

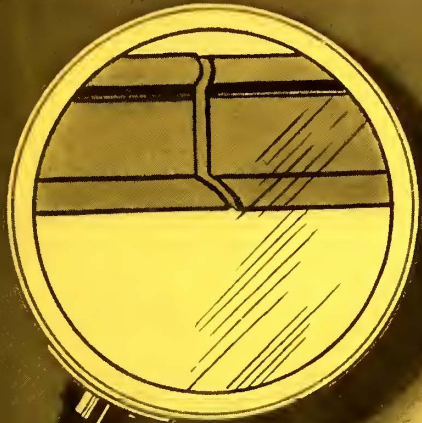
ELECTRIC RAILWAY JOURNAL

New York, July 7, 1917

McGraw-Hill Publishing Co., Inc.

Vol. 50, No. 1

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"Nip It in the Bud"

Cupped joints and track corrugations never cure themselves. In the beginning every one of these track defects is small and when small do little harm. But they are *bound* to grow worse every time a wheel rolls over them. If *promptly* cared for with a



Reciprocating Track Grinder

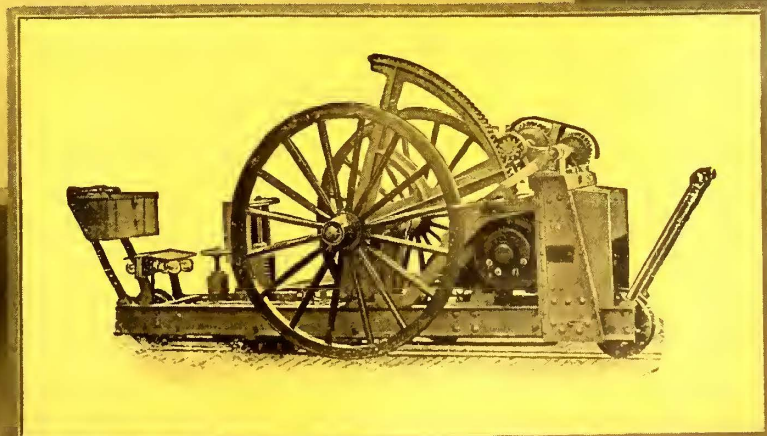
the cost of removing them is relatively insignificant.

Ignored, they burden rolling stock with undue wear—loosen bolts in cars and track—destroy track foundation—cause discomfort to passengers—and the deeper they get the more costly they are to grind out.

Delay in remedying these defects simply means *added* expense.

You can demonstrate the value of a Reciprocating Grinder on your track at our risk.

They are giving satisfaction the world over.



Railway Track-work Co.

30th and Walnut Sts., Philadelphia, U. S. A.



A Real Railroad Without Steam

The aggressiveness of the Toledo & Western Railroad has made it the pride of the territory which it serves. This is evidenced by their business boosting, and is further proven by their most recent addition of a 60-ton

Baldwin-Westinghouse Locomotive

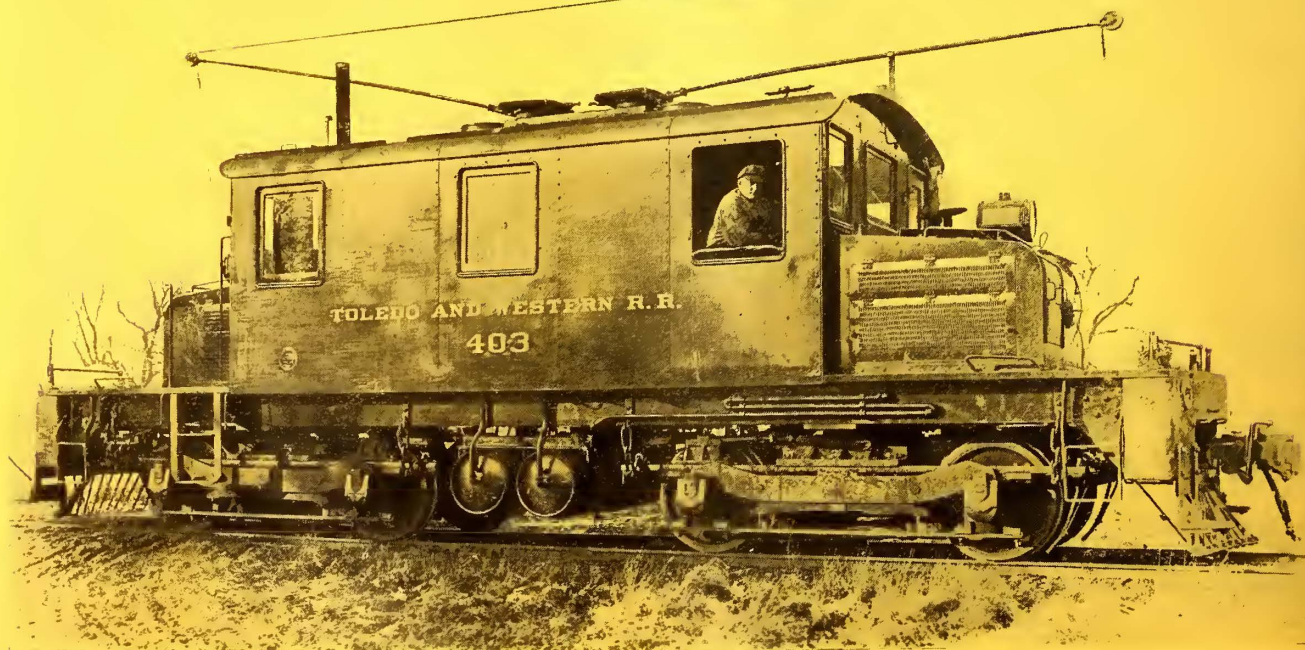
equipped with HL Control and quadruple No. 308-D5 Motors for 600 volts.

Address either company

The Baldwin Locomotive Works
Philadelphia, Pa.

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

731



ELECTRIC RAILWAY JOURNAL

H. W. BLAKE, Editor

VOLUME 50, No. 1

NEW YORK, JULY 7, 1917

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is built up on a basic one-piece body casting of great strength which contains air cylinders, crank case, motor housing and all journal bearings.

Permanent and positive alignment of all bearings.

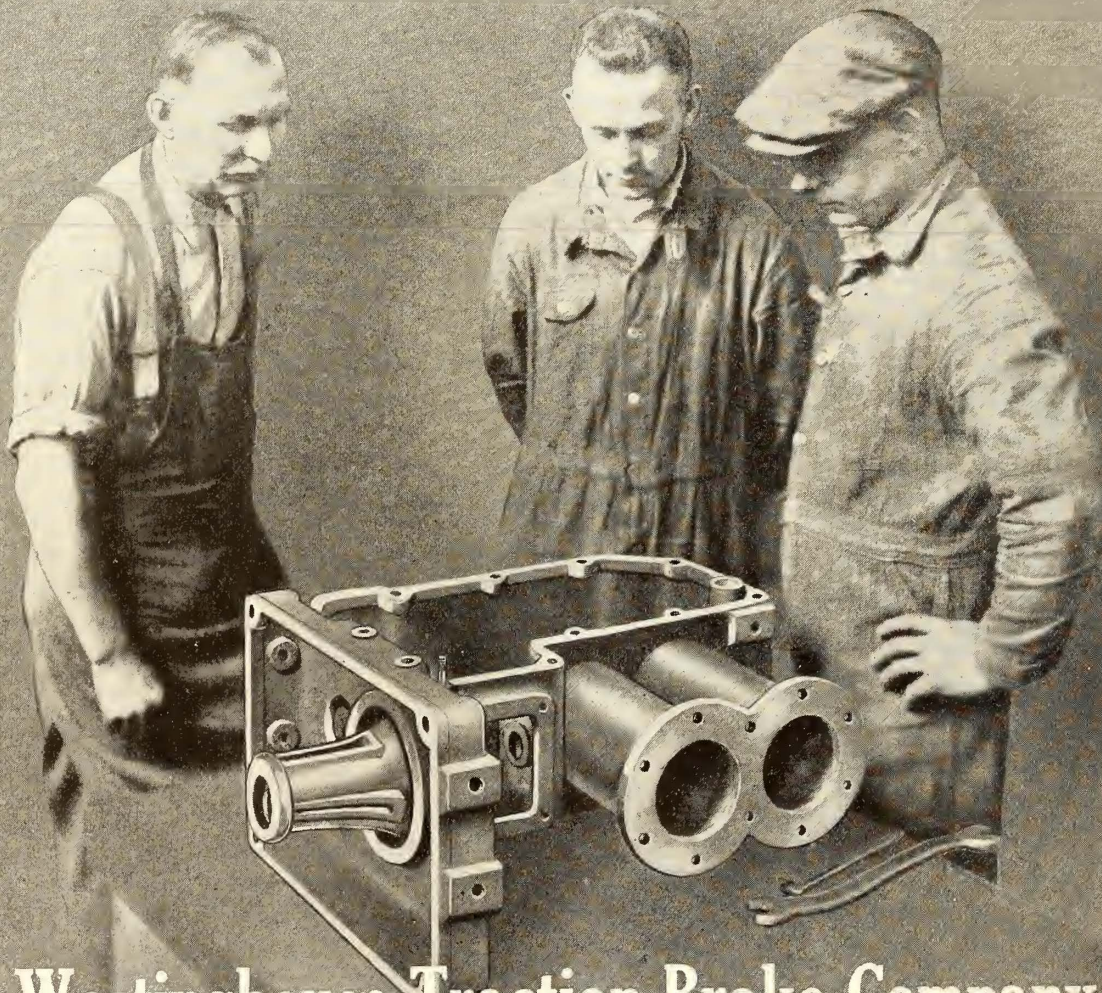
Absolute disappearance of reassembling troubles.

Combines greater simplicity and higher efficiency.

Decreases inspection and maintenance costs.

Capacities of 5, 10, 16, 38 and 50 cubic feet per minute.

For all classes of electric railway service. Send for D.C. Unit T-2016.



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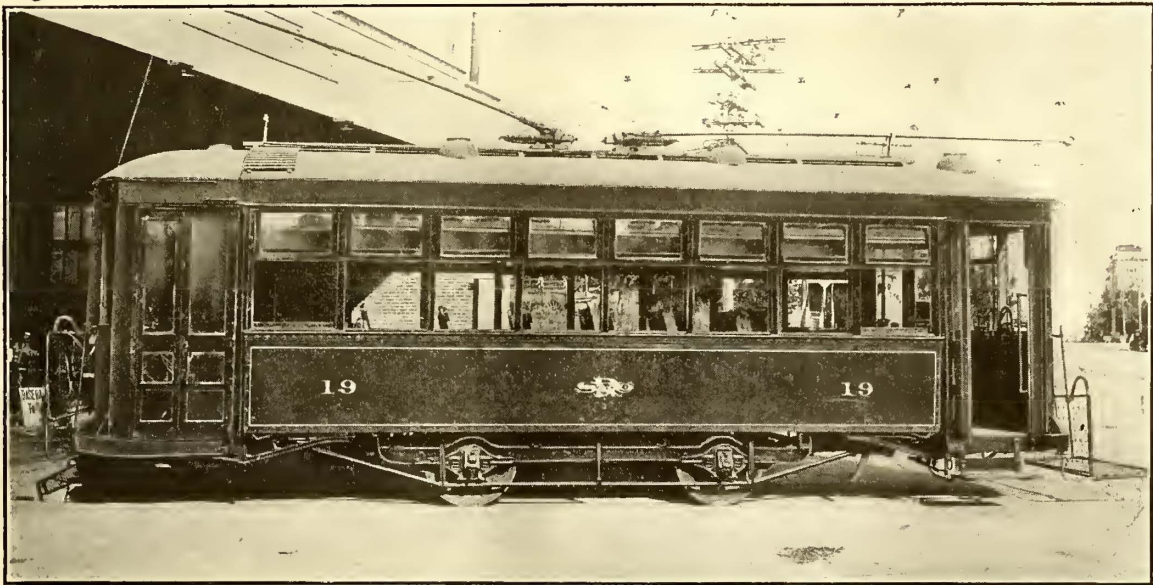
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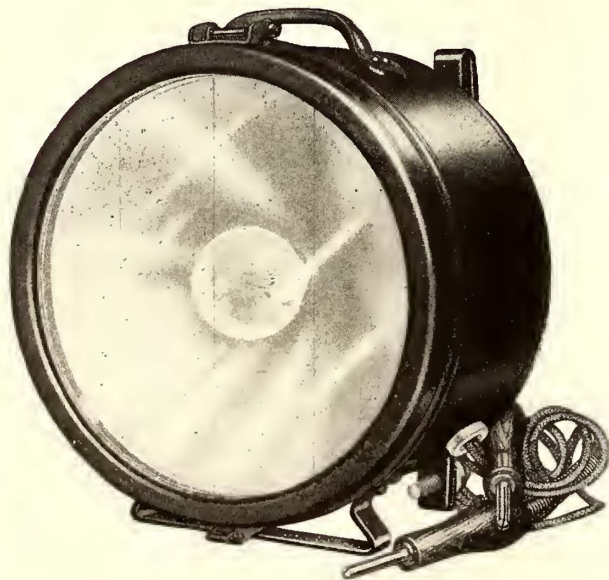
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For Maximum Illumination From the Incandescent Lamp



Type SDP
Imperial Incandescent Headlight
for Interurban Service

Incandescent Headlights are recommended for high speed service only when the voltage is well regulated because of the rapid decrease in efficiency of the lamp when the voltage drops.

Imperial Luminous Arc and Carbon Arc Headlights are practically unaffected by fluctuations in voltage.

Have you seen new catalog 201-202?

Crouse-Hinds Imperial Incandescent Headlights with Crystal Glass mirror reflectors send a clear, intense shaft of light (Crystal Ray) far down the track. Their coefficient of reflection is high and they utilize to the utmost all the power of the lamp.

Crystal Ray Reflectors are true parabolas accurately ground and polished on both sides, with a permanent silvering on the back. They retain all of their reflecting ability after long, hard service.

Another aid to efficient illumination is the simple focusing mechanism in Imperial Incandescent Headlights. It makes it easy to locate the lamp so the reflector can concentrate the light to the best advantage.

When it is desired Imperial Incandescent Headlights may be furnished for

Gold Ray (yellow light) produced either by a gold glass reflector or by Noglare glass in the door.

Sterling Ray (white light) produced by polished metal reflector.

But for maximum illumination from a given lamp—Crystal Ray.

The Ohio Brass Co.
Mansfield, Ohio



O-B Cleveland Splicing Ear (Patented), 21 inches long
(Also made 30 inches long)

Plenty of Service from This Splicer

Compare the cross-section of an O-B Cleveland Splicer to the section of trolley wire. The cross-sectional area of the bronze is a little over three times as great as that of the copper. Even after the hardest wear there is still plenty of metal left to take the strain. It is a splicer which you may install and forget.

Tough as they are, the lips are ductile. Notice how smoothly they fit around the wire.

