical industry. It has established a notable record in thorough and efficient construction at a low cost.

Western Red Cedar Poles were used in the electrification of the first units. It is announced that the Company is going ahead with the electrification of another unit of 220 miles from Othello, Wash., to Seattle, Wash., and are using Western Red Cedar Poles.

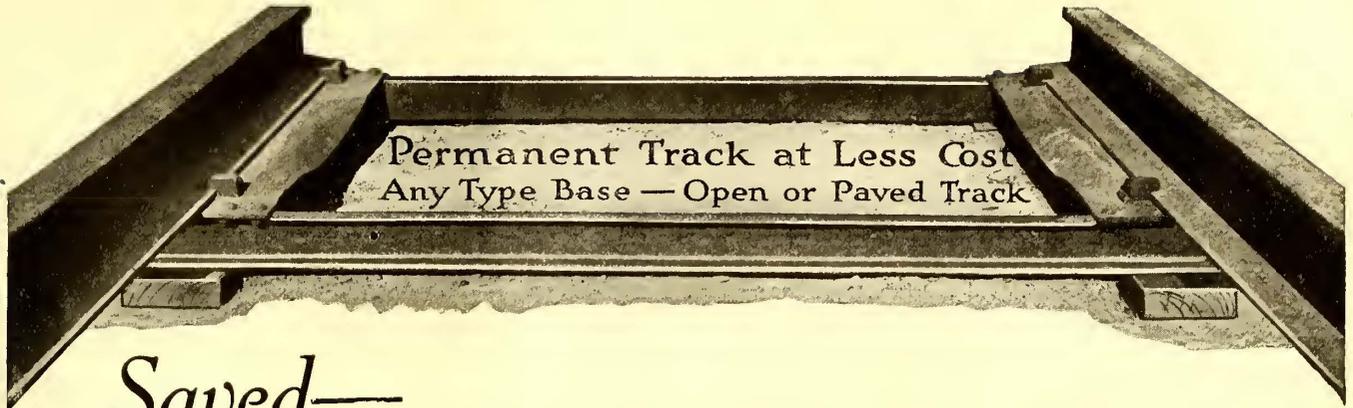
**They Carry the Heavy Load.
They Stand the Heavy Pull.
They Make the Most Beautiful Line.**



On Chicago, Milwaukee & St. Paul Railway, 20 miles east of Butte, Montana. Weight supported by Pole Structure in foreground, 1335 pounds. Height of Pole above ground, 30 ft.; length of Span, 970 ft.

You are invited to write us for further information.

Western Red Cedar Association, Peyton Building, Spokane, Washington



Saved—

\$1000 to \$6000 Per Mile of Track
by constructing with

INTERNATIONAL STEEL TWIN TIES

Here Are the Figures: Comparison of Costs of Standard Wooden Tie and Steel Tie Track Construction from base of Rail to Subgrade.

Estimate Based on Type C. Track Shown

In A. E. R. E. A. Proceedings of 1914—Page 487
(6 in. x 8 in. x 8 ft. Ties in 9 ft. Trench)

5280 sq. yds. granite block paving at \$2.25 per sq. yd.....	\$11,880.00
880 tie rods 2 in. x 5/16 in. x 5 ft. at 50c.....	440.00
5280 tie plates at 30c.....	1,584.00
10,560 screw spikes and clips at 11c.....	1,161.60
Track labor (laying and surfacing).....	2,640.00
2640 6 in. x 8 in. oak treated ties at \$1.00.....	2,640.00
1494 cu. yds. of concrete at \$5.00.....	7,470.00
1754 cu. yds. of excavation at \$1.15.....	2,017.10
	<hr/>
	\$27,232.00*

*If tie plates, screw spikes and clips are omitted and cut spikes are used, deduct \$2,601.00 from wooden tie construction estimate.

**In case tie rods are required, add \$440.00 to steel tie construction estimate.

Estimate Based on Standard Steel Tie Construction

(International Steel Twin Ties in a 7 ft. Trench)

4110 sq. yds. Granite Block paving at \$2.25 per yard.....	\$9,274.50
880 Steel Twin Ties at \$6.00 f.o.b. Cleveland.....	5,280.00
7040 clips and wedges at 7c.....	492.80
Track labor (laying and surfacing).....	1,320.00
789 cu. yds. of concrete 1:3:6 at \$5.00.....	3,945.00
801 cu. yds. of excavation at \$1.15.....	921.15
	<hr/>
	\$21,216.45**
Total cost wooden ties.....	\$27,232.00
Total cost steel ties.....	21,216.45
	<hr/>
Total saving.....	\$6,015.55

Labor saving shown in Steel Tie Estimate is made possible by the reduction of the number of ties, the simplicity of the fastening, the elimination of track gauging, the reduction in the number of blocks and wedges required to line and surface the track, and in the small quantities of excavation and concrete required.

Let us submit comparative estimates for your job

Prompt deliveries made from stock

The International Steel Tie Company

Manufacturers of Steel Twin Ties and Crossing Foundations

General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES:

Western Eng'g Sales Co.,
Los Angeles, Cal.

San Francisco, Cal.
Seattle, Wash.

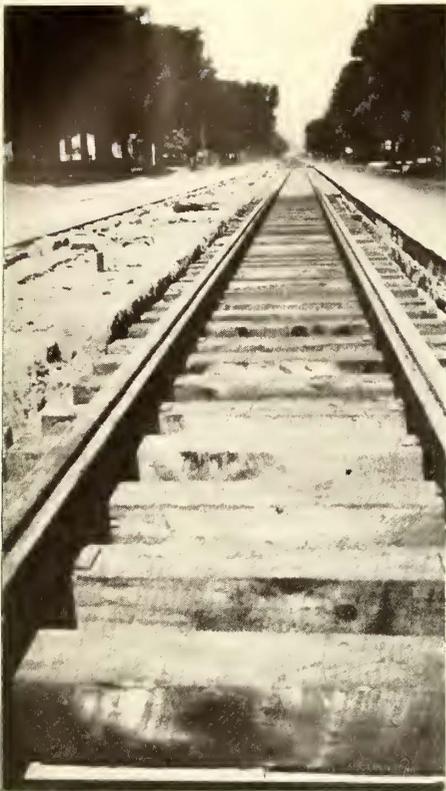
R. J. Cooper Co.,
Salt Lake City, Utah.

J. E. Lewis & Co.,
Dallas, Texas.

Maurice Joy,
Philadelphia.

William H. Ziegler,
Minneapolis, Minn.





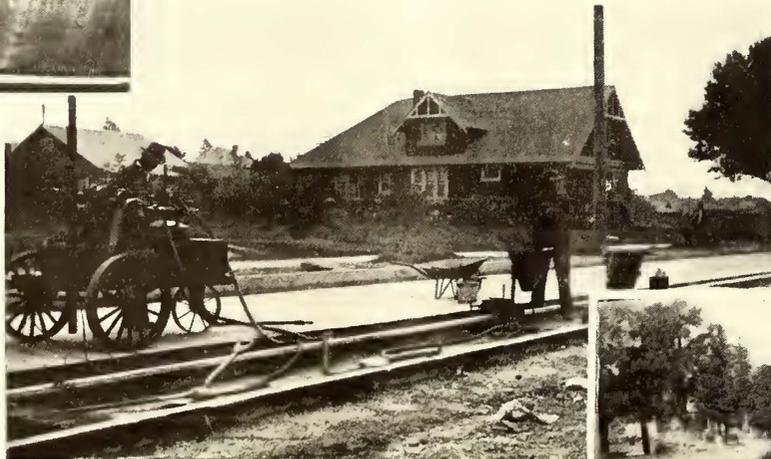
Los Angeles

Thermit Insert Welds

*continue to give
an uninterrupted rail*

In the March 16, 1916, issue of the Electric Railway Journal we quoted an official telegram, March 13, 1916, from the Los Angeles Railway that out of "300 Thermit Insert Welds made in 1913 on P S 116/292 rail; report of October, 1915, reads 'no breaks; no cupping; no pounding; perfect condition.'"

Thermit Insert Welds in course of installation on Main St., between Moneta Ave. and Slauson Ave., Los Angeles.



On April 25, 1917, personal inquiry made at Los Angeles disclosed the fact that

Thermit Insert Welds Have Shown No Breaks to Date

Records like this clearly prove that the Thermit Insert Weld is all that we assert. It is far more economical to pay a little more for first cost than to suffer the annoyance and expense of repairing breaks in service—

Especially as the repair of one bad break means the insertion of a new piece of rail and two joints for one.

Thermit Insert Welds Assure a Truly Continuous Rail



GOLDSCHMIDT THERMIT CO.

120 BROADWAY, N. Y.

329-333 Folsom St., San Francisco

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

7300 So. Chicago Ave., Chicago



There's the way to bond for permanency

—using *“Protected” Rail Bonds*

The “Shot-Over” Sleeves protect the strands right at the point where they need protection against vibration—at the terminal.

The strands being of pure lake copper give further protection.

Permanency is further aided by the soft, pure, ductile copper lugs which compress perfectly.

There are “Protected” bonds for every class of service.

You ought to use them.

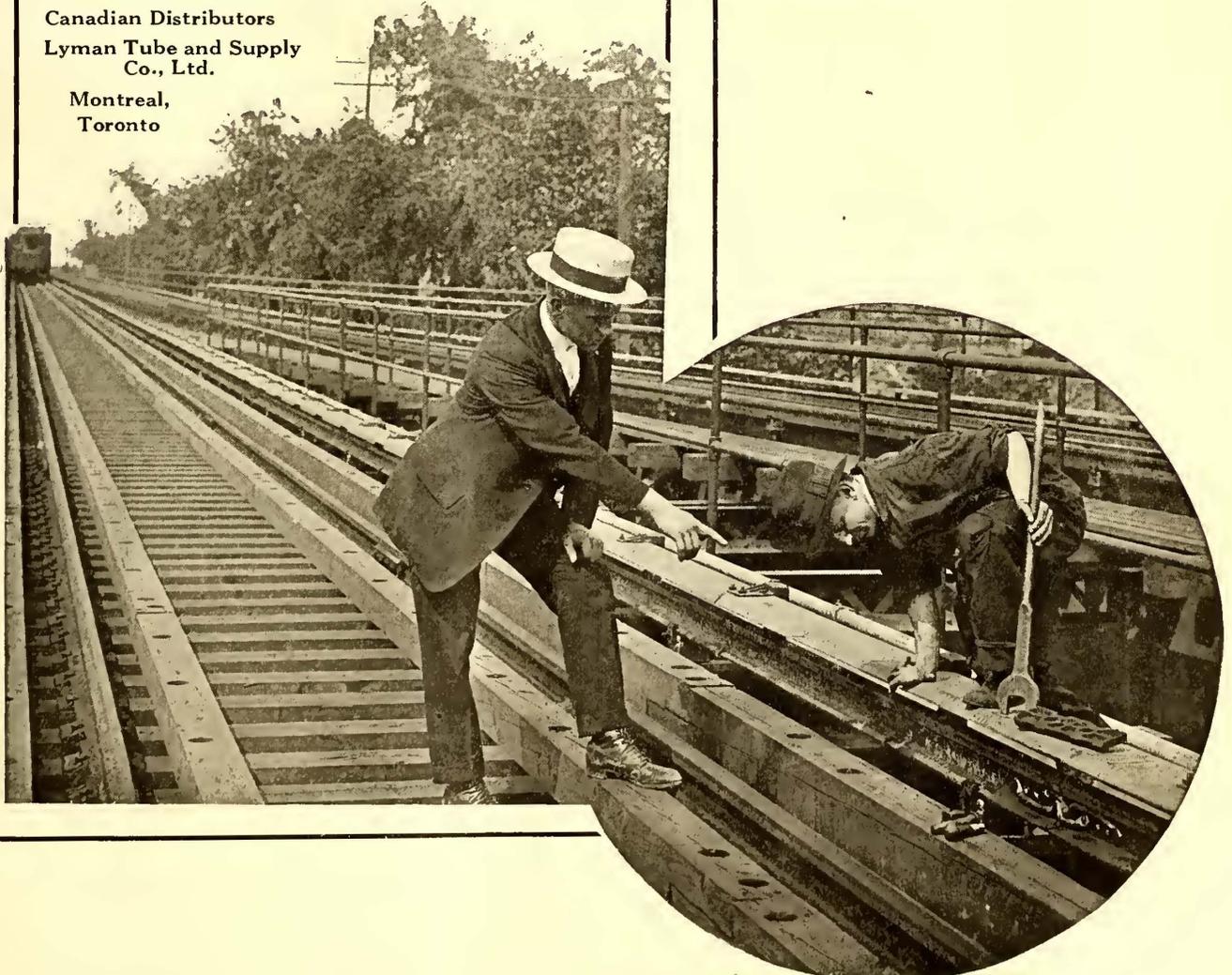
ELECTRIC SERVICE SUPPLIES Co.

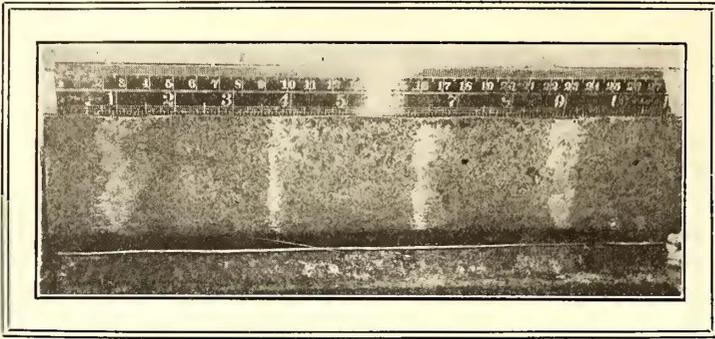
*Manufacturer of Railway Material
and Electrical Supplies*

PHILADELPHIA NEW YORK CHICAGO
17th and Cambria Sts. 50 Church St. Monadnock Bldg.

Canadian Distributors
Lyman Tube and Supply
Co., Ltd.

Montreal,
Toronto



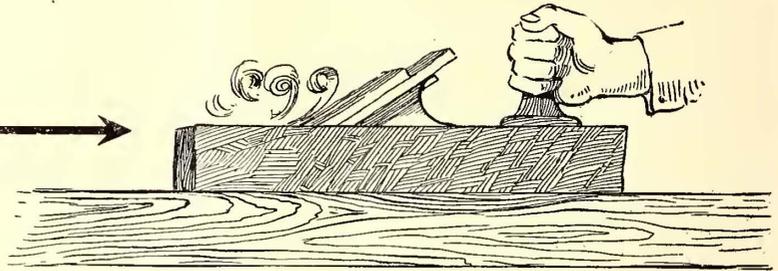


← **To bring a rail
in this condition**

to a true, smooth surface

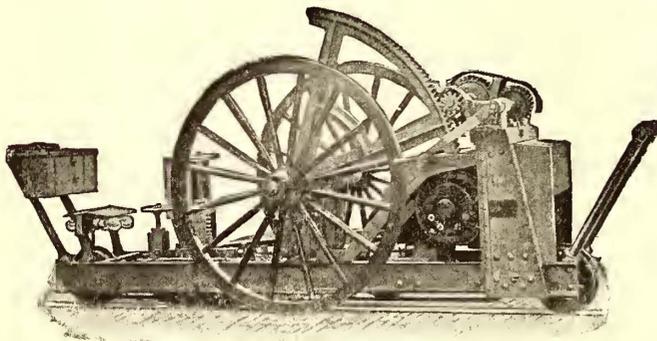
It doesn't require much imagination to see that the best possible process is a long, steady planing stroke that works

Like This



and Here is the Machine

that gives that Stroke



The difference is that the plane stroke is effective in one direction only. The

Reciprocating Track Grinder

stroke is effective in both directions. It is working all the time.

It is the surest, most accurate, effective and least wasteful method of grinding out corrugations and cupped joints in rails.

You can try it on your track at our expense.

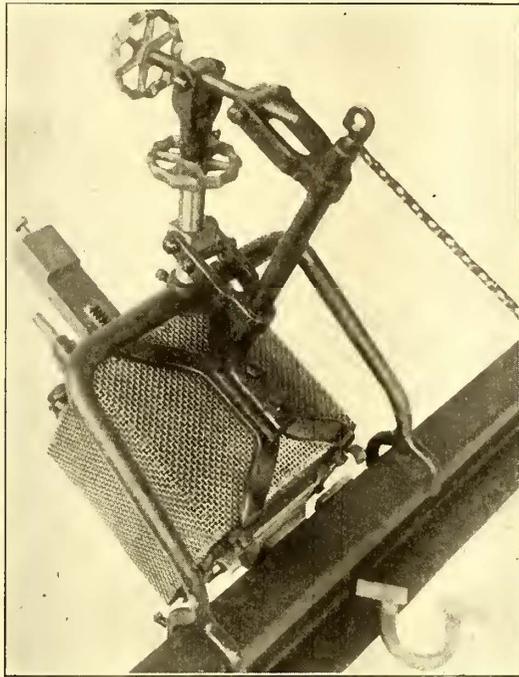
It requires no skilled labor for operation.

Railway Track-work Co.

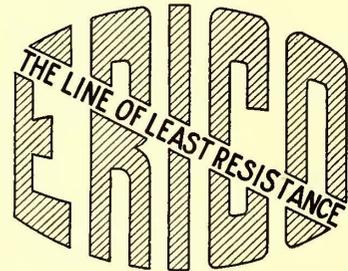
30th and Walnut Sts., Philadelphia

The Erico Portable Welder

Has
No
Rotating
Parts

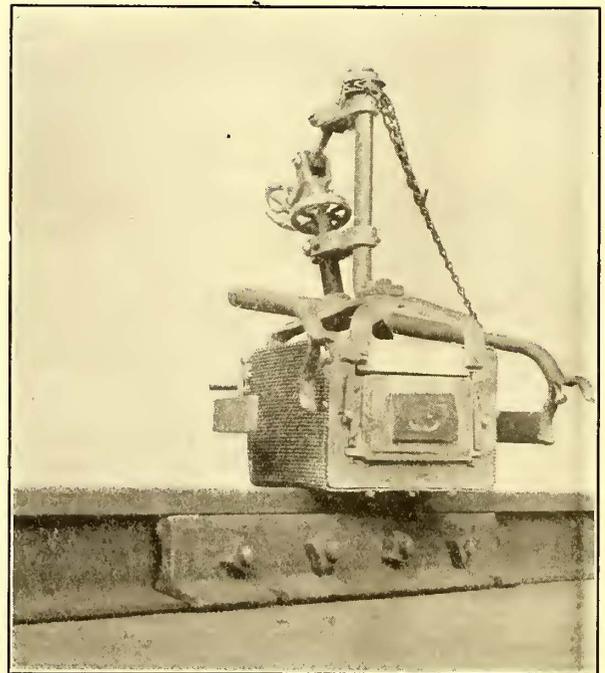


Top View



We know of no better way of describing the simplicity of the Erico Portable Welder than to state that it contains no rotating parts. The rheostat is always in a tamper-proof, safety-first cage, while the furnace is made up of such elements as a metal chamber with a graphite lining, an electrode fitted with a handle, and an adjustable supporting frame.

In short, the Erico Portable Welder, while extremely light in weight, has no finely adjusted parts to get out of order.



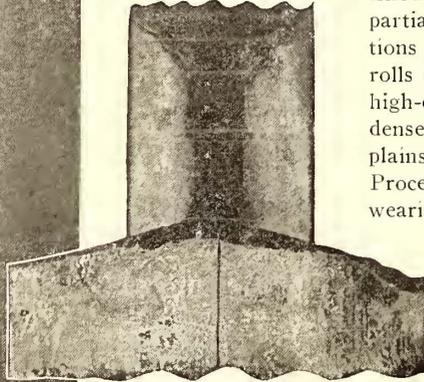
Front View

The Electric Railway Improvement Co.
Cleveland

How the Lackawanna Deseaming Process eliminates two very serious rail faults

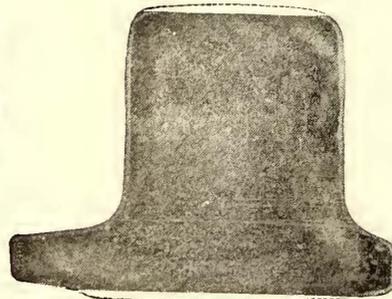
Greater Safety

through removal of all seamy metal from the vital part of the base



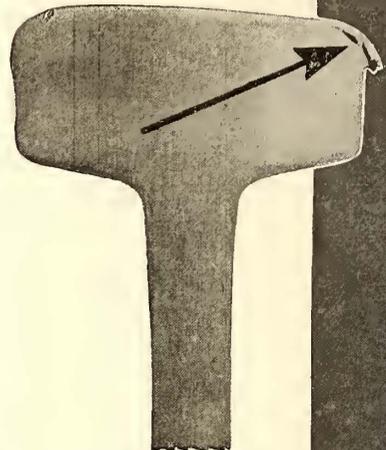
Typical base seam—the kind that tends to open up and cause fracture.