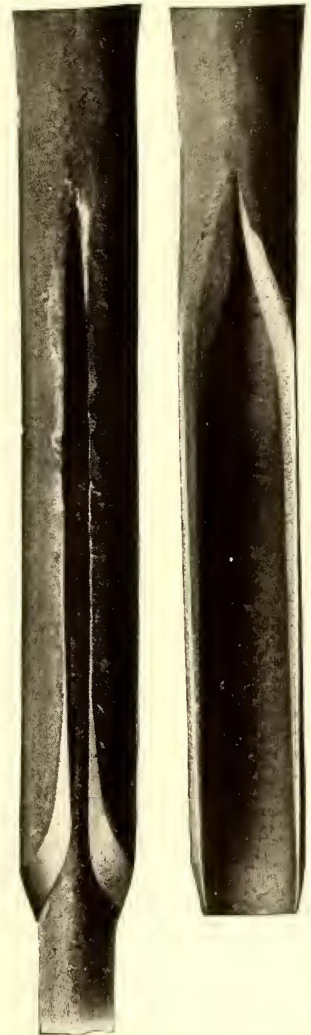
O-B Cleveland Splicers

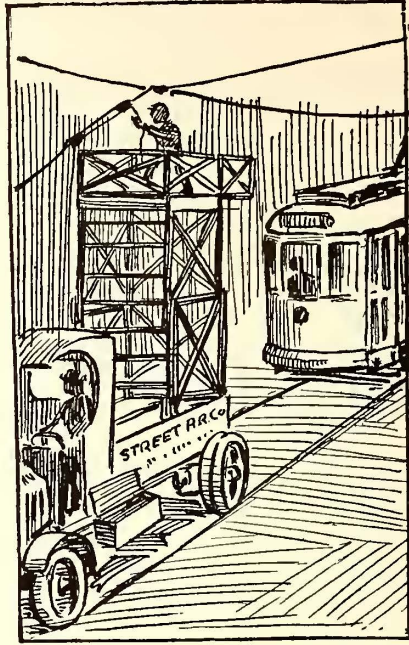
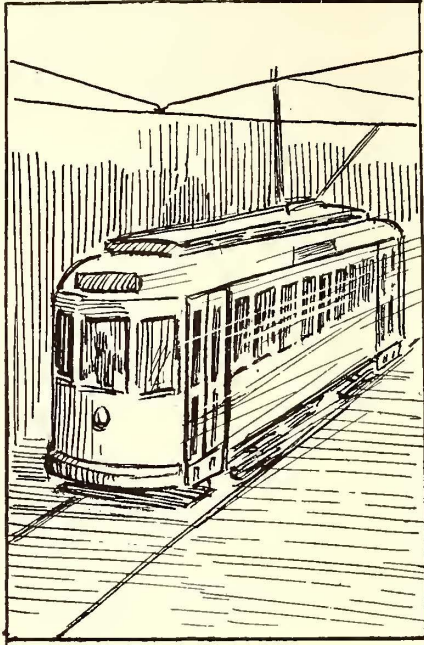
have the "Lily" approach. When the lips are hammered around the wire they make a smooth, gradual arc-reducing approach for the wheel. The illustration shows the peculiar design (patented) of the lips.

A still better way to find out is to send a trial order. You undoubtedly will see the advantage of the O-B Cleveland Splicer at once. Then when it goes up on the wire your judgment will be justified.

There are other O-B Splicers. Each is for a certain definite set of conditions. Pages 176-184, catalog No. 16.

The Ohio Brass Co.
Mansfield, Ohio





Save 40% on wire cost and maintenance and eliminate trips of the emergency trucks

Aristos "COPPERWELD" Copper Clad TROLLEY Wire

combines the conductivity of copper with the strength of steel.

Copperweld wears uniformly and stays up twice as long as ordinary copper.

Fewer breakdowns mean better adherence to schedules.
Let us tell you how.

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Eastern Sales Office:
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30 Church St., New York

Made from the product of COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by

PAGE WOVEN WIRE FENCE COMPANY

MONESSEN, PA.

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 Chicago, Rock Island & Pacific Ry.
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 Northern Ohio Traction & Light Co.
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Terre Haute, Indianapolis & Eastern Traction

If your company's name is not in the list it should be. These companies are protecting their crossing frog investments.

Let us show you why, and how moderate the cost.

Prompt deliveries made from stock.

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Manufacturer of Steel Twin Ties and Crossing Foundations

General Sales Office and Works: Cleveland, Ohio

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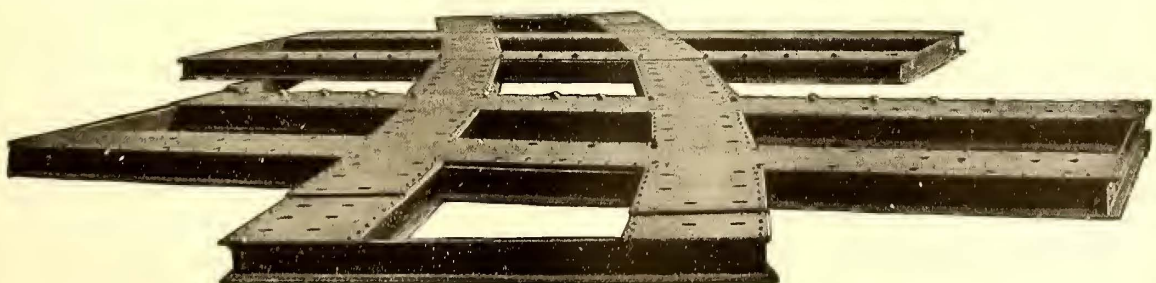
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J. E. Lewis & Co.,
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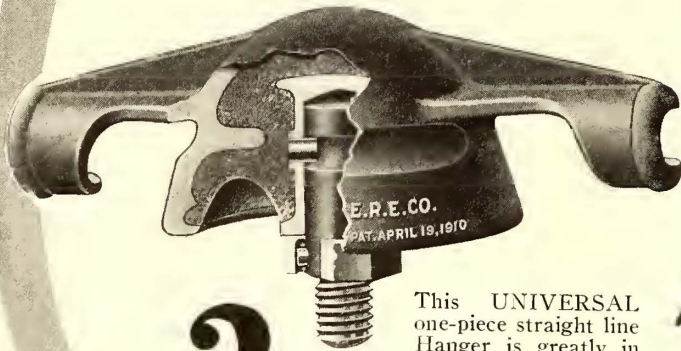
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 Philadelphia.

William H. Ziegler,
 Minneapolis, Minn.





1 UNIVERSAL double curve Hanger, the only one-piece insulated pull-over now on the market. A great improvement over malleable iron yoke and separate insulators.



2 This UNIVERSAL one-piece straight line Hanger is greatly in advance of the old solid stud three-piece Hangers. The revolving stud permits loss of ear to be drawn up tight against the Hanger face, relieving the threads from strain and insuring correct alignment of ear.



3 UNIVERSAL Hanger arranged for single curve pull-over. The patented revolving stud permits line ears of any length to be attached to Hanger without the necessity of having removable arm as is required in similar Hangers with solid studs.

CONSIDER

the Three UNIVERSAL Hangers shown on this page. They are worthy of your best attention.

They are one-piece Hangers, so that the disadvantages of the old three-piece Hangers are done away with.

Each Hanger has the revolving stud as an integral part of its construction. In your next order for trolley line material you'll specify these Hangers, especially if heavy suspension work on curves is to be undertaken.

Write now for further particulars.

Electric Railway Equipment Co.

Cincinnati, Ohio

New York: 30 Church St.



“That’s what I Call a Finished Job”

Finished because with “Protected” Rail Bonds the soft copper strands and terminals make fitting and compression a simple job to do neatly.

Finished because the “Shot-Over” Sleeves permanently protect the strands from the effects of vibration at the point where they emerge from the terminal.

Rebonding is expensive—use “Protected” bonds in the first place—just as they are doing here.

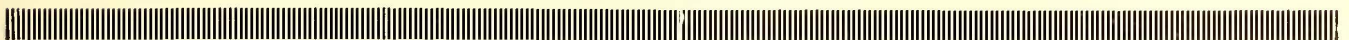
ELECTRIC SERVICE SUPPLIES Co. *Manufacturer of Railway Material and Electrical Supplies*

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17th and Cambria S.s.

NEW YORK
53 Church St.

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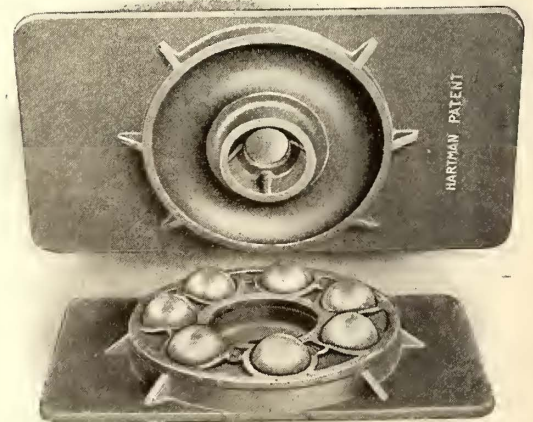
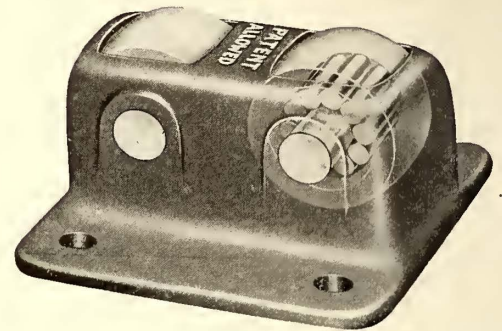
Canadian Distributors: Lyman Tube & Supply Co., Ltd., Montreal, Toronto



These Roads Are Reducing Flange Wear on Old Cars by Installing Perry-Hartman Bearings

These bearings practically double the life of wheels, cut in half pull-ins for wheel renewals, decrease nosing, lessen flange and rail wear, reduce power consumption on curves, eliminate lubrication costs. The following roads are using them on both old and new cars and repeat orders testify as to service. Over 200,000 are in daily service. These railroads know the results—

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Buffalo & Lake Erie Traction Co.
Calgary Railway
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Chambersburg, Greencastle & Waynesboro Street Ry. Co.
Chicago Elevated Railways
Chicago, South Bend & Northern Indiana Ry. Co.
Chicago & West Towns Railway Company
Cleveland & Eastern Traction Company
Cleveland & Erie Railway Company
Cleveland, Painesville & Eastern R.R. Co.
Colorado Springs & Interurban Railway Company
Denver Tramways Company
Des Moines City Railway Company
East St. Louis & Suburban Railway Company
Evanston Railway Company
Evansville Railways Company
Evansville Public Utilities Company
Fonda, Johnstown & Gloversville R.R.
Ft. Wayne & Northern Indiana Traction Co.
Ft. Wayne & Northwestern Railway Company
Gary & Interurban R. R. Company
Harrisburg Railways Company
Houghton County Traction Company
Lake Shore Electric Railway Company
Lehigh Valley Transit Company
Louisville Railway Company
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Maryland Electric Railways Company
Mason City & Clear Lake R. R. Company
Michigan Railway Company
Newport News & Hampton Ry., Gas & Elec. Co.
New York, Westchester & Boston Ry. Company
Northern Texas Traction Company
Oakland, Antioch & Eastern Railway
Ogden, Logan & Idaho Railway Company
Oklahoma Railway Company
Philadelphia Rapid Transit Company
Salt Lake & Utah R. R. Company
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Scranton Railway Company
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Don't wait for new cars to show you Perry-Hartman bearing economies—they fit almost any old truck. Send for catalogue and dimension data sheet.

**Put Them On
Your Old Cars**

Holden & White Inc.

Electric Railway Distributors for the Joliet Railway Supply Company

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

“IMPERIAL” PNEUMATIC TAMPERS AT DENVER



The Report States:

“The labor cost is only 1/3 that of hand tamping. As yet the company (Denver Tramway Co.) hasn't gone into relative costs when the overhead investment is taken into consideration. However, the labor cost is \$10.00 per day for the machines: for the same amount of tamping by hand it would be \$30.00, so the overhead will not begin to balance it.”

“Imperial” Tamping means more and better work with less labor and at less cost.

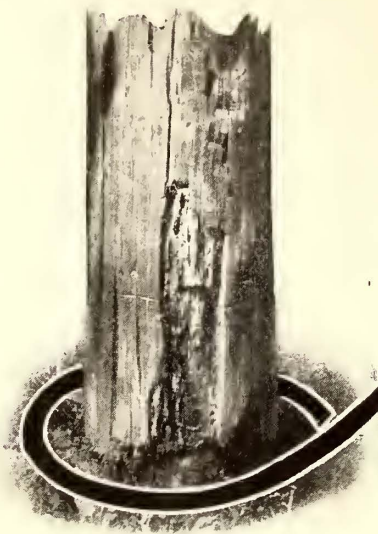
*Ask for a copy of
Bulletin 9023*

INGERSOLL-RAND COMPANY

11 Broadway, New York
165 Q. Victoria St., London

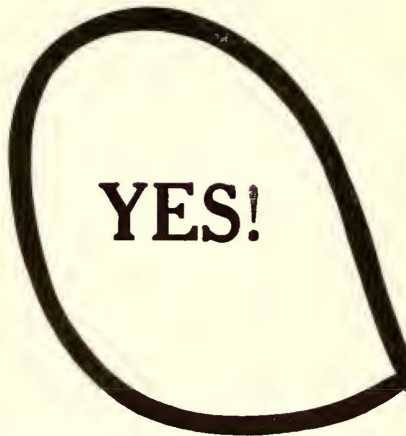
Offices the world over





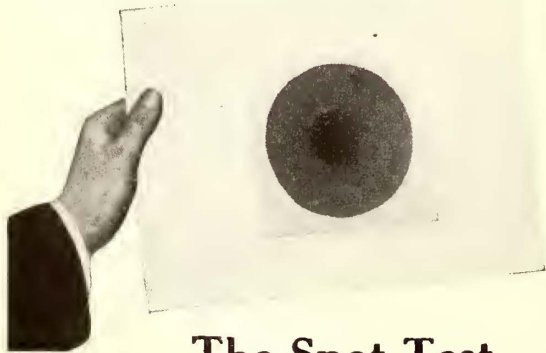
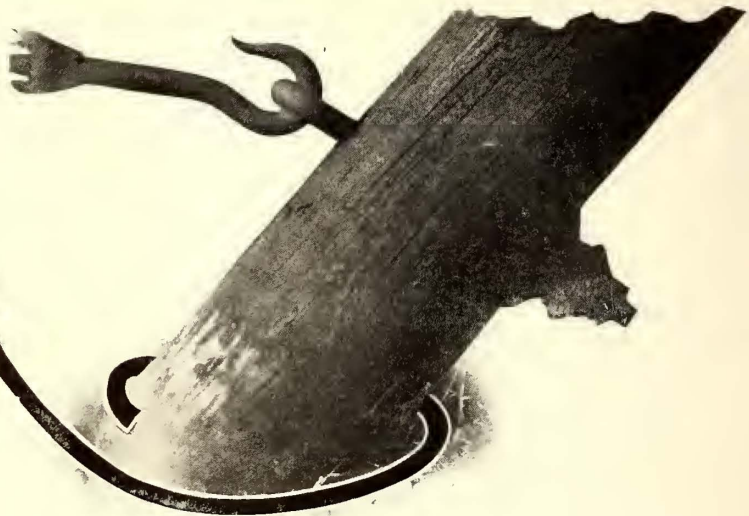
NO!