The weak, partially decarburized surface steel of the original ingot is ordinarily finished into the rail, but if hot-milled off the partially formed rail section, at the locations of rail head and base, the finishing rolls complete their work upon clean, solid high-carbon steel and produce a harder, denser and finer finish. This, in short, explains how the Lackawanna Deseaming Process eliminates seamy bases and soft wearing surface.



Better Service

through a harder top surface that is not so apt to wear down or slough off



Rail head sloughed off under the cold-rolling action of the wheels.

TREATMENT of the partially finished rail bar as described above is the only recent *real* improvement in rail manufacture—and is the most logical way of meeting present day increases in wheel load. This is proven by the marked resistance to wear and freedom from fracture, which Lackawanna Deseamed Rails have demonstrated in several years of service.

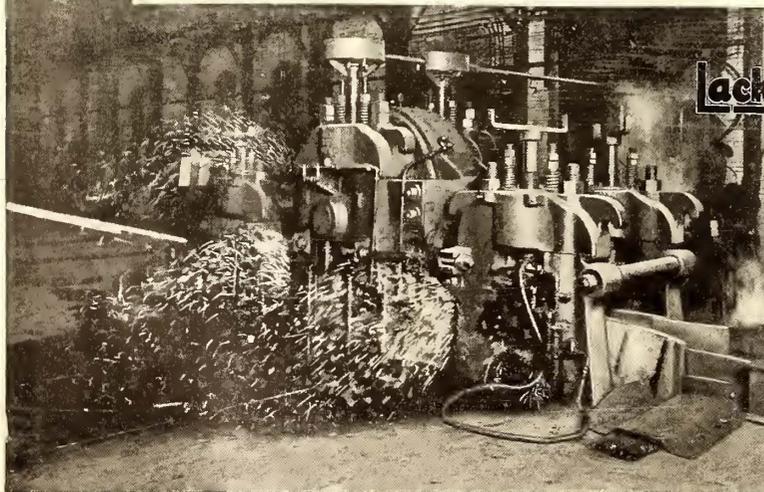
Etching away the head and base surfaces of rails made by this process shows an entire freedom from seamy, streaky metal at these locations, and hardness tests also prove that the metal here is slightly superior to that in the body of the rail.

This deseaming process, as originated and controlled exclusively by us, is now applied (see picture below) to all Lackawanna Sections of 50 pounds per yard and over.

Those seeking safer track, greater load capacity and reduced maintenance expense can profitably study our illustrated book on The Lackawanna Deseaming Process, which we will mail on request.

Ask for our booklet "Improved Track Appliances."

292



Lackawanna Steel Company

LACKAWANNA, N. Y.

ATLANTA	CHICAGO
BOSTON	CINCINNATI
BUFFALO	CLEVELAND

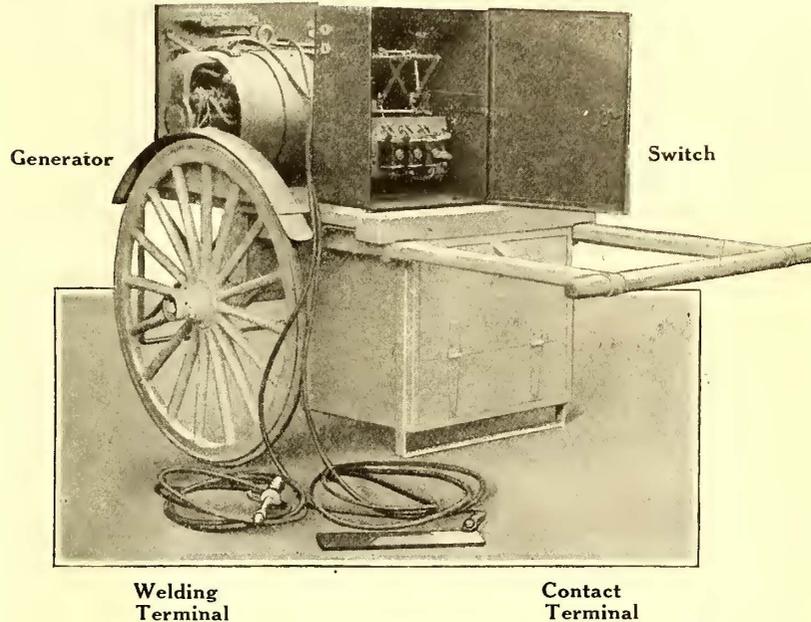
DETROIT	ST. LOUIS
NEW YORK	SAN FRANCISCO
PHILADELPHIA	HAVANA



A Simple Welder

The Lincoln Arc Welder is simply a motor operated by power from the trolley line. This motor drives a generator,

which delivers power at exactly the right voltage for the particular job at hand.



Lincoln Arc Welder

is free from all complicated devices or adjustments so that any workman can quickly learn to operate it. One terminal is laid on the rail, the operator picks up the other and welds.

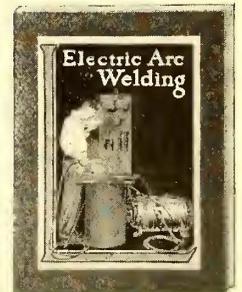
No power is wasted in resistances, thus keeping current consumption low. There is no possibility of shock or injury to the operator.

This standard Lincoln Motor has operated under water for over 3 years without damage to windings.

Ask for
Welding Book
104-J

48 pages illustrated, containing a complete review of arc welding and examples of street railway work.

Write on your letterhead.



The Lincoln Electric Co.

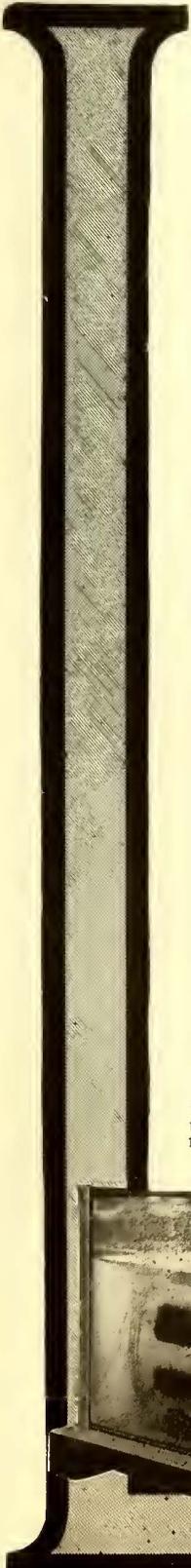
Cleveland, Ohio

New York City
(Singer Bldg.)
Buffalo
Syracuse

Chicago
Columbus
Detroit
Grand Rapids

Philadelphia
Pittsburgh
Charlotte, N. C.
Toronto, Canada

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Here Are Six Things You Would Like to Have Your Motormen Do



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

- 1 Coast more
- 2 Avoid unnecessary stops and slowdowns.
- 3 Start and stop smoothly.
- 4 Release brakes early after stopping on level track.
- 5 Use hand brakes enough to keep this safety feature in good working order.
- 6 Operate cautiously and safely.

Equipment of Your Cars with the

Arthur Power-Saving Recorder

followed by your intelligent interpretation to your men of the meaning of the records established and suggestions for making better records will rapidly educate your men to do these things.

And the results for your company will be big in economies of various kinds as well as in greater safety and better service in general.

We will be glad to demonstrate the accuracy of these statements.

The Arthur Power-Saving Recorder Co.

New Haven, Conn.

"Power wasted at the brake shoes is the true measure of the motormen's relative efficiency."

Have You Considered the Use of Metal Tickets?

The Lincoln Traction Company, Lincoln, Nebr., were pioneers in their use, and for them we designed the International Type C24 Combined Coin, Metal Ticket and Transfer Register, which went into service April 1, 1915, more than two years ago, and have given continuous, thoroughly satisfactory service since, with increased earnings and better maintained schedules. (See description and practices Lincoln machine page 199, Blake & Jackson's "Electric Railway Transportation.")

The latest road to adopt metal tickets is The Kansas City Railway Company, Kansas City, Mo., from whom we have just received the largest single order for this type of machine ever placed, covering a complete equipment for their cars with the International Type C17 Coin and Metal Ticket Fare Box to be used in connection with International Type R7 Single Register.

The Milwaukee Electric Railway & Light Company have also placed a small order for the same type of box for use at Racine.

The United Railways Company of St. Louis have in use a large number of standard International Coin Registers and Fare Boxes, and the Sioux City Service Company is entirely equipped with International Fare Boxes, where metal tickets of the size and value of a nickel are used.

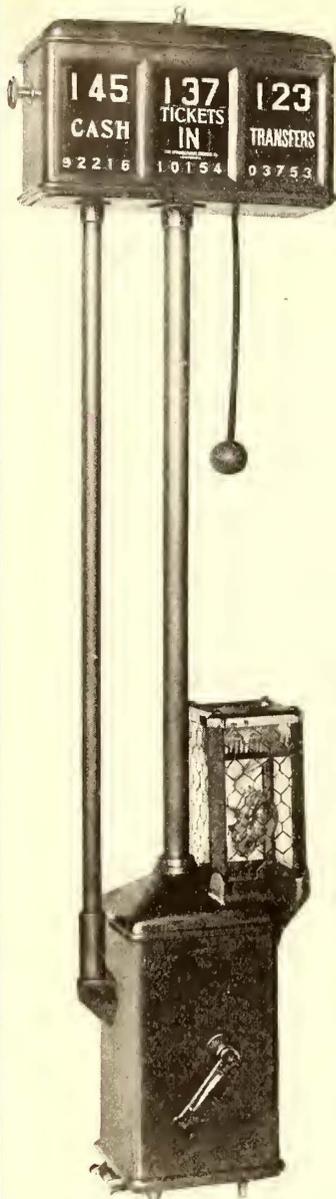
We illustrate on this page two types of Coin and Metal Ticket Registers and two views of the Coin and Metal Ticket Fare Box, any one of which can be arranged for motor operation if desired.

These are only a few of our many fare collection and registering devices. Send us your problems.

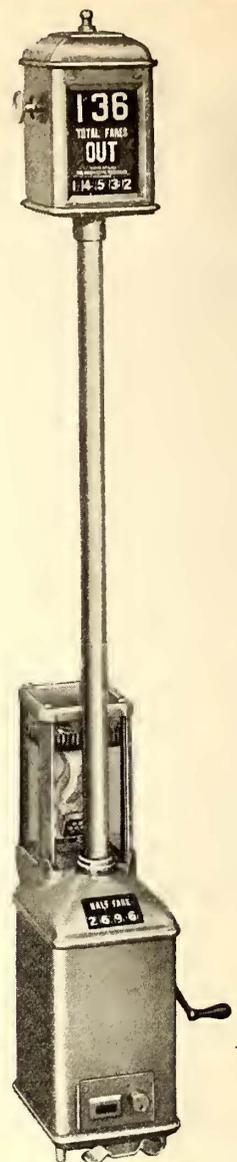
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15 South Throop Street

CHICAGO



Type C24 Coin, Metal Ticket and Transfer Register



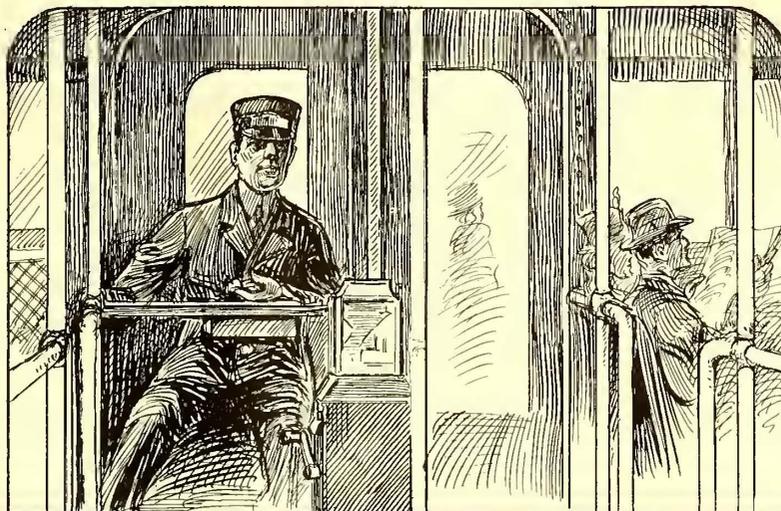
Type C14 Coin and Metal Ticket Register



Cash Side Type C17 Coin and Metal Ticket Fare Box



Ticket Side Type C17 Coin and Metal Ticket Fare Box



Every Fare Through One Hopper with the Johnson

There's no lost motion—no waste of time in receiving, counting and registering cash fares and metal tickets—on lines using

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Because the Johnson System handles all classes of fares—nickels, dimes, pennies and metal tickets representing two different rates of fare—through **one** hopper.

Errors, misunderstandings and arguments are cut to the minimum—time required for fare collection is cut at every stop, and schedules correspondingly improved.

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Johnson Fare Box Company
Jackson Boulevard and Robey St., Chicago

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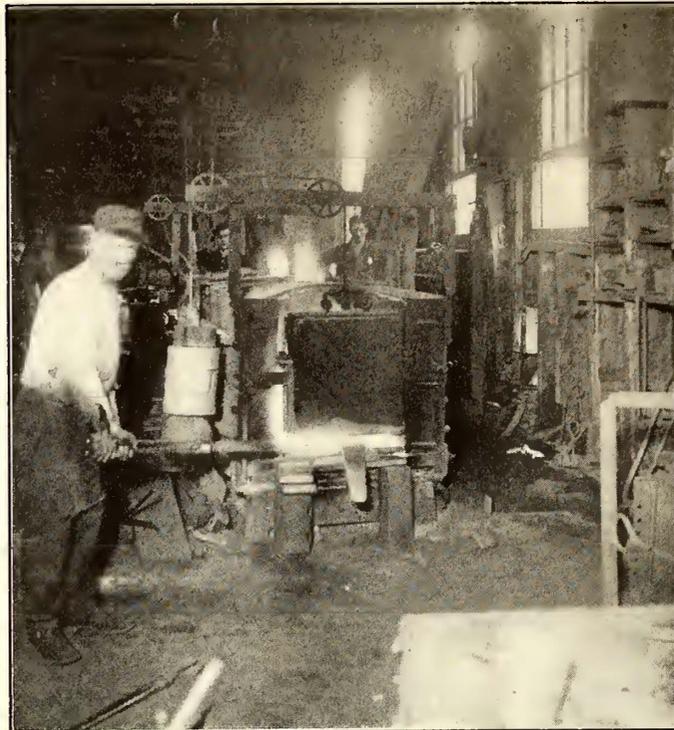




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No. 1

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The first step in the making of our brake levers is the heating of the rough shape preliminary to forging.

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Step No. 2, the forging, will be illustrated next week.

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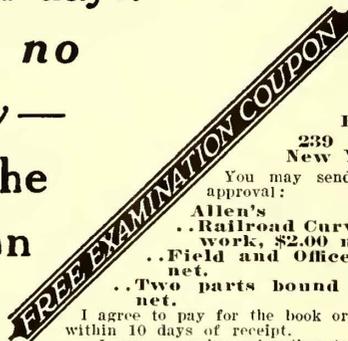
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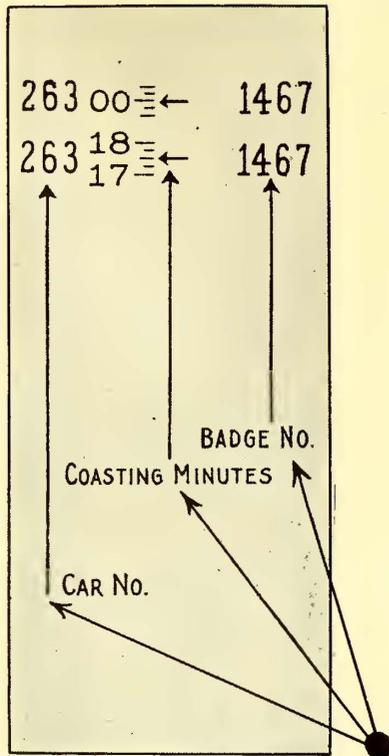
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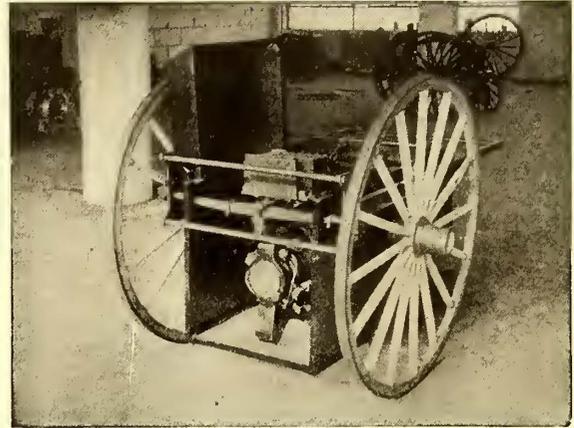
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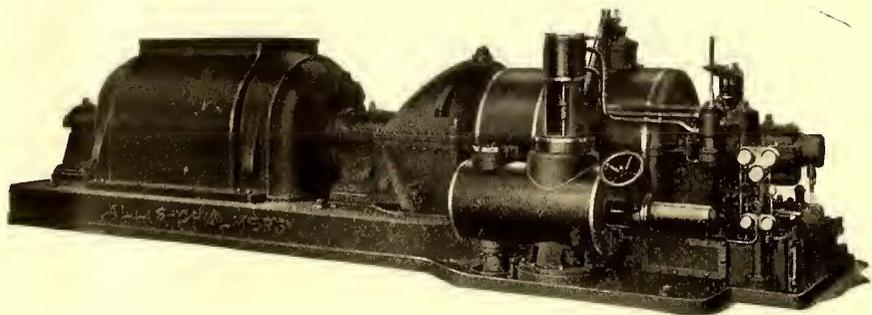
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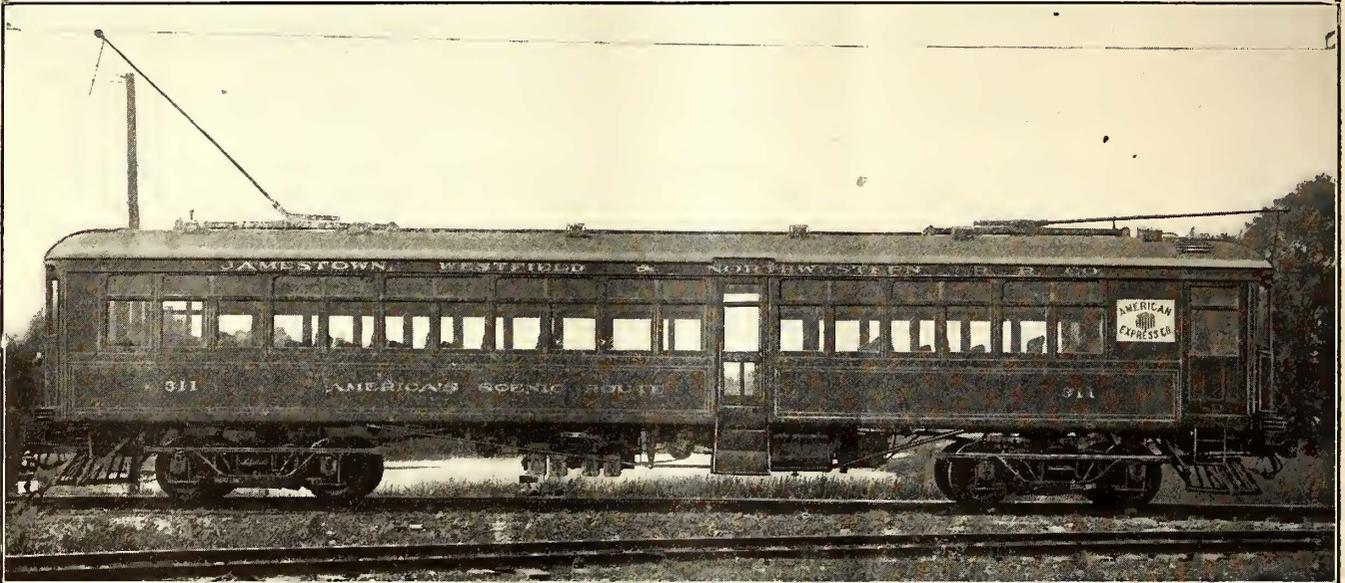
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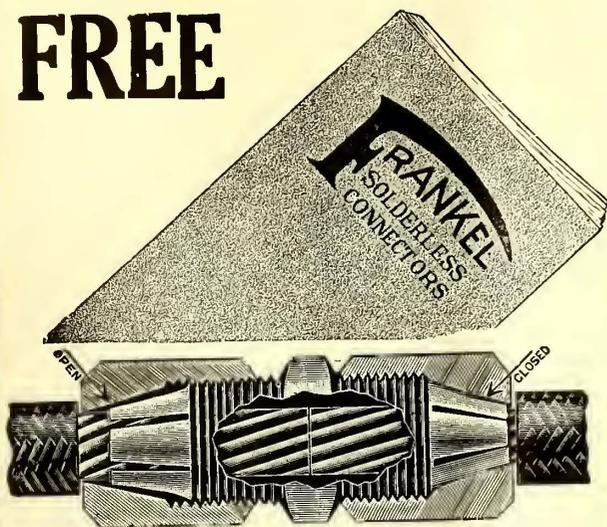
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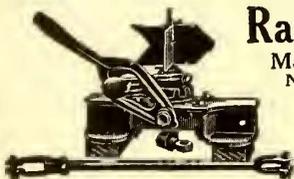
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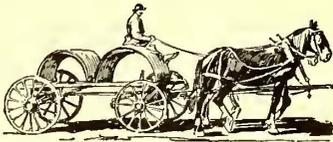
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JOSEPH DIXON CRUCIBLE COMPANY