This pole has not been treated with a preservative to prevent decay or dry rot. It speaks for itself. It tells the story of an economic waste that is easily preventable.



YES!

This pole has been treated with a Wood Preservative. It has been in service longer and under more severe service conditions than the pole shown above. It tells the tale of long service, no replacement, no labor or maintenance expense.



The Spot Test

You can easily detect impurities in a coal-tar preservative by placing a few drops on clean white blotting paper. The impurities gather in a spot in the center and in a short time their presence is clearly defined in a distinct zone. Try this test: Remember that these impurities are of no value, that they are a hindrance to the action of the preservative, that they represent a high percentage of cost from which you get no return. Try this test on the Reilly Preservative.

**REILLY
Improved Wood Preservative**

for open tank and brush treatment

This preservative enters into the very fibers of the wood and there it stays. The purity of the Reilly Improved Wood Preservative insures its effectiveness, stability and permanence. This preservative makes positive the long service life of Poles, Cross Arms, Ties and Structural Timbers.

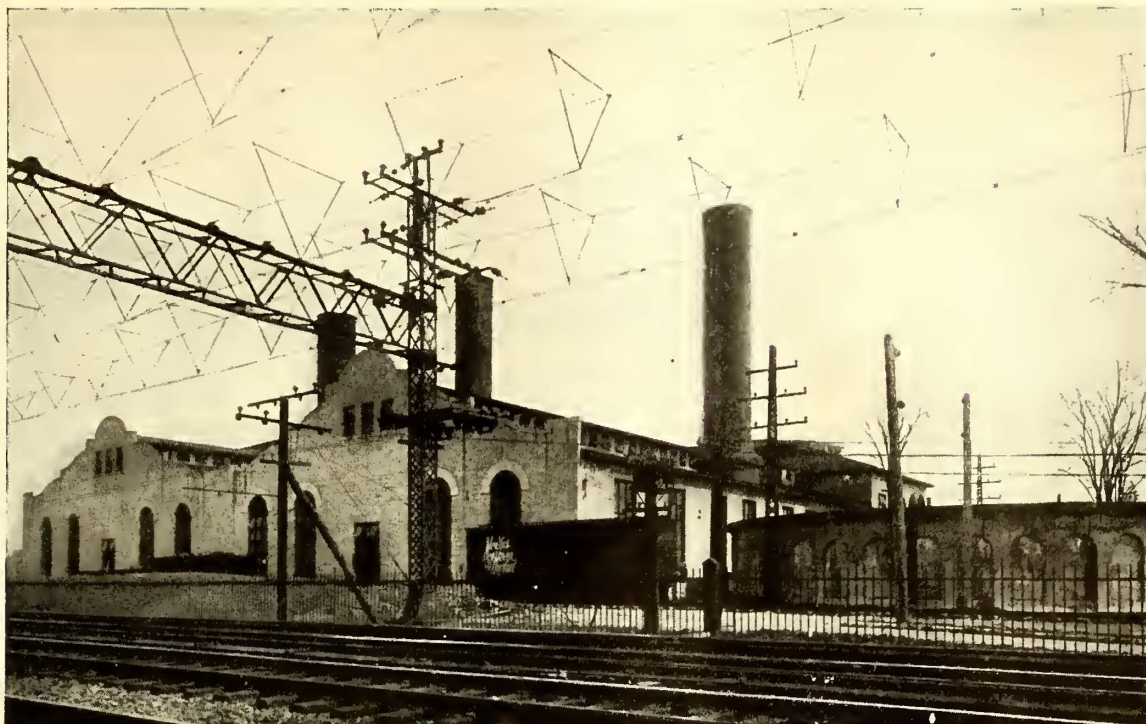
We can furnish this specially treated standard timber or any treated special material on short notice. Reilly Improved Wood Preservative can be supplied in any quantity from a gallon to a carload. Let us know your problem. We can supply valuable information to help you in its solution.

"It Stays in the Wood"

REPUBLIC CREOSOTING CO.

Indianapolis, Ind.

Plants: Indianapolis Mobile Minneapolis Seattle



Phono-Electric

—the Trolley Wire of Long Life

Now a New Haven Standard

Eight years of heavy electric railroad-ing have proved to the New Haven that for clean-cut, reliable current collection Phono-Electric is unexcelled.

The first Phono-Electric wire was put up in 1908 on about 4 miles on one of the tracks between Larchmont and Portchester. It is still up, and in fine condition.

The remarkable resistance to wear of the Phono-Electric contact wire in New Haven service is particularly

noteworthy, because it is subject to scraping from pantograph collectors, which have been roughened by running under the old sections of steel contact wire.

The New Haven's opinion is reflected by two facts:

Phono-Electric supersedes steel as new wire becomes necessary.

Phono-Electric is used for new work.

Bridgeport Brass Company
Bridgeport **Connecticut**

Protect and Direct Your Traffic with "UNION" Signals

The TDB System of signaling fulfills all the requirements of electric railway single track operation. It provides head-on protection and at the same time permits two trains to move in the same direction, each protected by a separate signal between turnouts.

The Union Switch & Signal Co.

Founded by Geo. Westinghouse 1881.

SWISSVALE, PA.



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NEW YORK

Peoples Gas Bldg.
CHICAGO

Canadian Express Bldg.
MONTREAL

Candler Annex
ATLANTA

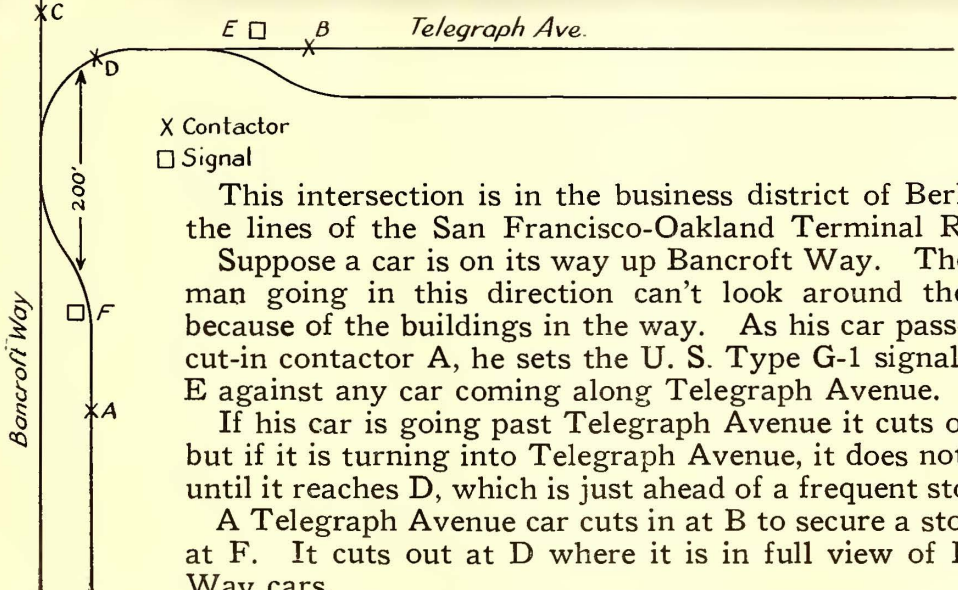
Railway Exchange Bldg.
ST. LOUIS MO.

Pacific Bldg.
SAN FRANCISCO

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



Where U. S. ELECTRIC SIGNALS *permit opposing cars to pass every two minutes*



This intersection is in the business district of Berkeley on the lines of the San Francisco-Oakland Terminal Railways.

Suppose a car is on its way up Bancroft Way. The motorman going in this direction can't look around the corner because of the buildings in the way. As his car passes under cut-in contactor A, he sets the U. S. Type G-1 signal marked E against any car coming along Telegraph Avenue.

If his car is going past Telegraph Avenue it cuts out at C; but if it is turning into Telegraph Avenue, it does not cut out until it reaches D, which is just ahead of a frequent stop.

A Telegraph Avenue car cuts in at B to secure a stop signal at F. It cuts out at D where it is in full view of Bancroft Way cars.

United States Electric Signal Company

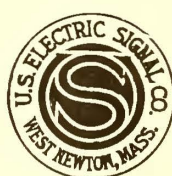
West Newton, Massachusetts

Representatives:

Western: Frank F. Bodler, Monadnock Bldg., San Francisco

Chicago: Warren Moore Osborn, McCormick Bldg.

Foreign: Forest City Electric Service Supply Company, Salford, Eng.



A Manufacturer writes:

[From an article by L. W. Horne on "Selling Costs Should Be Reduced"]
in the Electric Railway Journal.

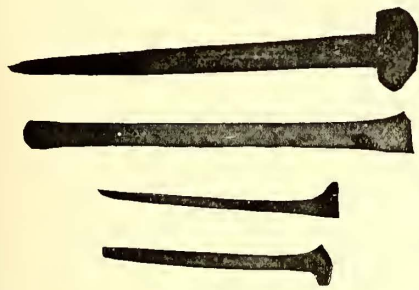
"In many cases the master mechanic or superintendent of equipment does not see this card or any other advertising literature *because it is destroyed by some clerk* in the department before it is called to the attention of the men actually interested." Note our italics.

The Electric Railway Journal is the one great carrier of your advertising sales message that runs no danger of submarining by the office boy!

**ELECTRIC RAILWAY
JOURNAL**

invariably goes directly to your customers

Pure Iron For Long Service



Pure Iron Nails from the Coffin of a Soldier buried in 1792 at Ft. St. Clair, Ohio, and exhumed in 1892. After 100 years in the ground they are practically unharmed by rust. Analysis shows that they are 99.83% pure iron

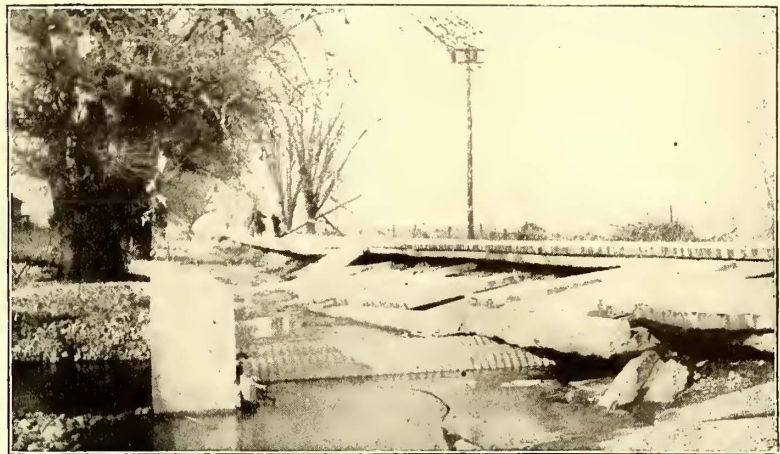
A Century in the Ground Has Not Harmed These Pure Iron Nails.

A Revolutionary soldier was buried at Fort St. Clair, Ohio, in 1792. A hundred years later the body was exhumed. The wooden coffin had almost wholly disappeared, but the nails with which it was fastened were sound and strong—almost unharmed by rust.

Analysis shows them to be **iron of high purity (99.83%)**. Manganese, Copper and Sulphur are almost entirely absent.

The "Armco" Iron Corrugated Culverts here pictured were installed in Butler County, Ohio, in 1907. In 1916 a tremendous rise of the near-by river washed away the roadway, and left the pipes exposed.

The iron is today in perfect condition after ten years of hard service. This material is guaranteed to contain **at least 99.84 per cent pure iron.**

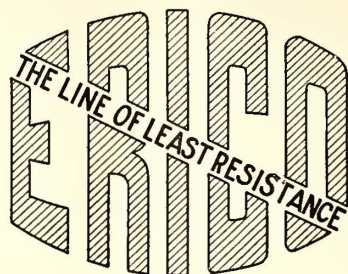


ARMCO IRON Resists Rust

because it is the **purest** and most **even** iron on the market. Every phase of its production is governed with the utmost care and skill. It is The Iron That's Made to Last.

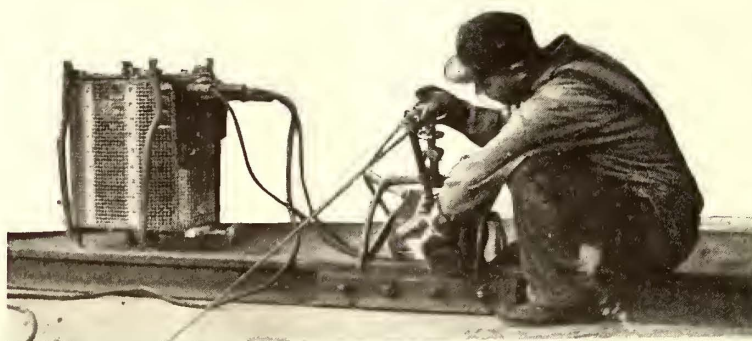
Write the Nearest Manufacturer for full information on Rust-Resisting "Armco" Iron Culverts, Flumes, Siphons, Sheets, Roofing and Formed Products

- | | | | |
|--|--|---|--|
| Arkansas, Little Rock
Dixie Culvert & Metal Co. | Kansas, Topeka
The Road Supply & Metal Co. | Nebraska, Lincoln
Lee-Arnett Co. | Pennsylvania, Warren
Pennsylvania Metal Culvert Co. |
| California, Los Angeles
California Cor. Culvert Co. | Kentucky, Louisville
Kentucky Culvert Mfg. Co. | Nebraska, Wahoo
Nebraska Culvert & Mfg. Co. | South Dakota, Sioux Falls
Sioux Falls Metal Culvert Co. |
| California, West Berkeley
California Cor. Culvert Co. | Louisiana, New Orleans
Dixie Culvert & Metal Co. | Nevada, Reno
Nevada Metal Mfg. Co. | Tennessee, Nashville
Tennessee Metal Culvert Co. |
| Colorado, Denver
R. Hardesty Mfg. Co. | Maryland, Munsey Bldg., Baltimore.
Wm. M. Baker | New Hampshire, Nashua
North-east Metal Culvert Co. | Texas, Dallas
Wyatt Metal Works |
| Delaware, Clayton
Delaware Metal Culvert Co. | Massachusetts, Palmer
New England Metal Cul. Co. | New Jersey, Flemington
Pennsylvania Metal Culvert Co. | Texas, El Paso
Western Metal Mfg. Co. |
| Florida, Jacksonville
Dixie Culvert & Metal Co. | Michigan, Bark River
Bark River Bridge & Cul. Co. | New York, Auburn
Pennsylvania Metal Culvert Co. | Texas, Houston
Lone Star Culvert Co. |
| Georgia, Atlanta
Dixie Culvert & Metal Co. | Michigan, Lansing
Michigan Bridge & Pipe Co. | North Dakota, Wahpeton
Northwestern Sheet & Iron Works | Utah, Woods Cross
Utah Corrugated Cul. & Flume Co. |
| Illinois, Springfield
Illinois Corrugated Metal Co. | Minnesota, Minneapolis
Lyle Corrugated Cul. Co. | Ohio, Middletown
American Rolling Mill Co. | Virginia, Roanoke
Virginia Metal Culvert Co. |
| Indiana, Crawfordsville
W. Q. O'Neal Co. | Minnesota, Lyle
Lyle Corrugated Cul. Co. | The Ohio Corrugated Culvert Co. | Washington, Spokane
Spokane Cor. Culvert & Tank Co. |
| Iowa, Des Moines
Iowa Pure Iron Culvert Co. | Missouri, Moberly
Corrugated Culvert Co. | Oklahoma, Shawnee
Dixie Culvert & Metal Co. | Wisconsin, Eau Claire
Bark River Bridge & Culvert Co. |
| Iowa, Independence
Independence Culvert Co. | Montana, Missoula
Montana Culvert & Flume Co. | Oregon, Portland
Coast Culvert & Flume Co. | |
- Canada: Canada Ingot Iron Co., Ltd., Guelph, Sherbrooke, Winnipeg, Calgary.



The Erico Portable Welder

**Permits No Flame or Arc to Strike
the Bond or Rail**



In the Erico Portable Welder the heat required for the application of the Erico Bond to the rail is transmitted from an electrode through a graphite block or plate which bears against the bond terminal, thus preventing those injuries which are liable to be caused by permitting a flame or arc to come into contact with either the bond or the rail.

The Electric Railway Improvement Co.
Cleveland

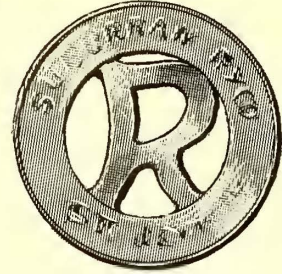


Whether It's a

Straight
5-Cent
Rate

—OR—

A reduced
Rate
Ticket



The Johnson System *handles both with equal ease*

Because the Johnson Fare Box automatically counts, on separate cyclometers, two different denominations of metal tickets as well as the nickels, dimes and pennies that are deposited in the hopper.

The metal ticket-tokens, which are made in two different sizes, are counted and indicated on two different indicators, while the cash fares are shown on another indicator. A fourth indicator totalizes all of the fares collected.

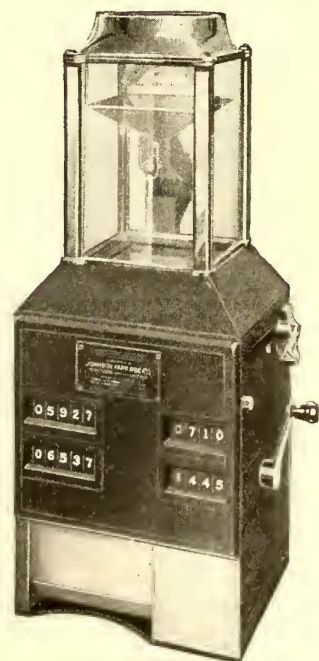
All fares are deposited in one hopper. After registration the metal tickets are at once available for resale and the cash for making change.

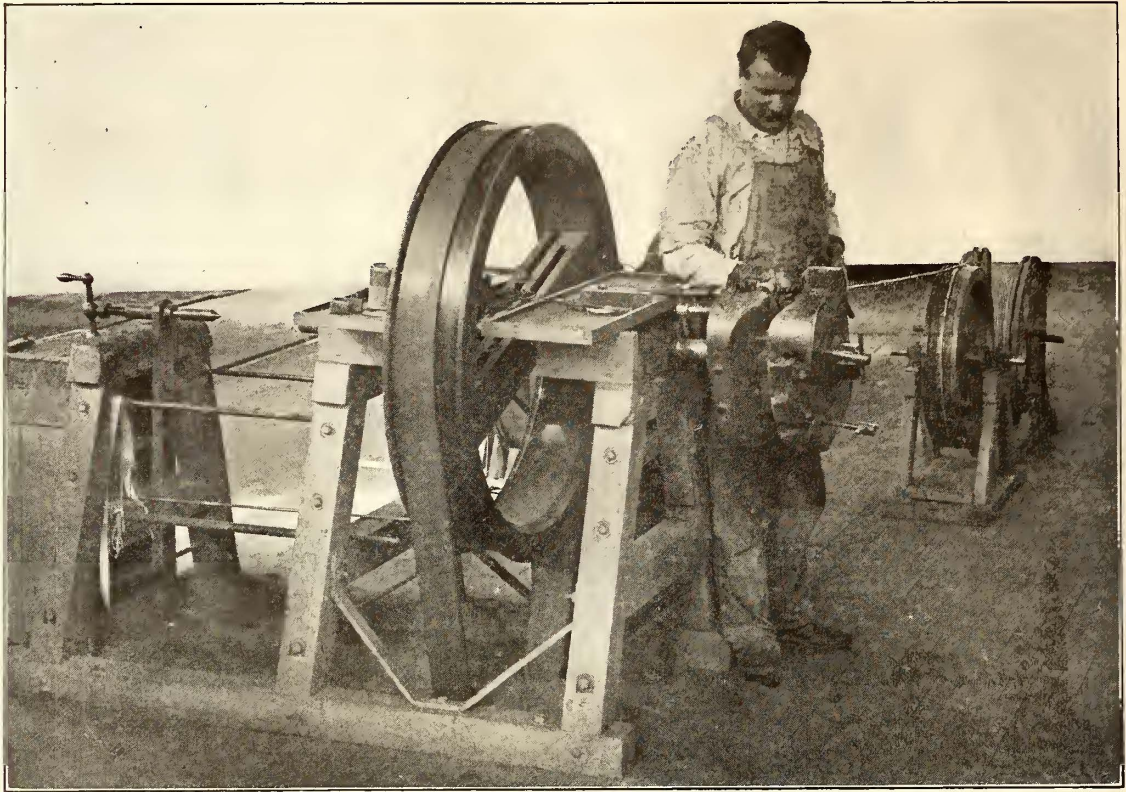
So many large, important electric railways have found in the Johnson System the final answer to their fare collection problems that we feel justified in asking for permission to work with and for you, too.

Johnson Fare Box Company

Jackson Boulevard and Robey St., Chicago

50 East 42nd Street, New York





In the electrical shop of the Los Angeles Railway.

What Deltabeston Did at Los Angeles

Prior to 1912 the Los Angeles Railway used asbestos cotton-covered magnet wire on one of its chief types of motors.

As the cotton disintegrated through overheating, the field coil windings loosened and the asbestos covering broke down because of vibration in the coils.

You know what this meant: Excessive use of energy due to weak fields; overheating; carbon-

ization of armature windings and flash-overs of commutators—in two words, high maintenance.

Minimum motor maintenance was attained and kept with the aid of 12,000 lb. of No. 3 Deltabeston wire!

You, too, can keep down your maintenance costs, whether for old or new motors, by the use of these famous products—

Deltabeston Wire—Delta Tape—Delta Sheeting

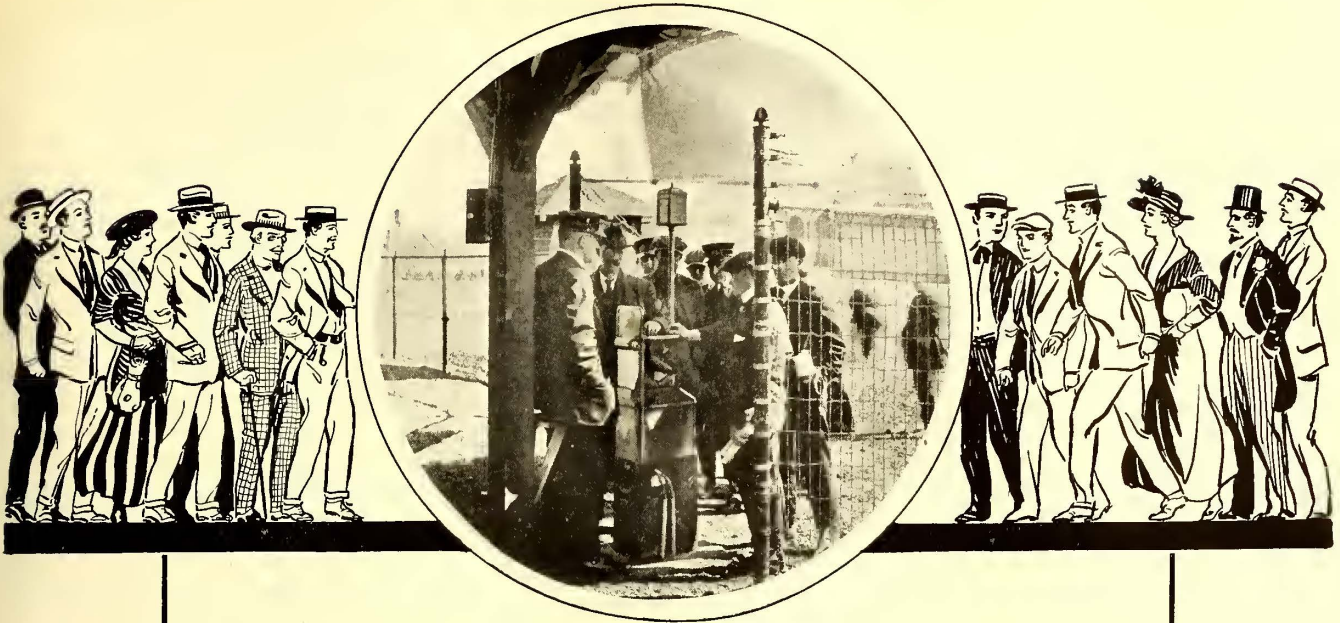
Write for our wire Catalog No. 5-J.



D & W FUSE CO.

PROVIDENCE, R. I.





International *Motor-driven* STATION REGISTERS ARE IDEAL FOR PARK AND STATION BUSINESS

The wasteful and slow ticket-chopping system has no excuse for living since the advent of the International Motor-Driven Station Registers.

With these registers, the large percentages of people who have the exact change for fare or fee can pass on immediately, thus eliminating paper and ENCOURAGING PATRONS TO SAVE THEIR OWN TIME AS WELL AS YOURS.

As a railway man you don't have to be told what this means when you have to handle a crowd that wants to be at the ball grounds before the first pitch.

Among other installations,

International Motor-driven Station Registers

made possible the quick handling of 400,000 rabid baseball fans at the last World's Series; of many thousands of visitors at the Springfield (Mass.) Agricultural Fair in 1916; and now two

El Motor-driven Station Registers have just been ordered for Diversey Beach, Lincoln Park, Chicago

By using these Internationals, the Park Commissioners will be sure that none of the dimes for bathing suits or lockers will go astray, aside from the satisfaction of serving the sweltering Chicagoans faster than in the past.

How many uses have you for International Motor-Driven Station Registers?

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

The Bonham Traffic Recorder

Permits the most economical and most satisfactory distribution of interurban mileage

THE gross earnings from your inter-urban line or even the number of fares of each classification are a poor guide to the distribution of service.

For instance, the gross earnings may remain practically unchanged and yet the amount of riding in different sections may have changed considerably.

A record of fare classifications might show this tendency, but it would not and could not show **between** what fare points the changes were taking place.

Only the Bonham Traffic Recorder shows from trip to trip and from day to day where the passengers come from and where they go to. In other words, **THE BONHAM TRAFFIC RECORDER**

Month	Day	Train	Div	Total Cash	Total Pass
02	08	12	2	10958	11988
	<i>On</i>		<i>Off</i>	<i>Miles</i>	<i>Cash</i>
30		37		3.5	7
37		91		27	
37		91		27	
37		91		27	
37		91		27	
37		91		27	
37		46		4.5	9
37		57		10	
37		57		10	
37		57		10	
37		57		10	
37		57		10	
57		68		5.5	11
57		91		17	34
57		91		17	34
68		91		11.5	
68		91		11.5	23
68		91		11.5	23
78		91		6.5	13
88		91		1.5	5
02 08 12 2				10967	12008
<i>H S Lake</i>					

Offers a Continuous Traffic Survey



Operating One of the Setting Rods

which enables its users to adjust the car service to the demands of the public—giving, say, an hourly service on one section, a two-hour service on another section, and so on, thereby

*Satisfying the
Passengers
and Eliminating
Waste Mileage*

**The Bonham
Recorder Co.**

Hamilton, Ohio

SOUTH COVINGTON & CINCINNATI ST. RY. CO.							
STREET CAR ECONOMY METER RECORD							
LINE <u>LUDLOW</u>		CAR TYPE <u>314-318, Wt. 21,200</u> <u>Brill Trucks</u>					
PERIOD FROM <u>Oct. 16, 1916</u> TO <u>Oct. 31, 1916</u> INCL.							
ROUND TRIP <u>9.11</u> MILES		SCHEDULE SPEED <u>9.11</u> M. P. H.					
RUN <u>Regular</u>							
Day	MOTORMAN	CAR NO.	MILEAGE	K W HS	AV. K W HS PER MILE	W W PER CAR MI.	FIGURE OF MERIT
Day	Flerlage, H	290	91	165	128	1.81	77.8
	Meyer, H	315	1127.8	1523	1590	1.35	104.3
	Chowning, W	316	1182.4	1803	1665	1.57	89.7
	Pfeiffer, J	317	636.7	926	897	1.41	97.1
	Weisenbach, A	318	1370.3	1739	1931	1.27	110.8
Trippers	Wagner, J.	290	92.6	171	130	1.85	76.1
	Ballard, H	315	1213.1	1680	1709	1.38	102
	Ogden, W	316	1204.0	1706	1696	1.43	98.5
	Ellis, J	317	840.3	1284	1183	1.53	92.0
	Sweeney, C	318	1094.7	1450	1542	1.33	105.9
Subs	Butler, J.	317	91.0	145	128		
	Crawford, W	318	92.6	130	130		
	Goodridge, C	317	91.0	142	128		
	Jones, W	318	134.8	212	190	1.57	89.7
	Worster, F	318	101.7	119	143	1.17	120.3
TOTALS			9364.0	13195			
LINE AVE. K. W. H. PER C. M. THIS PERIOD.				1.408			
" " " " " LAST PERIOD.				1.437			
" " " " " First				1.576			
" " " " " 6000 PERIOD 1916-1917				1.985			
Test Value				1.985			

South Covington & Cincinnati St. Ry. Co.

Saves Energy and Equipment by Using

ECONOMY METERS

The sample meter record shown here is reproduced from an article on the meter equipment of the South Covington & Cincinnati Ry. Co. published in "The United News"—a monthly magazine for employees.

Note that the K.W.H. per car mile has been reduced from 1.576 to 1.408, a saving of 10.66%. Further savings are expected as the campaign progresses.

The article concludes—"It is felt that the investment in Economy Meters will be justified for the following reasons:

"Safe car operation will be promoted.