Established 1827



JACKS

Barrett Track and Car Jacks
Barrett Emergency Car Jacks
Duff Ball Bearing Screw Jacks
Duff Motor Armature Lifts

The Duff Manufacturing Co., Pittsburgh, Pa.



**A Further
Guarantee
of Service on**

Transformers

Additional manufacturing and storage facilities and further specialization on our line enable us to maintain the well-known Packard service on a larger scale than ever.

The quality of our instruments will be as always, the best the industry can produce.

Write for Bulletin E. R. J.-200.
It's a transformer text-book.

The Packard **Warren,**
Electric Company **Ohio**

SALES AGENTS

Electric Appliance Co., Chicago, Dallas, New Orleans, San Francisco, Post Glover Electric Co., Cincinnati, Ohio, H. I. Sackett Electric Co., Buffalo, N. Y., Electric Service Supplies Co., Philadelphia, New York, Chicago, Braid Electric Co., Nashville, Tenn., N. L. Walker, Raleigh, N. C., Charleston Elec'l Supply Co., Charleston, W. Va., 400 San Fernando Bldg., Los Angeles, Cal.

SHERWIN-WILLIAMS

Old Dutch Railway Enamel



S-W Old Dutch Railway Enamel reduces material costs to a minimum, two coats being sufficient over proper undercoatings, instead of the usual two coats of color and two coats of varnish. When a car so finished is reshopped only one coat of Old Dutch Railway Enamel is necessary after cleaning and preparing the old surface.

It will wear longer than any finishing varnish or any other kind of enamel.

Color card on request.



THE SHERWIN-WILLIAMS Co.

Paint and Varnish Makers

601 Canal Road, Cleveland, O.



Last Word in Refillable Fuses



SAVE

60 to 80 per cent.

Sole Manufacturer
A. F. DAUM
Pittsburgh, Pa.



The Big Three

**D & W Fuses, Deltabeston Wire
Delta Tape**

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

Repair Shop Machinery and Cranes

Built by

NILES-BEMENT-POND CO.

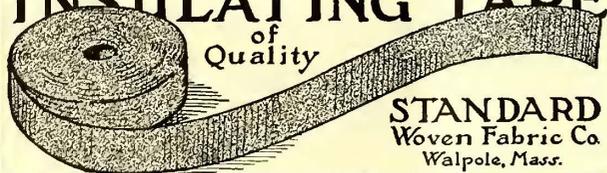
111 Broadway, New York

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of
Quality

STANDARD
Woven Fabric Co.
Walpole, Mass.



KINNEAR Steel Rolling Doors FOR CAR HOUSES

Compact, Durable, Easily and Speedily Operated and Fire-proof. Openings of any size may be equipped and the doors motor-operated if desired. Manufactured by the

KINNEAR MANUFACTURING CO., Columbus, Ohio
BOSTON PHILADELPHIA CHICAGO

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Original Manufacturers' Dimensions

Write for new bulletin

THE EUREKA CO., North East, Pa.

FORD TRIBLOC

A Chain Hoist that excels in every feature. It has Planetary Gears, Steel Parts, 3½ to 1 factor of Safety. It's the only Block that carries a five-year guarantee.

FORD CHAIN BLOCK & MFG. CO.

142 Oxford Street, Philadelphia

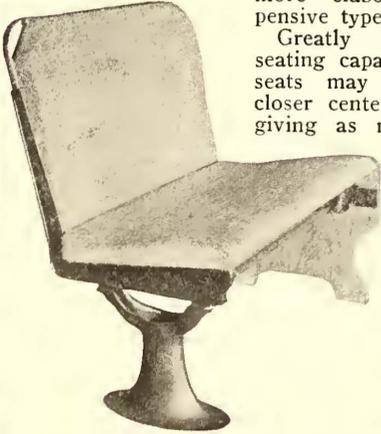
No. 108-AX Stationary Seat

Lighter in weight than ever before, and yet stronger and more compact.

Rigid Pressed Steel Frame supporting the cushion and the back, upholstered in Rattan.

New type of Shaped Cushion and Back conforms to the lines of the human body in a comfortable sitting posture, affording as much comfort and durability as more elaborate and expensive types.

Greatly increases the seating capacity of car, as seats may be placed in closer centers, though still giving as much room as before.



Hale and Kilburn Co.

Philadelphia New York Chicago
Washington Atlanta San Francisco

WE CAN CUT YOUR COST OF HEATING CURRENT

Write for THERMOSTATIC CONTROL INFORMATION

ELECTRIC HEATERS Cut Installation and Maintenance Charge.

VENTILATORS Also Ventilate in Stormy Weather. **THERMOSTATS** Save Current.

ORIGINATED the use of **NON-CORROSIVE** Wire for Electric Car Heaters.

ORIGINATED The Ventilated Coil Support.

LET US FIGURE ON YOUR NEXT REQUIREMENTS
Gold Car Heating & Lighting Co. 17 Battery Pl., New York

ECONOMY BUILT LIKE A WATCH METERS

—the only means at your disposal to accurately measure the power consumption of cars. You can well afford to investigate. Bulletin 416.

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Holden & White Inc.

Electric Railway Sales Distributors for:

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Chicago District Representatives for:

Drew Line Material.
Columbia Car & Shop Equipment.
Miller Trolley Shoe.
Lincoln Rail Bonding and Bonds.

1508 Fisher Building CHICAGO

The Standard for Speed, Accuracy, Durability

B-V Visible Punch

Look for this



Trade Mark

BONNEY-VEHSLAGE TOOL COMPANY
124 Chambers Street, New York City
Factory, Newark, N. J.



Use them in your terminals—
PEREY TURNSTILES
or **PASSIMETERS**

Faster than the ticket seller

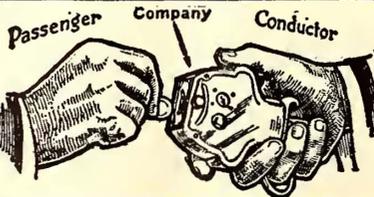
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30 Church Street, New York City

For the Answer to your Fare Collection Problems
Write for

"Earnings Per Passenger Mile"

It tells how the
BONHAM TRAFFIC RECORDER
Will Meet Your Needs

The Bonham Recorder Co., Hamilton, Ohio



Direct
Automatic
Registration
By the
Passenger
Rooke Automatic Register Co.
Providence, R. I.

RAILWAY UTILITY COMPANY

Sole Manufacturers

"HONEYCOMB" AND "ROUND JET" VENTILATORS for Monitor and Arch Roof Cars, and all classes of buildings; also **ELECTRIC THERMOMETER CONTROL** of Car Temperatures.

141-151 WEST 22D ST. Chicago, Ill. Write for Catalogue 1328 BROADWAY New York, N. Y.

The Best Shade Rollers for Cars

SPECIAL shade rollers for cars, that will last and give satisfaction for years, and yet cost but little more than the poorest you can buy, are made by the Stewart Hartshorn Co., E. Newark, N. J. This company is by far the largest shade roller manufacturer in the world. It is able to give high quality at lower prices because of the enormous output. Write for catalog, stating wants. You are always protected when you buy shade rollers if they bear the signature

Stewart Hartshorn

*Get away from unreliable
batteries*

The Consolidated Buzzer System

operates directly from the line and al-
ways gets plenty of juice. No metal
is exposed to the passenger's touch.

The only dependable system.

Consolidated Car-Heating Co.
New York Albany Chicago

The Kalamazoo Trolley Wheels

have always been made of entirely
new metal, which accounts for their
long life WITHOUT INJURY TO
THE WIRE. Do not be misled by
statements of large mileage, because
a wheel that will run too long will
damage the wire. If our catalogue
does not show the style you need,
write us—the LARGEST EXCLU-
SIVE TROLLEY WHEEL
MAKERS IN THE WORLD.



THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

TROLLEY POLES

Our stock of over 7000 high
carbon steel poles is at all times
available for immediate ship-
ment.

These poles are of high grade
special skelp, properly rein-
forced, and will sustain a wheel
pressure of from 35 to 40
pounds without taking a per-
manent bend.

NUTTALL
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Ventilation—Sanitation—Economy—Safety

All Combined in

The Cooper Forced 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.

HEATING AND VENTILATING YOUR CARS is
the problem to-day. Let us show you how to do both
with one equipment. Now is the time to consider
this change before you start your cars through the
shops for overhauling. Kill two birds with one stone.

THE PETER SMITH HEATER COMPANY
1759 Mt. Elliott Ave., Detroit, Mich.

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. People's Gas Bldg., Chicago, Ill.
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Horne Double Acting Brakes	Lord Screenless Air Cleaners for
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Sterling Trolley Bases	Fenders and Wheelguards
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Air Rectifiers, eliminating frozen	Friction and Rubber Tape
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HORNE MANUFACTURING CO., 50 Court St., Brooklyn, N. Y.

The Eclipse Railway Supply Co.

CLEVELAND, OHIO

Manufacturers of the

ECLIPSE LIFE GUARD **ECLIPSE WHEELGUARD**
ECLIPSE TROLLEY RETRIEVER **ACME FENDER**

PROVIDENCE H-B

FENDERS LIFE GUARDS

The Consolidated Car Fender Co., Providence, R. I.
Manufacturers of The Providence Fender and H-B Life Guard
Wendell & MacDuffie Co., 61 Broadway, New York
General Sales Agents

"GLOBE" VENTILATORS



An Efficient Ventilator
at a reasonable price



Globe Ventilator Co., Troy, N. Y.

SEARCHLIGHT SECTION

FOR SALE

Motors

4—West. 38-B Motors, complete with 64 teeth, 4" bore, split gears, 18 teeth pinions, and gear casings, extra repair parts, 1 new each upper and lower field coils, 1 new set armature coils, 2 new brush holders, 1 new gear and 1 new pinion. Will sell as a complete lot.

Compressors

25—AA-1 Air Compressors.

Controllers

12—K-6 Controllers.

30—K-10 Controllers.

Lathe

1 Pond Standard Car wheel lathe, motor driven, with variable speed motor, and with air cylinder attachment for removing and replacing wheels.

For further particulars apply to

W. R. KERSCHNER COMPANY, INC.

50 Church Street, New York

STREET CAR MOTORS

- 10 Westinghouse No. 306. PRACTICALLY NEW—LESS THAN ONE YEAR IN SERVICE.
12 Westinghouse No. 317-A, with gears and pinions. ABSOLUTELY NEW.

CONTROLLERS

38 Gen. Elec. K-10, with handles and brackets.

FREQUENCY CHANGERS

- 4 1000 KW. SETS:
Generators: 3 ph., 60 cy., 4500-2300 volts, 300 RPM.
Motors: 1050 Kva., 3 ph., 25 cy., 6600 volts, 300 RPM.
Exciters: Direct connected.
Switchboards: With necessary instruments.
1 100 KW. SET:
Generator: Sgle. ph., 60 cycle, 2300 volts, 720 RPM.
Motor: 150 HP, 3 ph., 25 cy., 2300 volts, 720 RPM.
Exciter: 5 KW., direct connected.

ROTARY CONVERTERS AND MOTOR GENERATOR SETS—25 cycles

- 1 600 KW. Gen. Elec., TC-A, 3 ph., 600 volt, D.C., 375 volt A.C., 8 pole, 375 RPM.
1 600 KW. set consisting of two 300 KW. 6 pole generators, 550 volts, 600 amps., dir. conn. to one 750 HP. synchronous motor, 3 ph., 25 cy., 6600 volt, 500 RPM., complete with AC and DC panels.
4 500 KW. Gen. Elec., HC-K, 600 volt D.C., 4 pole, 750 RPM., each rotary complete with three 165 Kva. Gen. Elec. OI SC Transformers, HP-RP, 6600/5940 volts prim., 430/286/143 volts sec., also necessary panels and instruments.
1 500 KW. Westg., 3 ph., 550 volt D.C., 390 volt A.C., 6 pole, 500 RPM., with dir. conn. starting motor, AC and DC panels and three 175 KW. Westg. oil cooled transformers, 13,200 volts prim., 390 volts sec.

Our new and complete list of steam and electrical equipment will be mailed upon request

MACGOVERN & COMPANY, Inc.

114 Liberty Street, New York City

IMMEDIATE SHIPMENT

- 1—500 KW. General Electric Curtis steam turbine, 3 ph., 60 cy., 1800 rpm., 2300 volts, 150 lb. steam pressure, vertical type.
1—500 K.W. Westinghouse Horizontal Turbo Generating Unit wound for 3 phase, 60 cycle, 2300 volts, speed 3600 rpm., condensing duty.

25 Cycle Rotary Converters

- 2—150 KW. General Electric type T.C., 4-150-750, 25 cycle, 3 ph., 575 volt, rotary converters, 750 rpm., complete with end play and speed limit device.

200 Kilowatt 60 Cycle Rotary Converters

- 1—200 KW. Westinghouse 3 ph., 60 cy. rotary converters, 550 volts, 720 rpm., complete with 4—100 KW. Westinghouse Scott connected oil insulated transformers, 10,000/9500 volts prim., 430/362 volts secy.
1—150 KW. Westinghouse 3 ph., 60 cy., rotary converter, 550 volts, 720 rpm.

Transformers

- 6—750 KVA. General Electric oil filled self cooled transformers, 4400/281 volts, with 4400-4290-4180-4070-2200-2090-1980 taps in the primary.
3—500 KW. General Electric, 60 cy., single phase transformers, 66,000 volts primary, 4400/2200 volts secondary.
3—375 KVA. Allis Chalmers O. I. S. C. indoor type transformers, 25 cy., 2300 v., 367 v. secy.
3—350 KVA. General Electric, type H, 60 cy., transformers 2400/2300/2200 v. prim., 200/400 v. secy.
1—100 KVA. General Electric, type H, 60 cy. transformer, 4600 volts prim., 115-230 volts secy.
4—100 KW. Westinghouse, oil insulated, Scott connected transformers, 10,000/9500 v. prim., 430/362 v. secy.
3—75 KW. Westinghouse 60 cy. transformers, 2200 v. prim., 110/220/440 v. secy.
3—50 KVA. General Electric type H, 60 cy. transformers, 900/1000/16000 v. prim. Y., 230/460 v. secy.
Also a stock of smaller sized transformers.

IMMEDIATE DELIVERY

ARCHER & BALDWIN, Inc.

114-118 Liberty Street New York City

TELEPHONE 4337-4338 RECTOR

FOR SALE

About 4500

POLES

Long Leaf
Yellow Pine

creosoted by standard method with 12 lbs. per cubic foot. The poles are straight, specially selected and finest class 35' to 36' long and 14" to 11 $\frac{3}{4}$ " diameter five feet from butt. Poles were inspected, accepted and purchased for a neutral country power line, but shipping conditions prevent moving. Now stored at Mobile. Inspection can be arranged. Further particulars obtainable from the Pyrites Company, Ltd., 15 William Street, New York.

SEARCHLIGHT SECTION

FOR SALE

If you want
New or Old Steel Rails
Machinery, Cars or Equipment
Write us your needs
Have you seen our new bargain list?
ZELNICKER IN ST. LOUIS

IMMEDIATE SHIPMENT

1—300 K.W. Westinghouse, compound wound, 3 bearing, belt-driven

Generator

speed 435 R.P.M., 550 volts.

LEO A. PHILLIPS

Steam & Electrical Equipment
 90 West Street New York City

FOR SALE

16 W. H. 68

Railway Motors

now running in good condition, with gears, pinions, cases, collars. Will release for delivery during month of July.

Also one set G. E. 1000 Armature Coils—and one 1200 G. E. new field coil.

C. G. & W. St. Ry. Co.

Waynesboro, Penna.

FOR SALE OR EXCHANGE

Two one-man single truck

Passenger Cars

used 3 years. 12 center dump

Ballast Cars

in fair condition. Chicago delivery. Will sell for cash or exchange for baggage and express cars suitable for use as trailers for hauling milk and freight in interurban service.

ELGIN AND BELVIDERE ELECTRIC CO.,
 105 So. La Salle St., Chicago.

FOR SALE

Two second-hand

Open Car Bodies

8 seat, 25 feet long over all. One body just painted—other cleaned for painting.

Rome Railway & Light Company,
 Rome, Ga.

FOR SALE

Fare Boxes for Sale

40 Johnson registering fare boxes. In excellent operating condition. Greatly reduced prices. For immediate shipment address Nelson P. Hall, Sales Agency, 14 East Jackson Blvd., Chicago, Ill.

Immediate Shipment

100 tons of 62 lb. Shanghai rails, together with bars, rails practically as good as new, ready for quick shipment. Wire for prices.

M. K. FRANK

Frick Building, Pittsburgh, Pa.

85 lb. A. S. C. E. Relays

16,000 tons—with Angle Bars to match. Available immediate shipment and centrally located.

We positively own these Rails and offer same in carload lots and over.

25,000 tons—Relayers—sizes 25 lb. to 100 lb., in stock our Pittsburgh yards and vicinity.

Immediate shipment guaranteed and prices very attractive.

Carload and less than carload inquiries and orders solicited.

Rails cut to length for structural purposes.

Frogs, Switches, Bolts, Nuts, Spikes and all Accessories.

L. B. FOSTER COMPANY

Park Bldg. Pittsburgh, Pa.

CLEVELAND ARMATURE WORKS

Cleveland, Ohio

Everything in the Line of Repairs to Electrical Machinery

Complete Armatures, New Armatures, Rewound Armature Cores, Armature Shafts, Armature Coils, Fields and Commutators.

Established 22 Years.

MISCELLANEOUS WANTS

Wanted at Once

For immediate shipment any quantity of battery lead plates, sediment scrap copper and wire, brass and all other grades of scrap material. Write to us today for our prices. National Metal & Rubber Co., 31 India Wharf, Boston, Mass.

POSITIONS WANTED

AS superintendent, train master or chief train dispatcher, with a good interurban company. 17 years' experience in operating department of electric and steam railways. Best reference. P. W. 1542 (Utah), Elec. Ry. Journal, San Francisco.

POSITION as superintendent or assistant superintendent of electric railway. Have experience as superintendent, pro tem, of large interurban and city railway and dispatcher of same. Best of references furnished upon request. P. W. 1551 (Pa.), Elec. Ry. Journal, Philadelphia.

POSITIONS WANTED

OPERATING man, 45, with fifteen years' successful experience as Superintendent and General Superintendent, short line roads, open for engagement on steam or electric line. P. W. 1543 (Cal.), Elec. Ry. Journal, San Francisco.