"Comfort of the passengers will be increased.

"The interest in correct car operation will be stimulated, and this will be accompanied by a more careful attention to the car conditions, such as brake setting, bearing wear, motor armature trouble, etc., from which a very considerable saving will result.

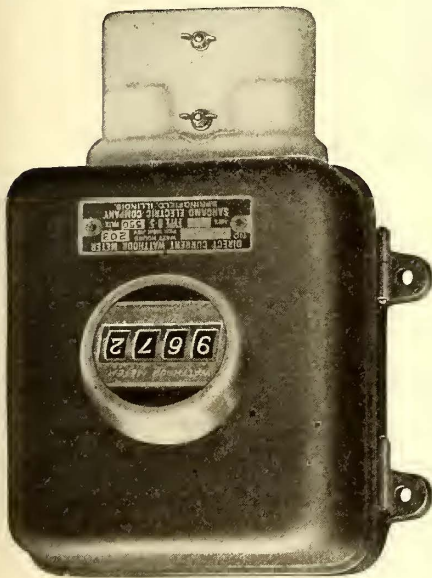
"It has been demonstrated that a saving in power is possible, the extent only of which is to be determined."

Why not promote similar economies for your company?

Sangamo Electric Company

Springfield, Illinois

Specialists in Meters for Every Electrical Need



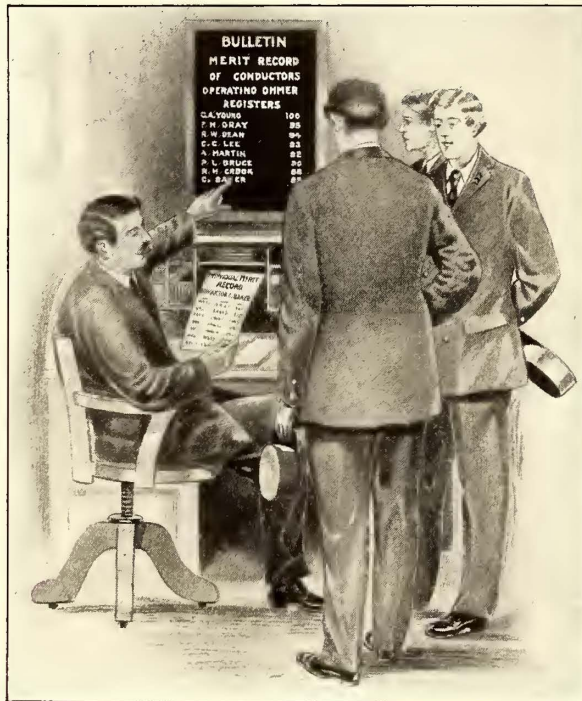
ECONOMY METERS

BUILT LIKE A WATCH

Human Engineering

"Problems in human engineering will receive during the coming years the same genius and attention which the nineteenth century gave to the more material forms of engineering."

—THOS. A. EDISON.



Mr. Edison's words are true. Successful electric railway men agree with him and we agree with him. We have solved one very important problem in human engineering, and the solution of that problem is the Ohmer System. The Ohmer System protects the income of electric railways. It reduces fare collecting to a scientific basis. The Ohmer System is not a machine. A machine, the Ohmer Fare Register, is only a part of it. The register does all that any machine can do or should do. It produces complete, accurate and untamperable

records of every transaction between passengers and conductor. It indicates the character of each transaction clearly and publicly. The Ohmer System allows human nature to work only in one direction, toward carefulness; honesty and efficiency. It prevents human nature from failing through temptation. It does this by making the conductor discover for himself that his best interests are served only when he serves his employer best. The Ohmer System is our triumph of human engineering.

Ohmer Fare Register Company
Dayton, Ohio



DURADUCT

Car Wiring Conduit

Is Easiest and Cheapest to Install

There are few jobs more tedious to the workman than making the scores of bends and threadings required in metal conduit for car wiring.

And every hour that your men require for conduit bending and threading has to be paid for.

The flexibility of Duraduct eliminates all this labor cost automatically.

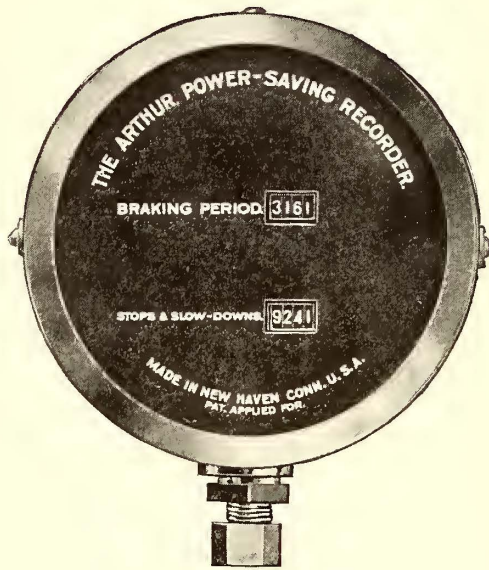
Because Duraduct is a non-raveling conduit which can be bent and cleated by hand to any desired curvature.

TUBULAR WOVEN FABRIC COMPANY
 MANUFACTURERS — PAWTUCKET, R. I.
 GENERAL SALES AGENT — A HALL BERRY
 71-73 Murray St., New York. 9 So. Clinton St., Chicago

Northern Electric Company Distributors for Canada
LIMITED

The Arthur Power

Saves Power, Brake Shoes of Operation by Encouraging



It achieves these results by automatically recording the amount of time in minutes for which brakes are applied and by recording the number of times brakes are applied during a run.

It is extremely simple. Entirely mechanical. Requires only one instrument per car.

It is held in place by a single screw and is connected to the train pipe by a short length of $\frac{1}{4}$ -inch pipe much in the same way as the

Its advantages may be

It encourages coasting

for the motorman soon learns that under equal conditions the man who coasts the most must of necessity have his brakes on the least.

It eliminates unnecessary stops and slow downs

as instance when one car follows a preceding car too closely.

It therefore saves power

by indicating the operator who uses the least power for maintaining a given schedule.

It develops safety

by maintaining proper headway

The operator soon learns that following a preceding

car too closely forces him to more frequent use of brakes and makes a bad record for him, when compared with a man who has exercised greater caution.

It checks excessive speed

A motorman soon learns that unnecessary "speeding up" entails more frequent and longer brake applications, which give him a bad record on both dials.

It encourages use of hand brake at end of run

This essential safety rule is often neglected by motormen. Its observance when the Arthur Power-Saving Recorder is in use gives the operator a better record. In fact, in this instance as in others, the motormen who observe the rules most closely get the best record.

If interested in power-saving, investigate the merits of

"The power wasted at the brakeshoes is the

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

-Saving Recorder and Wheels, Increases Safety Motormen to Run Cars Properly

pressure gauge is connected. Absolutely no auxiliary equipment is needed, and the complete cost of labor and material for installation is very small.

It is in service on 200 cars of the Connecticut Company, and its use is now being extended to cover the whole system of this company, i.e., it will shortly be in operation on practically all cars in the State of Connecticut.



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

summarized as follows:

“Fanning the air”

One of the worst habits of a motorman is “fanning the air,” as it is called. This consists in throwing the brakes on and off when making a stop instead of stopping smoothly. This results in the uncomfortable jerking about of passengers, and in addition wears away brake valves, seatings, governors, compressors, compressor motors, etc. It also wastes compressed air and wastes power by requiring the more frequent pumping up of the reservoir. All of this is annoying and wasteful. The Recorder checks this, for each time a motorman “fans the air” the device registers one against him, as well as lengthens his braking period. The device effectively eradicates this bad habit.

It encourages the use of sand on slippery rails and so lessens the possibility of flat wheels.

It educates operators to take frogs and switches at proper speed and so decreases risk of derailments.

It teaches motormen to observe condition of equipment closely and report defects promptly.

It gives motormen an incentive to observe the rule for draining air tanks when car goes to barn and consequently decreases risk of injury to piping and tanks during freezing weather.

It operates uniformly on any car without regard to size or weight of car, gear ratios, wheel diameters, and thereby greatly simplifies clerical work in figuring and keeping motormen’s records.

It does the work and does it well, being mechanically simple, with few parts to get out of order, both its first cost and maintenance cost is relatively low.

this new Recorder. Its simplicity will appeal to you.

true index of the motormen’s relative efficiency”

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

The Arthur Power-Saving Recorder

Saves Power, Brake Shoes of Operation by Encouraging



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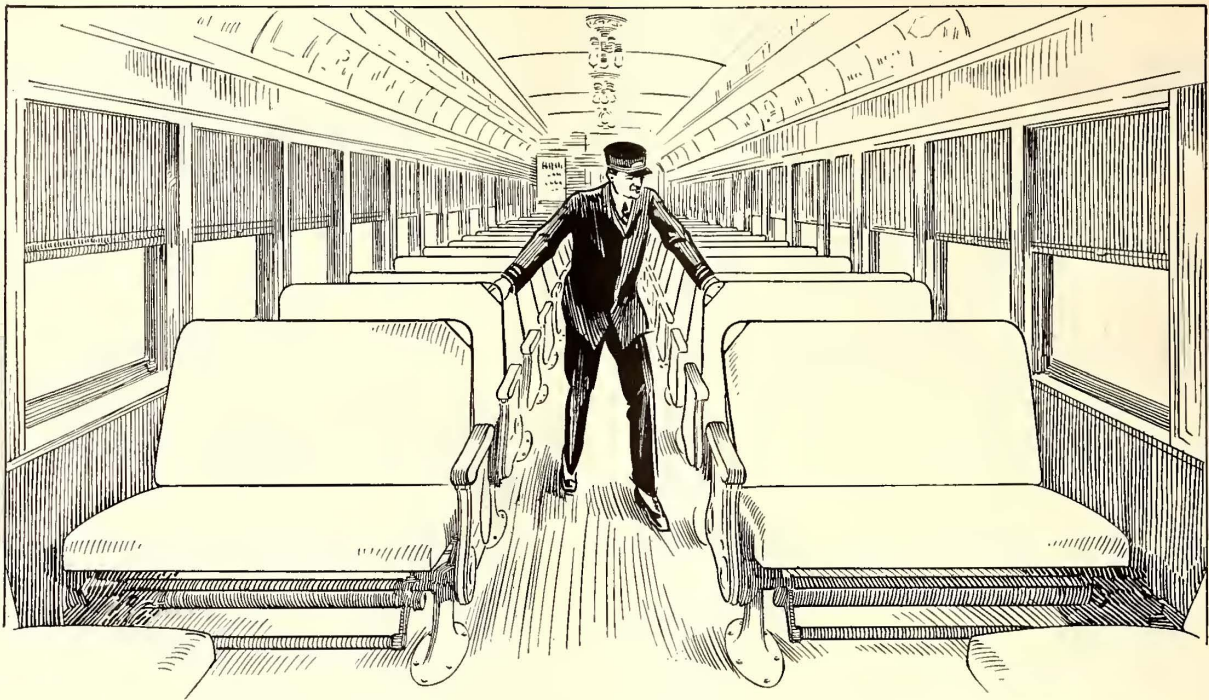
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The Arthur Power-Saving Recorder Co.
New Haven, Conn.



SLAM! BANG! CRASH!!

Ever watch conductors rush through a car at the end of a run to reverse the cross-seats?

Isn't it a fact that many of them look upon this job as something to be done with all the brute force at their command?

That kind of mauling thirty to thirty-five times a day, ten thousand times or more a year, can be withstood successfully only by

Hale and Kilburn "Walkover" Reversing Mechanism

This is not an empty claim. It is a fact that we have proved on a number of seats, by reversing them through an electrically operated arm. This arm actually reversed the back with much more force than would be exerted by the ordinary conductor.

234,000 COMPLETE REVERSALS
backward and forward, of the Hale & Kilburn No. 400 seat were obtained in one test, without

injury to the seat; while 202,600 complete reversals were obtained with the Hale & Kilburn No. 300 seat before the first indication of wear.

If you want to avoid jammed seat-backs, you want Hale & Kilburn mechanism—the only seat mechanism which has been found capable of withstanding more than 200,000 reversals without trouble—a record well ahead of the useful life of a car seat.

Hale and Kilburn "Walkover" Seat Mechanism Calls for Least Maintenance

Pioneers in Steel Trim for Passenger Cars, including interior finish, steel doors, etc.



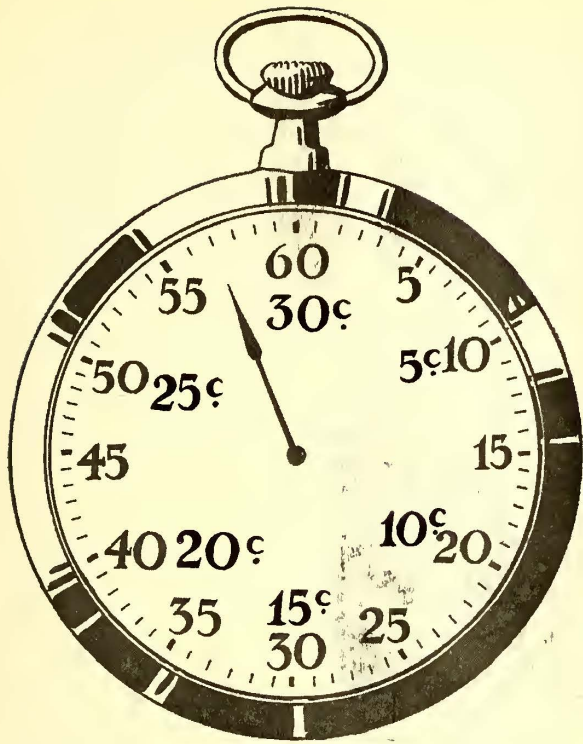
Hale and Kilburn Co.

PHILADELPHIA
WASHINGTON

NEW YORK
ATLANTA

CHICAGO
SAN FRANCISCO





Equip Your Lines
Completely with

National Pneumatic Door and Step Control

To Cut Running Time and Get More Car Miles

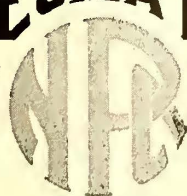
The **partial** adoption of National Pneumatic Door and Step Control means much to the passengers and platform men on the individual cars equipped.

But to take full advantage of the reduction in stopping time made possible with National Pneumatic Control, **every** car on a given route should be equipped.

By lowering the stopping time of **all** cars instead of operating types with varying speed of passenger interchange, a faster, safer schedule is possible, with a resultant increase in car miles per hour.

NATIONAL PNEUMATIC COMPANY

50 Church St. New York



515 Laflin St. Chicago



Notice particularly the Headlining

THIS is an interior view of one of the new high-speed cars just put into service by the Jamestown, Westfield and North-Western Railroad.

Among several notable features which mark the efficiency and up-to-dateness of these cars is the use of

Nevasplit for Headlinings and Wainscoatings

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

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

What is Nevasplit

"Nevasplit" is waterproof and of minimum conductivity. It is absolutely uniform in texture. "Nevasplit" is NOT veneered lumber but wood fibre in the highest form of refinement, possessing constructional features and beauty of appearance that makes its use an

Essential for Headlining, Insulation Roofs and Interlining of Cars

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

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

THE KEYES PRODUCTS COMPANY

120 BROADWAY, NEW YORK

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

CHICAGO
J. E. Simons
Fisher Bldg.

SAN FRANCISCO
Ford & Geirrine
Merchants Exchange Bldg.

ITALY
American Traffic Co.
Via Capuccini, #4, Milano, Italy



The Motorman Knows That The Rico Coasting Recorder

Shows the Analysis of "Schedule Time" Components

To understand the wonderful possibilities of the Rico Coasting Recorder, we must bear in mind that there is nothing mysterious about the components of what is called "Schedule Time." They are simply:

- The aggregate of the power-on periods
- The aggregate of the brakes-on periods
- The aggregate of the standing-time periods

And what is left is

The aggregate **coasting** period, the total of which depends upon the skill of the motorman—and this coasting is measured only by the Rico Coasting Recorder.

Note, too, that every one of these components of "Scheduled Time," and particularly coasting,

**IS WITHIN THE COMPREHENSION
OF THE MOTORMAN**

Furthermore, every component of "Schedule Time" is a **time** factor, whether power-on, brakes-on, standing or coasting, for

Time is the Essence of Railroading

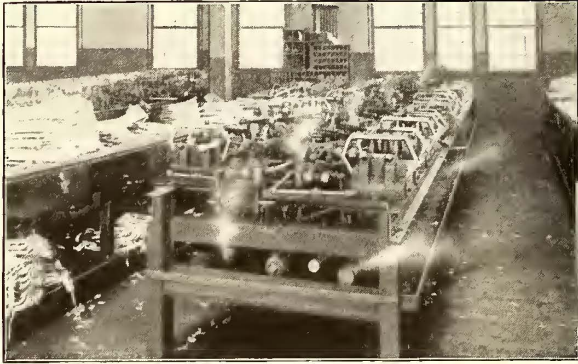
RAILWAY IMPROVEMENT CO.



61 BROADWAY, NEW YORK

Interesting Properties of G-E Coils

Steam Moulded



Every G-E coil is steam moulded. This process cements the turns together, preventing all chafing and insures correct shape. Experience has shown that steam moulded G-E coils have a life 25% longer than other makes which do not use this process.

Dipped Leads

The leads of G-E coils are dipped in a waterproofing compound. This serves two purposes—it keeps all moisture away and prevents unraveling of the insulation.

Perfect Fit

Because all G-E coils are made of the same material and with the same care, they fit perfectly the motor they are designed for. They can be pressed snugly into the armature slots without injury due to forcing.

General Electric Company

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio

Columbus, Ohio
*Dallas, Tex.
Dayton, Ohio
Denver, Colo.
†Detroit, Mich.
Des Moines, Iowa
Duluth, Minn.
Elmira, N. Y.
Erie, Pa.
*El Paso, Tex.
Fort Wayne, Ind.
Hartford, Conn.

General Office: Schenectady, N. Y.

ADDRESS NEAREST CITY

*Houston, Tex.
Indianapolis, Ind.
Jacksonville, Fla.
Joplin, Mo.
Kansas City, Mo.
Knoxville, Tenn.



Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.

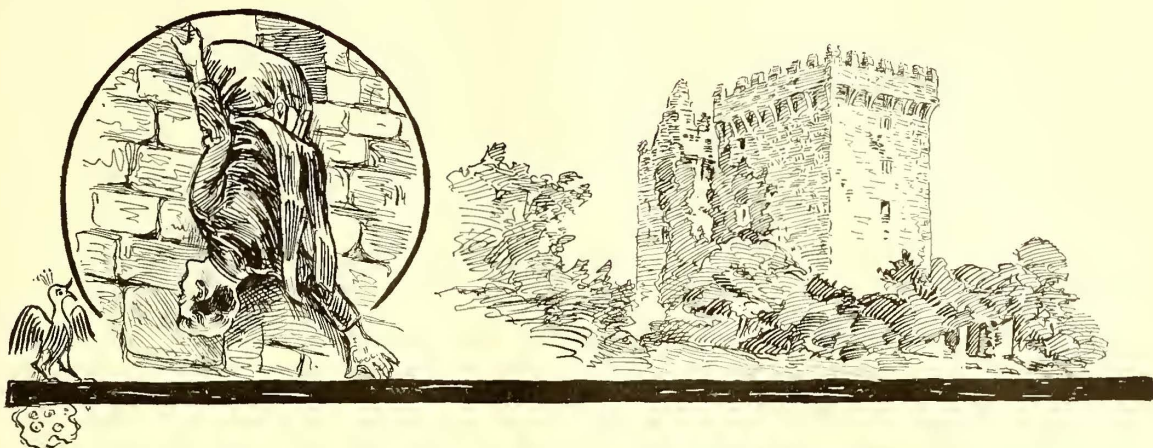
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Niagara Falls, N. Y.
*Oklahoma City, Okla.
Omaha, Neb.
Philadelphia, Pa.
Pittsburg, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.

St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
Youngstown, Ohio

*Southwest General Electric Company. †General Electric Company of Michigan.

FOR CANADIAN BUSINESS refer to Canadian General Electric Company, Ltd., Toronto, Ont.

GENERAL FOREIGN SALES OFFICES, Schenectady, N. Y.; 30 Church St., New York City; 83 Cannon St., London, E. C., England.



Blarney

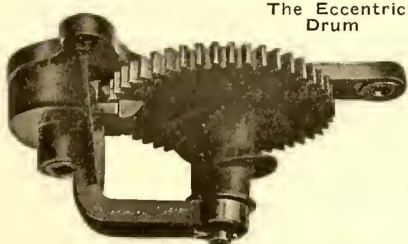
Some railway salesmen don't find it necessary to kiss the Blarney Stone to acquire the gift of blarney.

It's born with 'em, it is.

Blarney is good to listen to, but it never stopped a car when a heedless pedestrian or a careless driver suddenly got into the danger zone.

There's no blarney about the Peacock Brake. Knowing that it is relied upon to save life and property, we put into it the best materials we can buy and the best thoughts that we can secure from the fullness of our experience and the co-operation of our operating customers.

Have you written "Peacock Brakes" unmistakably in your specification for new cars?



The Eccentric
Drum

National Brake Co.
Buffalo, N. Y.

Bankers and Engineers

Electric Railway Lighting and
Power Company Bonds

ENTIRE ISSUES PURCHASED
THE NATIONAL CITY CO.

NATIONAL CITY BANK BUILDING
55 WALL STREET, NEW YORK

THE J. G. WHITE COMPANIES

ENGINEERS  CONTRACTORS
FINANCIERS OPERATORS

43 EXCHANGE PLACE NEW YORK CHICAGO
LONDON

THE ARNOLD COMPANY

ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL

105 SOUTH LA SALLE STREET
CHICAGO
111 BROADWAY
NEW YORK

Arthur D. Little, Inc.

An organization prepared to handle all work which calls for the application of chemistry to electric railway engineering—such as the testing of coal, lubricants, water, wire insulation, trolley wire, cable, timber preservatives, paints, bearing metals, etc.

Correspondence regarding our service is invited.

93 Broad Street, Boston, Mass.

ALBERT S. RICHEY

ELECTRIC RAILWAY ENGINEER

WORCESTER POLYTECHNIC INSTITUTE
WORCESTER, MASSACHUSETTS

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

ROBERT W. HUNT & CO., Engineers

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Inspection and Test of all Electrical Equipment

NEW YORK, 90 West St. ST. LOUIS, Syndicate Trust Bldg.
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H. M. Byllesby & Company, Inc.

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Purchase, Finance, Construct and Operate Electric Light,
Gas, Street Railway and Water Power Properties.
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Industrial Plants and Buildings, Steam Power Stations,
Water Power Developments, Substations, Gas Plants,
Transmission Lines, Electric and Steam Railroad Work.

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Consultation—Management
and Engineering

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Scotfield Engineering Co. Consulting Engineers

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HYDRAULIC DEVELOPMENTS GAS WORKS
ELECTRIC RAILWAYS

NEILER, RICH & CO., INC. Engineers

Manhattan Building, CHICAGO, ILL.

Reports, Appraisals and Valuations, Railway and Lighting Properties

ELECTRICAL TESTING LABORATORIES
Electrical, Photometrical and
Mechanical Testing.
80th Street and East End Ave., New York, N. Y.

Frederick Sargent
Wm. S. Monroe

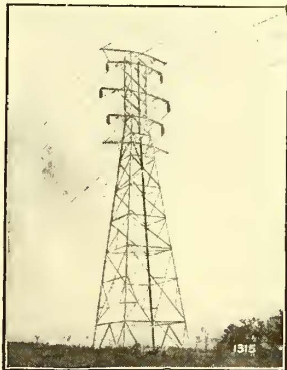
A. D. Lundy
James Lyman

SARGENT & LUNDY, Engineers
1412 Edison Bldg., 72 W. Adams St., Chicago, Ill.

AMERICAN BRIDGE COMPANY

HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

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



Transmission Tower, Pittsburgh, Pa.
Duquesne Light Company

SALES OFFICES

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Baltimore, Md., Continental Trust Bldg.	Duluth, Minn. Wolvin Building
PITTSBURGH, PA. . . Frick Building	Minneapolis, Minn., 7th Ave & 2nd St., S. E.
Buffalo, N. Y. . Marine National Bank	
Cincinnati, Ohio. Union Trust Building	
Atlanta, Ga. Candler Building	
Cleveland, Ohio . . Guardian Building	
Detroit, Mich., Beecher Ave. & M. C. R. R.	
CHICAGO, ILL., 208 South La Salle St.	Seattle, Wash., 4th Ave. So. Cor. Conn. St.

Pacific Coast Representative:

U. S. Steel Products Co. Pacific Coast Dept.
SAN FRANCISCO, CAL., Rialto Building
Portland, Ore. Selling Building

Export Representative:

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

The Coal & Iron National Bank of the City of New York

Capital, Surplus & Profits \$1,635,000
Resources Nearly \$10,000,000.

**Offers to dealers every facility of a New York
Clearing House Bank.**

SAMUEL STEPHENSON SONS & CO.

**Buy Entire Issues of Electric Railway,
Light and Power Bonds**

RAILWAY ENGINEERS AND CONTRACTORS
BOSTON NEW HAVEN CHICAGO

EDWARD P. BURCH, Engineer ELECTRIC RAILWAY VALUATIONS

Dime Bank Bldg., Detroit Plymouth Bldg., Minneapolis

THE P. EDW. WISCH SERVICE

Suite 1710 DETECTIVES Suite 715
Park Row Bldg., New York Board of Trade Bldg., Boston

The subscription was discontinued because a "Want" Advertisement brought results

Editor—"We are sorry to lose your subscription, Mr. Jackson. What's the matter? Don't you like our politics?"

Mistah Jackson—" 'Tain't dat, sah; 'tain't dat. Mah wife jes' been an' dun landed a job o' wuk for me by advertisin' in youh darned ole papah."

If you're looking for a "job o' wuk" in the electric railway field—

—if you're looking for a competent man who will be able to handle a big or a little "job o' wuk" and who will bring RESULTS—

—there is no more efficient or economical method of securing either than the insertion of a card in the

SEARCHLIGHT SECTION

Copy for "Want" and "For Sale" cards can be received on Wednesday for issue out on Saturday.

ELECTRIC RAILWAY JOURNAL
239 West 39th Street, New York

Collier Service

Produces the Cards That Pay

Nothing looks simpler than a completed car card, yet few things are more complex in the making.

There is first the nature of the article—Is it of a kind that can be profitably advertised in a card?

Second—Has straight text or art work proved most effective with this particular article?

Third—What colors and designs are most suitable?

Fourth—How often should the cards and the line of appeal be changed?

These problems are but a fraction of the many that arise in preparing a campaign for a Collier car advertiser.

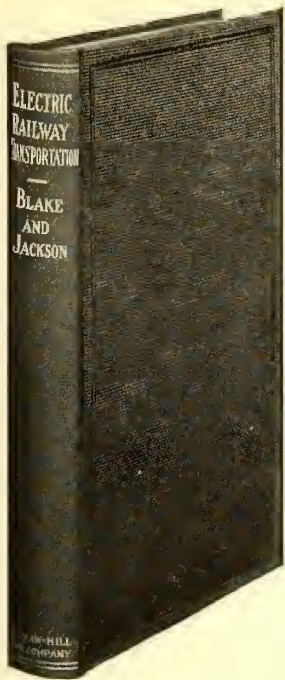
Collier Service

is so extensive that each step receives the attention of a group of specialists. Their one thought—How to make car advertising bring the largest possible returns to the advertiser—maintains the value of this asset of the railway company.

Barron G. Collier
INCORPORATED

Candler Building

220 West 42nd Street, New York City



Boosting the Earnings of Electric Railways

is the problem attacked in this new and unusual volume.

It is the first book to take up solely the improvement of transportation methods in the light of recent progress.

The various expedients, good and bad, now being adopted by city and interurban roads are fully discussed; and the resulting effect upon earnings is shown.

The book points out in a practical way how traffic—passenger, freight and express—may be increased by suitable exploitation methods.

It illustrates, describes and demonstrates the results of new equipment appliances for expediting traffic and collecting fares.

This book should be in the hands of every executive, traffic manager, railway engineer and investor in electric railway securities.

It will suggest many means of developing the road, serving the public to better advantage and, hence, increasing the net earnings.

Electric Railway Transportation

By Henry W. Blake, Editor, and Walter Jackson, formerly Assoc. Editor of the Electric Railway Journal.

487 pages, 6 x 9, 120 illustrations, \$5.00 (English price 21s.) net, postpaid.

Our Approval Offer

The value of this book to you can best be judged by an examination of the volume itself. We will send you a copy for 10 days' consideration free of cost and without any obligation. Use the coupon to get the book now. Look it over, at our expense, with reference to your own problems.

McGraw-Hill Book Co., Inc.

239 WEST 39TH STREET, NEW YORK

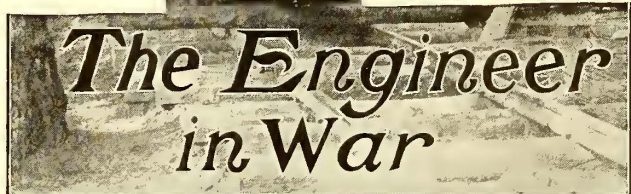
LONDON: HILL PUBLISHING CO., LTD.

6 & 8 BOUVERIE ST., E.C.

Publishers of Books for Electric Railway Journal

Timely

Important



By P. S. Bond

Major, Corps of Engineers, U. S. Army, Member Am. Soc. C. E., Honor Graduate Army Field Engineer School, Graduate Army Staff College.

Pocket size, flexible binding, 175 pages, about 75 illustrations, \$1.50 net, postpaid.

Approved by the Secretary of War, the articles in this book comprise a complete answer to the question—

"What service can the technically trained man render in carrying on war?"

FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc.,
239 West 39th St., New York, N. Y.