SUBSTATION and overhead superintendent also experienced in shop work. Good interurban record, 18 years' experience, 10 years in last position. P. W., 1520 (Ill.), Elec. Ry. Journal, Chicago.

SUPERINTENDENT—Competent operating executive thoroughly conversant with modern practice. 20 years' experience in high-speed single track and city operation. Now employed, but desirous of assuming greater responsibilities. Correspondence solicited. P. W., 1535 (N. Y.), Elec. Ry. Journal, N. Y. C.

BUSINESS OPPORTUNITIES

Offices Available

For immediate occupancy, 1200 sq. ft. of office space in The Engineering Building, Liberty St., N. Y. Unobstructed view from all sides. Ideal location for engineering company or manufacturers' representative. B. O., 1550 (N. Y.), Elec. Ry. Journal.

POSITIONS VACANT

DRAFTSMAN wanted for Master Mechanic's office. Must have good electrical and mechanical knowledge. State salary expected. Man over 31 years old preferred. P. 1544 (Pa.), Elec. Ry. Journal, Philadelphia.

TRACK supervisor wanted for city and interurban road. Give details of past experience, together with age, salary expected and references in first letter. P. 1549 (Pa.), Elec. Ry. Journal, Phila.

WANTED: Man for armature winding and all kinds of electrical repairing. Pay 37c. per hour. P. 1541 (Pa.), Elec. Ry. Journal, Philadelphia.

AGENTS AND SALESMEN

Salesman Wants Position

Buyer now connected with large corporation wishes position as salesman for manufacturing company. An especially fitted to handle hardware or tools. Can furnish unlimited references; not particular as to territory. S., 1548 (Mo.), Elec. Ry. Journal, Chicago.

EMPLOYMENT AGENCIES

Correspondence Service

The undersigned provides a confidential service designed to locate openings through correspondence for men earning not less than \$2,500 and up to \$25,000; all lines. Not an employment agency, but a constructive, initiative service, covering individual negotiations. Established 1910. Complete privacy assured; present connections in no way jeopardized. Send name and address only for explanatory details. R. W. Bixby, H1 Niagara Square, Buffalo, N. Y.

READY - REFERENCE INDEX

to products manufactured by advertisers in this issue of Electric Railway Journal

More than 300 different products are here listed.
The Alphabetical Index (see eighth page following) gives the page number of each advertisement.

As far as possible advertisements are so arranged that those relating to the same kind of equipment or apparatus will be found together.

This ready-reference index is up to date, changes being made each week.

If you don't find listed in these pages any product of which you desire the name of the maker, write or wire Electric Railway Journal, and we will probably furnish the information.

- Acetylene Apparatus.**
(See Cutting Apparatus, Oxy-Acetylene.)
- Advertising, Street Car.**
Collier, Inc., Barron G.
- Air Cleaners.**
Horne Mfg. Co.
- Air Rectifiers.**
Horne Mfg. Co.
- Alloys and Bearing Metals.**
(See Bearings and Bearing Metals.)
- Alloys, Steel and Iron.**
Titanium Alloy Mfg. Co.
- Anchor, Guy.**
Electric Service Supplies Co.
Holden & White, Inc.
Ohio Brass Co.
Union Electric Co.
Westinghouse Elec. & M. Co.
- Anti-Climbers.**
Railway Improvement Co.
- Automobiles and Buses.**
Brill Co., The J. G.
- Axles.**
National Tube Co.
- Axle Straighteners.**
Columbia M. W. & M. I. Co.
- Axles, Car Wheel.**
Bemis Car Truck Co.
Brill Co., The J. G.
Carnegie Steel Co.
St. Louis Car Co.
Standard Steel Works Co.
Westinghouse Elec. & M. Co.
- Babbling Devices.**
Columbia M. W. & M. I. Co.
- Badges and Buttons.**
Electric Service Supplies Co.
International Register Co., The
- Bankers and Brokers.**
National City Co.
- Batteries, Storage.**
Electric Storage Battery Co.
- Bearings and Bearing Metals.**
Ajax Metal Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Eureka Co.
General Electric Co.
Kerschner Co., Inc., W. R.
Long Co., E. G.
St. Louis Car Co.
Westinghouse Elec. & M. Co.
- Bearings, Center.**
Baldwin Locomotive Works.
Holden & White, Inc.
- Bearings, Roller and Ball.**
Gurney Ball-Bearing Co.
Railway Roller Bearing Co.
- Bearings, Roller Side.**
Holden & White, Inc.
- Bells and Gongs.**
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
St. Louis Car Co.
- Benders, Rail.**
Niles-Bement-Pond Co.
Zelnicker Sup. Co., W. A.
- Blow Torches for Soldering and Brazing.** (See Cutting Apparatus, Oxy-Acetylene.)
- Blowers.**
General Electric Co.
Westinghouse Elec. & M. Co.
- Boilers.**
Babcock & Wilcox Co.
- Boiler Cleaning Compounds.**
Dearborn Chemical Co.
- Boiler Tubes.**
National Tube Co.
- Bond Clips.**
Electric Railway Improvement Co.
- Bond Testers.**
American Steel & Wire Co.
- Bonding Apparatus.**
Electric Railway Improvement Co.
Ohio Brass Co.
- Bonding Tools.**
American Steel & Wire Co.
Electric Railway Improvement Co.
Electric Service Supplies Co.
Ohio Brass Co.
- Bonds, Rail.**
American Steel & Wire Co.
Electric Railway Improvement Co.
Electric Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Union Electric Co.
Westinghouse Elec. & M. Co.
- Bonds, Welded.**
Lincoln Bonding Co.
- Book Publishers.**
McGraw-Hill Book Co., Inc.
- Boring Tools, Car Wheel.**
Niles-Bement-Pond Co.
- Braces, Rail.**
Kilby Frog & Switch Co.
- Brackets and Cross Arms.** (See also Poles, Ties, Posts, Etc.)
Bates Expanded Steel Truss Co.
Electric Service Supplies Co.
Hubbard & Co.
Lindsay Bros. Co.
Ohio Brass Co.
- Brake Adjusters.**
Holden & White, Inc.
Smith-Ward Brake Co.
- Brake Shoes.**
Amer. Brake Shoe & Fdy. Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Long Co., E. G.
St. Louis Car Co.
- Brakes, Brake Systems and Brake Parts.**
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
Holden & White, Inc.
Horne Mfg. Co.
Long Co., E. G.
St. Louis Car Co.
Union Electric Co.
Westinghouse Trac. B. Co.
- Brooms, Track, Steel or Rattan.**
Zelnicker Supply Co., W. A.
- Brush Holders.**
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Eureka Co.
- Brushes, Carbon.**
American Carbon & Battery Co.
General Electric Co.
Jeandron, W. J.
Morgan Crucible Co.
Westinghouse Elec. & M. Co.
- Brushes, Graphite.**
Dixon Crucible Co., Jos.
- Bumpers, Car Seat.**
Electric Service Supplies Co.
- Bushings, Case Hardened and Manganese.**
Bemis Car Truck Co.
- Bushings, Fibre.**
Diamond State Fibre Co.
- Buttons.** (See Badges and Buttons.)
- Cables.** (See Wires and Cables.)
- Carbon Brushes.** (See Brushes, Carbon.)
- Car Equipment.** (For Fenders, Heaters, Registers, Wheels, etc.—See those headings.)
- Car Stops—Automatic.**
Consolidated Car Heating Co.
- Car Trimmings.** (For Curtains, Registers, Doors, Seats, etc.—See those headings.)
- Cars, Passenger, Freight, Express, etc.**
American Car Co.
Brill Co., The J. G.
Jewett Car Co.
Kuhlman Car Co., G. C.
St. Louis Car Co.
Stephenson Co., John.
Wason Mfg. Co.
- Cars, Second Hand.**
Electric Equipment Co.
Kerschner Co., Inc., W. R.
- Cars, Self-Propelled.**
Electric Storage Battery Co.
General Electric Co.
- Castings, Brass.**
Columbia M. W. & M. I. Co.
Eureka Co.
Frankel Connector Co.
- Castings, Composition or Copper.**
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Eureka Co.
Horne Mfg. Co.
- Castings, Gray Iron and Steel.**
Amer. Brake Shoe & Fdy. Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Horne Mfg. Co.
Long Co., E. G.
St. Louis Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
- Castings, Malleable and Brass.**
Amer. Brake Shoe & Fdy. Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Horne Mfg. Co.
Long Co., E. G.
St. Louis Car Co.
- Catchers and Retrievers, Trolley.**
Eclipse Railway Supply Co.
Electric Service Supplies Co.
Holden & White, Inc.
Horne Mfg. Co.
Kerschner Co., Inc., W. R.
Long Co., E. G.
Ohio Brass Co.
Union Electric Co.
Wood Co., Chas. N.
- Ceiling, Car.—(See head lining.)**
- Charging Sets, Storage Battery.**
General Electric Co.
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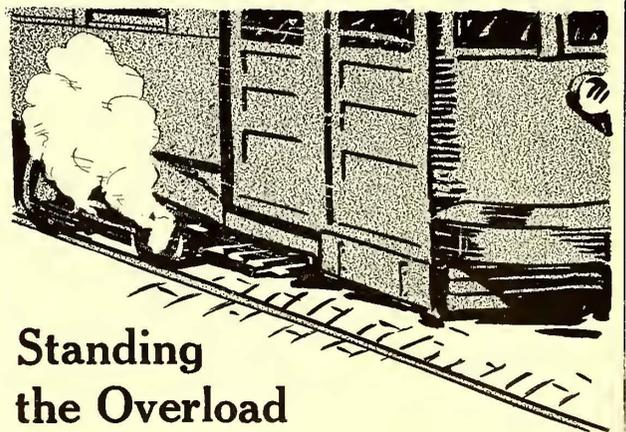
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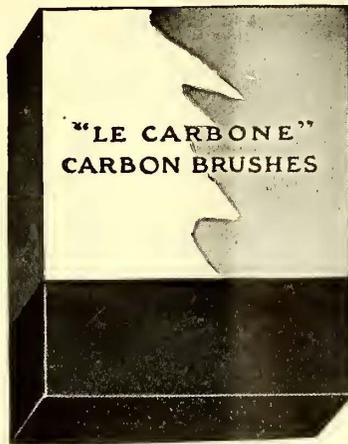
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If you are,
 write us
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You get more than simply
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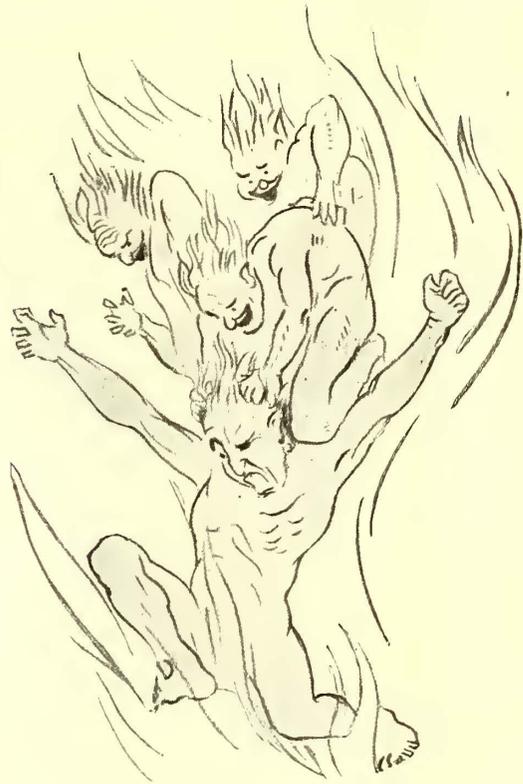
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Inshallah