You may send me on 10 days' approval the books checked:

.... Blake & Jackson—Electric Railway Transportation, \$5.00 net.

.... Bond—The Engineer in War, \$1.50 net.

I agree to pay for the books or return them postpaid within 10 days of receipt.

.... I am a regular subscriber to the Electric Railway Journal.

.... I am a member of the A. I. E. E. or A. E. R. A.

(Signed)

(Address)

References E-7-7-17
(Not required of subscribers to the Electric Railway Journal or members of A. I. E. E. or A. E. R. A. Books sent on approval to retail customers in U. S. and Canada only.)

The Growth of Oxy-Acetylene Welding and Cutting and the Increasing Demand for Davis-Bournonville Apparatus

A Year Ago we said—

“The growth of Oxy-Acetylene Welding and Cutting in the United States is shown by the increasing use of Davis-Bournonville apparatus, which is inseparably associated with the development and success of the oxy-acetylene industry in this country.

“Ten years ago the process was unknown in the United States. . To-day it forms one of the great industries of the country, with its requirements for acetylene, oxygen and efficient apparatus.

“The Davis-Bournonville Company obtained the United States patents for the independent positive-pressure type of welding torch (mixing the gases in an interchangeable tip or nozzle) in 1906—basic principles which have been retained in the D-B torch because of their proven superiority through ten years of development, improvement and the most successful operation.

“There is more Davis-Bournonville welding and cutting apparatus in successful use in the United States than of any other make, and the prominent concerns which have established the greatest success with this process have large installations of D-B apparatus, with from ten to one hundred or more torch units, and from one to six of the largest acetylene generators.”

Today—

the increasing use of oxy-acetylene process for welding and cutting and of Davis-Bournonville apparatus are parallel and are graphically shown by the sales of “Davis Apparatus” as charted below:



“Davis Apparatus” Leads the World in Range, Efficiency and Number of Successful Users. Write for bulletins and information showing why it is used by the largest steel mills, foundries, ship-yards, locomotive and car builders, U. S. Navy Yards and government works, mines, sheet metal working factories, tube and barrel welders, scrap yards, and in hundreds of small repair shops and garages.

DAVIS-BOURNONVILLE CO.

General Offices and Factory, Jersey City, N. J.

NEW YORK
BOSTON
PHILADELPHIA

PITTSBURGH
CLEVELAND
CINCINNATI



CHICAGO
DETROIT
ST. LOUIS

SEATTLE
SAN FRANCISCO
TORONTO, ONT.
(Carter Welding Co.)



This car's record points the way

For years we have pointed out to railway men that Hess-Bright ball bearings were essential in order to realize the *maximum* economy accruing from the use of ball bearings.

This car's record lends striking emphasis to the superiority of Hess-Brights in railway service.

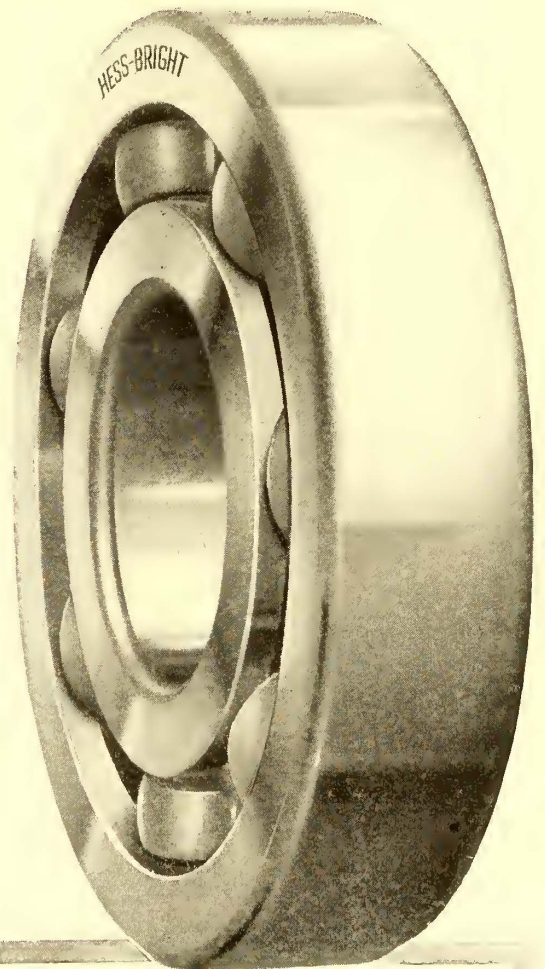
On this 52,000-lb. car Hess-Bright bearings have been in operation for 200,000 car miles on G.E. No. 74 motors, 65 hp.

When removed the bearings were measured for wear, with the following results:

The pinion bearing only .009" radial freedom
 The commutator bearing . . . only .0014" radial freedom

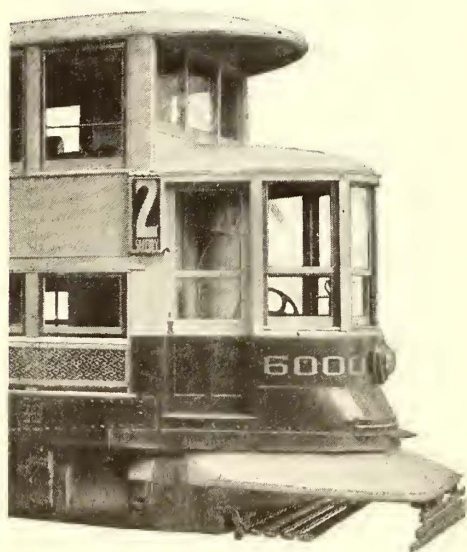
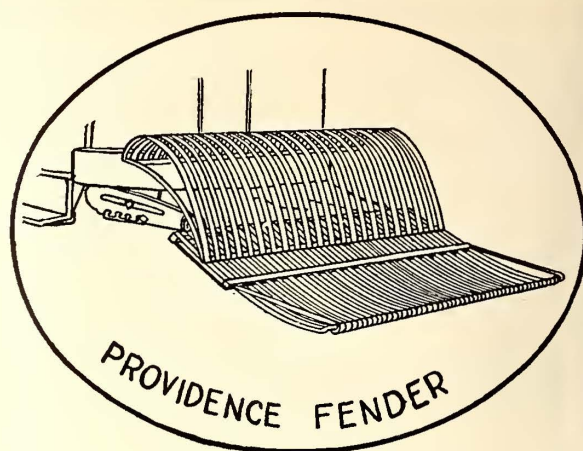
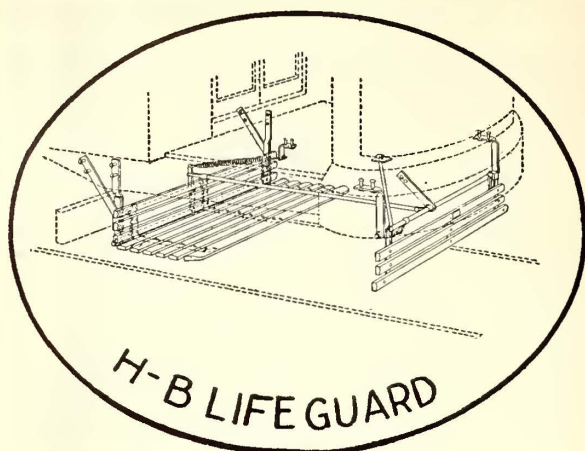
A slight grinding and polishing of the race grooves will make the bearings practically as good as new and ready for another 200,000 miles of typical H-B service.

*Hess-Bright's Conrad Patents
 Are Thoroughly Adjudicated*



HESS-BRIGHT

PHILADELPHIA



You Can Safely Claim Exemption

from serious accidents and the resultant costs by fitting every car with the most efficient fender or life guard.

The most important systems in this country (and abroad) standardize on

Providence Fenders *and* H-B Life Guards

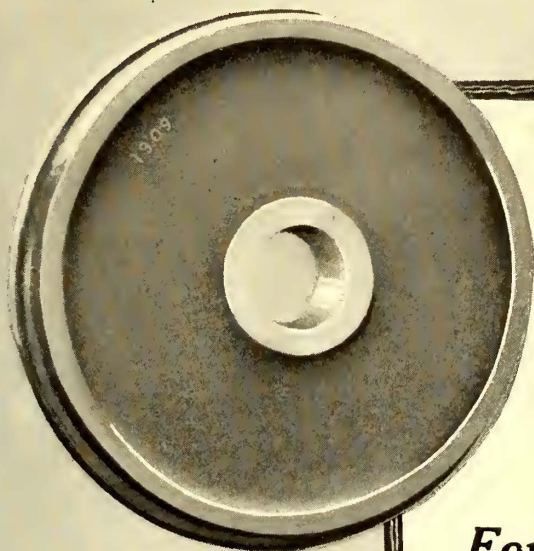
because actual road service has demonstrated their superiority in keeping the percentage of accidents to a minimum.

Get the opinions of users, sent on request.

The Consolidated Car Fender Co., Providence, R. I.

General Sales Agent:

Wendell & MacDuffie Co., 61 Broadway, N. Y.



Standard for 67 Years

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

For Freight Cars

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

For Street Cars

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

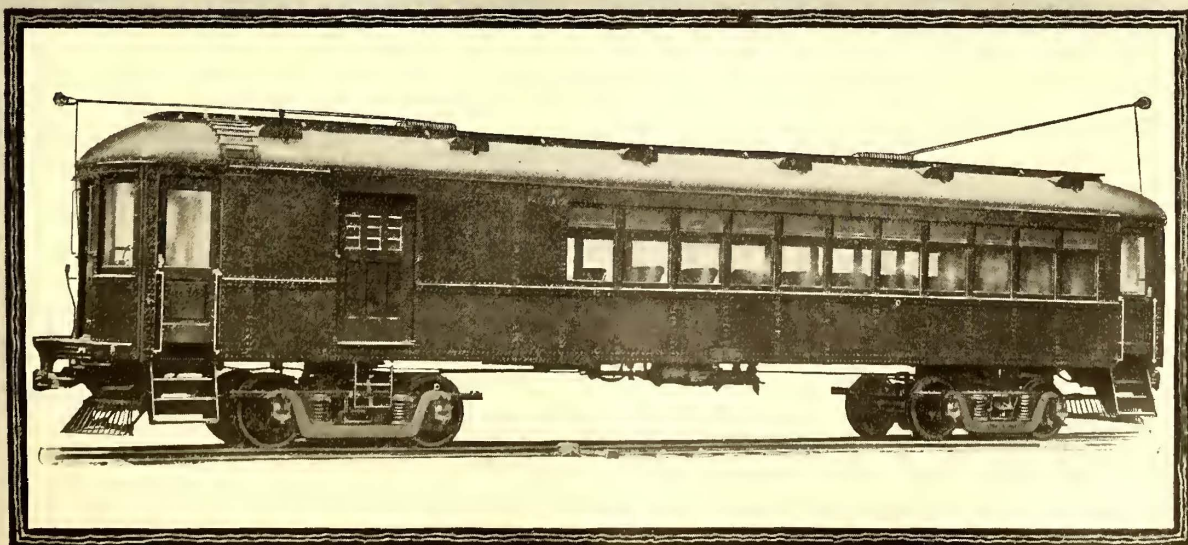
The Conclusion

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

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

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

The
Wonderful
Single-Service
Chilled-Iron
Wheel





NUTTALL B P GEARING STILL GROWING IN POPULARITY

In 1916 the increase in the number of
B P Gears and Pinions sold **55%**
over 1915 was.....

The 1917 total quantity for six months is
80% of the entire 1916 produc- **60%**
tion or a probable increase of

Every day new names appear on the list of B P
users. Is yours there? We would like to demon-
strate that B P will solve your gearing problems.

Send for new Heat Treatment Booklet. It's Free.

NUTTALL
Pittsburgh **L**

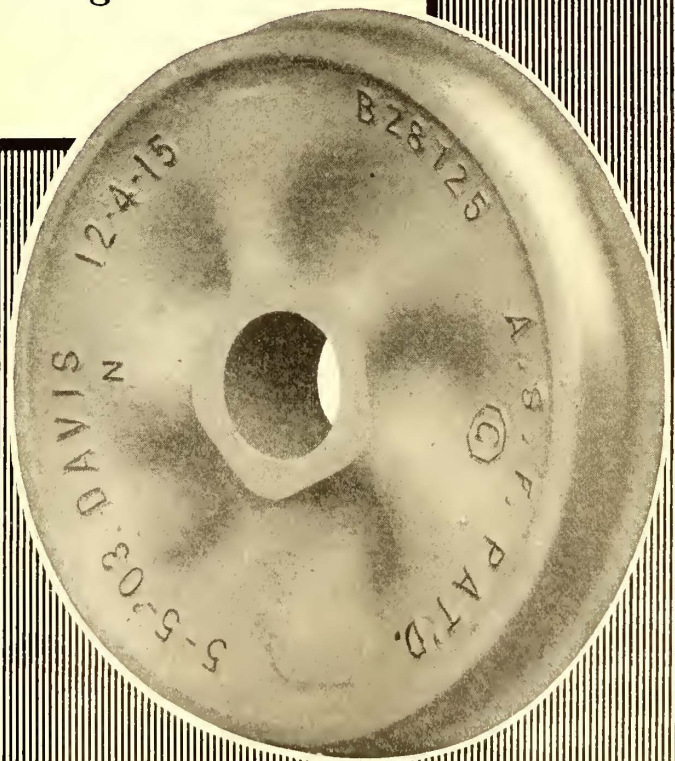
ECONOMY

— the prime reason for using the Davis Wheel. Economy in weight—economy in maintenance.

American Steel Foundries

1105 McCormick Building
CHICAGO

The
**DAVIS
STEEL
WHEEL**





Columbia Brake Lever

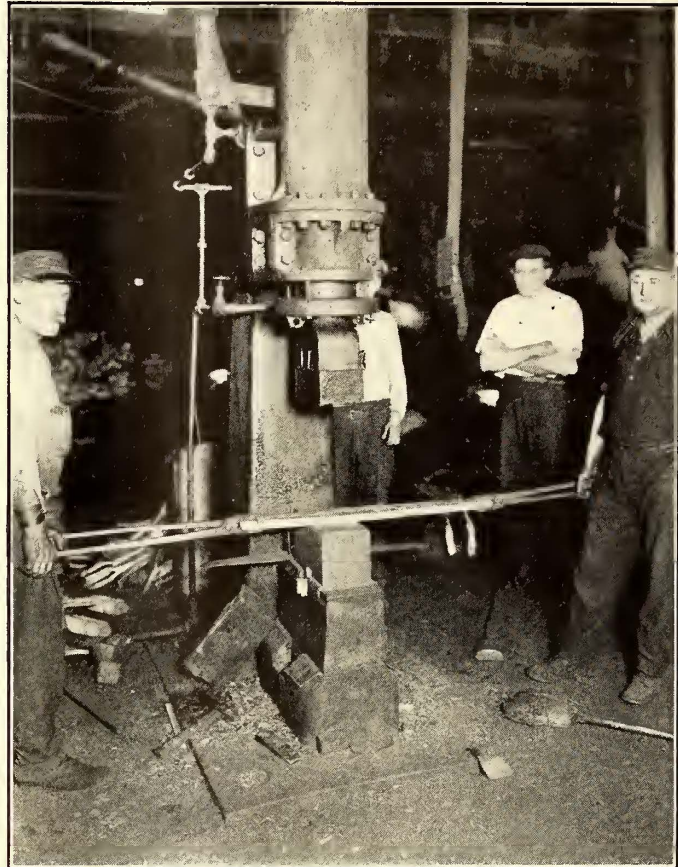


No. 2

The Forging

On being removed from the furnace, a pair of our husky lads bring the glowing bar to a 5-ton steam hammer, where it is forged most thoroughly for the responsible work it will have to do.