It's a bad breach of religious obligation for an Arabian to say that he is going to do a thing without preceding the remark with "Inshallah"—meaning, Allah willing.

He feels secure in his actions when this prefix is used, and particularly does he rely on it when undertaking some unfamiliar venture.

This is all very commendable in its place, but it has been imposed on by makers of cheap carbon brushes who blindly put a run-of-mill set of brushes on a machine and trust to Deity that they'll work out.

Now, the laws of electricity are largely *engineering* laws and it isn't efficiency to call on a higher executive to protect one against transgression of those laws.

That's why Morganite carbon brushes are sold under *engineering* prescription.

We are able, ready and willing to see Morganite brushes through to a successful finish without outside help.

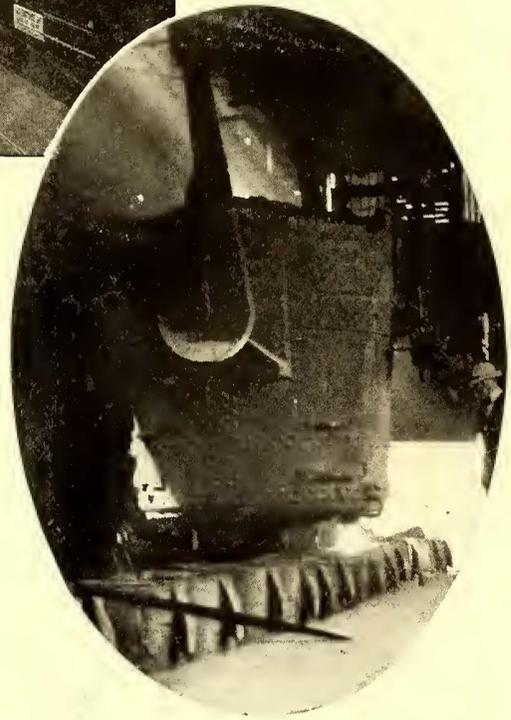


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Since 1910 the Los Angeles Railway has bought 19,000 tons of Titanium-treated rail, most of it for 116 lb. heavy service section.

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GURNEY

What you gain by reducing friction

FRICITION changes useful power to worse than useless heat and causes "hot boxes."

Friction makes necessary frequent oiling with its large expense for labor and lubricant.

Friction wears out bearings, causing rubbing of armatures, improper meshing of gears, noisy operation and other troubles too numerous to mention.

The use of Gurney Ball Bearings for reducing friction eliminates most of the power loss and all the "hot boxes."

It reduces lubrication expense and troubles due to worn bearings to a point where they are almost negligible.

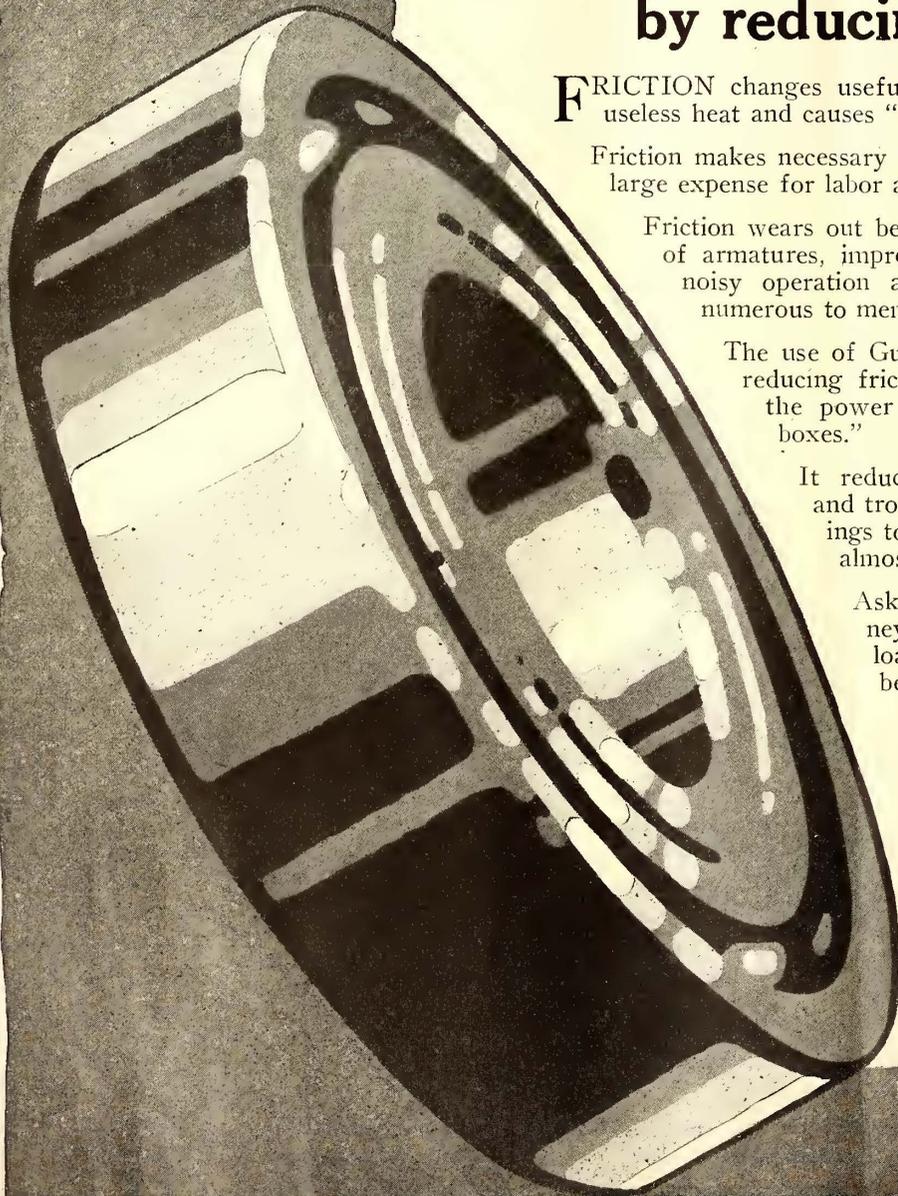
Ask us to explain why Gurney Bearings carry bigger loads than any other ball bearings of equal size.

**Gurney Ball
Bearing Co.**

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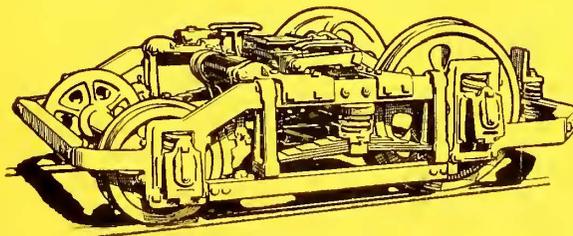
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The Lightest of All Trucks

Judged by the numbers built each year, the Brill Single Motor Truck, 39-E, has been the foremost truck in the electric railway field for the last seven years. The reason is plain. It is a city truck and the big city systems of the world operate a larger number of cars by far than the other classes of electric railways together, and as they use mostly double-trucks and need the type of truck that gives the highest service and greatest economy, the majority of them have chosen the 39-E as their standard. As it is subjected to very considerably less weight and strain than the double-motor truck, the single-motor type is of lighter construction. Weight, too, is saved by the use of pony wheels and their smaller axles. Less weight and single-motor equipment means less initial cost, less operating cost and less maintenance cost for both trucks and motors.

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BRILL

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The success of the commutating pole generator on G-E motor generators used in heavy railway service is well known.

For extremely heavy service the G-E Generators are now equipped with compensating pole-face windings.

The Butte, Anaconda & Pacific, the Chicago, Milwaukee & St. Paul and the Eastern Michigan Power Company motor generators are notable examples of this type.

Other G-E motor generator sets recently built for railway service are as follows:

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Benton Harbor & St. Joe Railway	- - - - -	1- 500 KW
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Columbus Ry. Pr. & Lt. Company	- - - - -	1- 750 KW
Detroit Edison Company	- - - - -	6- 1000 KW
Detroit United Railway	- - - - -	2- 1500 KW
El Paso Electric Company	- - - - -	1- 300 KW
Great Western Pr. Company	- - - - -	3- 2000 KW
Holyoke St. Ry. Company	- - - - -	1- 500 KW
Lincoln Traction Company	- - - - -	1- 500 KW
Nashville Rwy. & Lt. Company	- - - - -	1- 2000 KW
Pittsburgh, Harmony, Butler & New Castle Ry.	- - - - -	2- 500 KW
Public Service Elect. Company	- - - - -	1- 1000 KW
Public Utilities Company	- - - - -	1- 1000 KW
Rockland, Thomaston & Camden St. Ry.	- - - - -	1- 400 KW
Spokane & Inland Empire Railway	- - - - -	1- 2000 KW
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One of the 32-2000 and 1500 KW, 3000 Volt Motor Generator Sets for C-M & St. P. Electrification