Step No. 3 will show the squaring off of the ends.



And, in the meantime, remember that we are also making:

TOOLS

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

CAR EQUIPMENT

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



Columbia Machine Works & Malleable Iron Co.

Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

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

Holden & White, Inc., Chicago

F. F. Bodler, San Francisco



BALDWIN



Baldwin Standard Gauge Gasoline Locomotive

Cylinders (6)—7¼ x 12 inches	Height—11 ft. 0 inches
Wheels, diam.—42 inches	Width—9 ft. 0 inches
Wheel-base—6 ft. 6 inches	Length—18 ft. 8 inches
Weight—45,000 lbs.	

The need of a self-contained locomotive, independent of a third rail or an overhead wire; that is simple in construction, reliable in operation and easily handled, is often felt in electric railway service, especially in work about repair shops, power plants and terminals.

Baldwin Gasoline Locomotives meet these conditions admirably. The four lighter classes, weighing 3½, 5, 7 and 9 tons respectively, are specially suitable where tracks are of narrow gauge. A larger class built for standard gauge track only, and weighing about 23 tons, is illustrated above. This design is suitable for general switching service.

These locomotives have a positive drive from engine to wheels, and the transmission throughout is designed for severe duty. The wheels are driven from a jack-shaft by specially designed side rods; and the construction is such that the entire weight of the motor, transmission and jack-shaft is spring supported. The locomotive therefore rides easily and causes little wear of track.

Baldwin Record No. 85 describes these machines; and correspondence is solicited from electric railway managers who wish to obtain further particulars.

THE BALDWIN LOCOMOTIVE WORKS

Philadelphia, Pa.

REPRESENTED BY

F. W. Weston, 120 Broadway, New York, N. Y.

Charles Riddell, 627 Railway Exchange, Chicago, Ill.

C. H. Peterson, 1210 Boatmen's Bank Bldg., St. Louis, Mo.

George F. Jones, 407 Travelers' Building, Richmond, Va.

A. Wm. Hinger, 512 Northwestern Bank Bldg., Portland, Ore.

Williams, Dimond & Co., 310 Sansome St., San Francisco, Cal.



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 WEATHERPROOF WIRES
CANDEE PATENTED POTHEADS

Samples and Estimates on Application

THE OKONITE COMPANY, 501 Fifth Ave., cor. 42nd St., New York

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

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

Novelty Electric Co., Philadelphia, Pa.

Pettingell-Andrews Co., Boston, Mass.

TROLLEY WIRE

Round Grooved and Figure 8

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

That one is more economical than another—

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



Weatherproof Wires and Cables

Star Brand

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

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

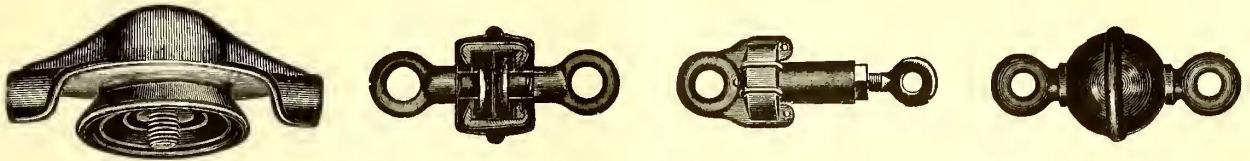
Read the words in the cut of the star.

American Electrical Works

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

Phillipsdale, R. I.

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



You Can Minimize Overhead Repair Work

and successfully cut maintenance costs if you turn to

The Macallen Line

of strain insulators, hangers, splicing ears, crossings, and other overhead material.

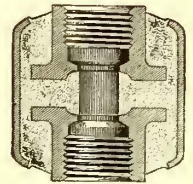
They are "specialty" products, designed and built to make "Macallen" the standard on American railways.

It will pay you to write for information and prices.



The Macallen Insulating Joint

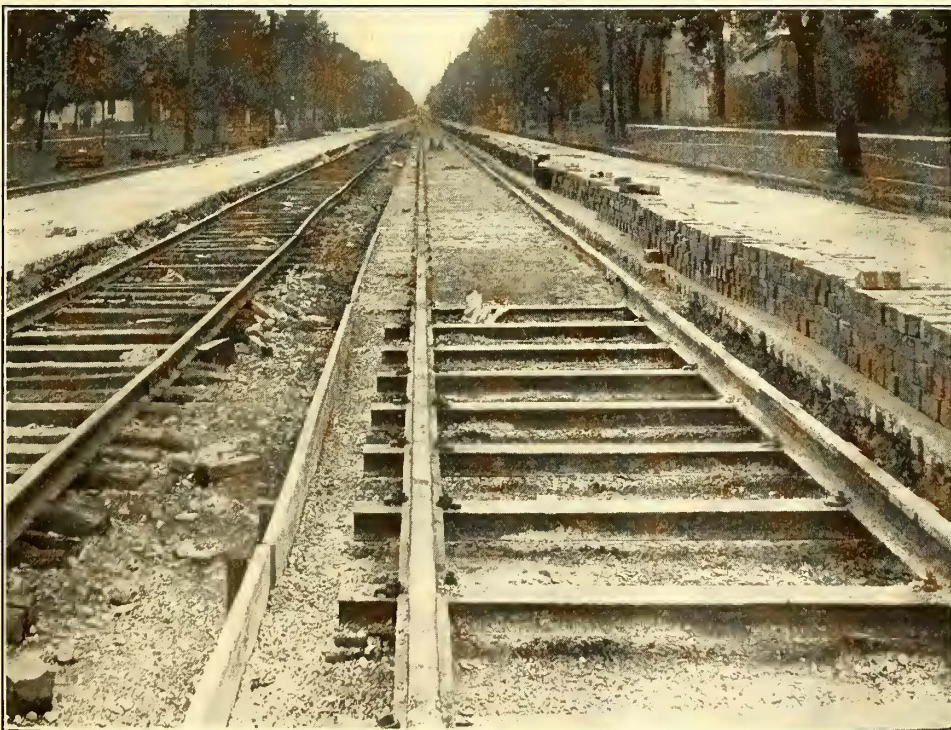
Adopted by principal air brake manufacturers as part of their standard equipment. Also insulates steam pipes, etc. Shell is seamless drawn steel, nipples are machined from steel rod, and insulating material is Macallen Vulcanite Compound, not affected by heat or oil—practically indestructible.



May We Send Our Catalog ?



The Macallen Company
Macallen and Foundry Sts., Boston



Steel Cross Ties

are the recognized standard for permanent track construction by many representative street railways.

A trial will demonstrate their economy.

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

3

(Three)

Simple Parts

and only three parts, make up White's Porcelain Trolley Hanger. This is a big advantage in shortening the time and labor of installation and in lengthening the service life of the hanger.



WHITE'S Porcelain Trolley Hanger

consists of the sherardized malleable iron yoke, the heavy glazed porcelain insulator and the "stud"—a standard bolt, sherardized or furnished in bronze.

The illustration will convince you of the ease of installation and alignment. You can see that this hanger will give service, too—there is no possibility of the insulation "breaking down" or cracking.

We will send you a sample and it will tell its own story to you. Let us give you quotations on complete hangers or parts which we have in stock for

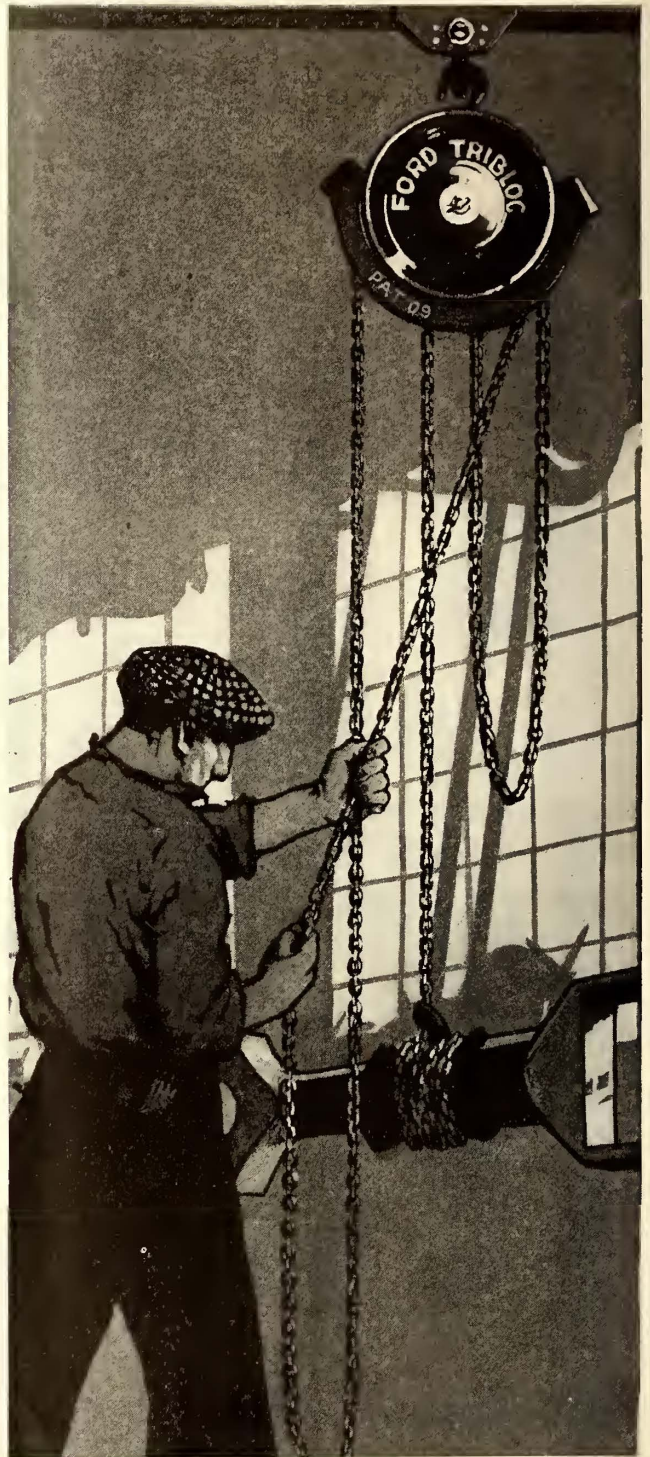
Immediate Delivery.

T. C. WHITE
Electrical Supply Co.

1122 Pine Street, St. Louis, Mo.

Foreign Representatives: Forest City Electrical Service Supply Co., Salford, England.

FORD TRIBLOC



The Chain Hoist in the Foreground of Service

They say you can always tell whether a picture of a street scene is real by looking for the Fords. The same is true of shop scenes—only in this case the Fords are Ford Tribloc Chain Hoists. Manufactured, marketed and guaranteed for five years by Ford of Philadelphia.

Ask for Catalog

FORD CHAIN BLOCK & MFG. CO.
142 Oxford Street - - - Philadelphia, Pa.

2090D

With the Lincoln Bonding System



Bond Replacement Jobs Are Not Prohibitive

When you buy the Lincoln portable generator set for bonding, you buy a bonding equipment that will enable you to install a few bonds here and there from time to time—

Almost as economically as if you were using it for the installation of hundreds of bonds in straightaway work.

The portability and one-man operation of the Lincoln Bonding System will insure you against the prohibitive expense ordinarily attached to the replacement of individual bonds.

A true Integral Weld made in the shortest time at a minimum cost and without resistance losses.

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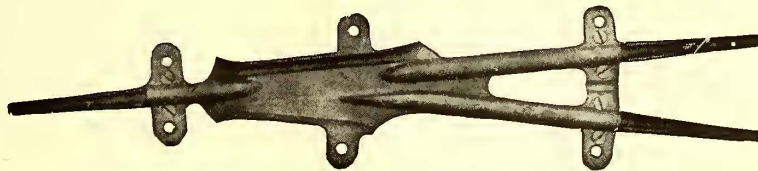
W. C. BURDICK, Milwaukee, Wis.
808 First National Bank Building

W. H. ELLIOT, Chattanooga, Tenn.

The Lincoln Bonding Co.
636 Huron Road, Cleveland, Ohio

Drew Trolley Frogs

reduce service costs



Bronze or Malleable from the Same Pattern

The approaches are properly designed to present a smooth, even running surface to the trolley wheel. The metal is so distributed in the pan that tension on the wires can not distort the switch. The approaches are renewable and easily applied.

"Trolley Off" is rare under Drew Overhead. It helps maintain schedules.

You can simplify and reduce the overhead man's work by standardizing on Drew. Remember, "it costs least per car mile."

Send for details of Drew Frogs and Crossings

DREW ELECTRIC & MFG. CO.
Offices and Works: Indianapolis, Ind.

Representatives in principal cities.

*Drew Overhead Line Material Is Standard on Keenly Managed Roads
Get Quotations*

Sharpen Band Saws

with

ALUNDUM

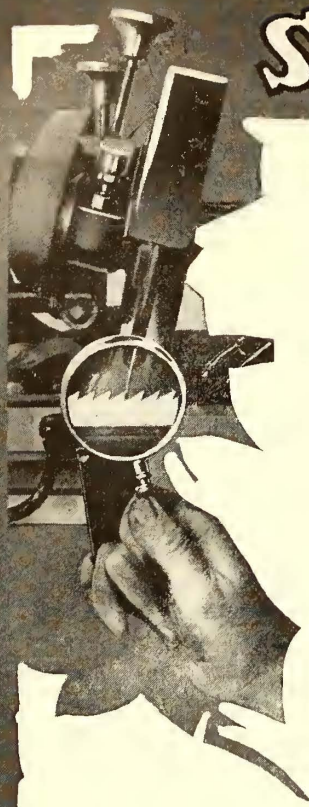
An ALUNDUM wheel $1/32$ inch thick at work sharpening a fine tooth, metal cutting band-saw.

The wheel goes down the face of the tooth and up the back of the following one, grinding each tooth to the same shape and size, and giving it that sharp and keen cutting edge that will "stand up" under hard service.

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WORCESTER, MASS.

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Hydraulic Machinery for the Electric Railway Shop

We are and have been for nearly 70 years the foremost builders of hydraulic machinery in this country. Each year has seen some improvement or refinement dictated by experience.

Any railway car shop could own this press profitably. For making repairs to armatures and numerous other operations of pressing, forcing and bending.

The press is a self contained unit requiring no auxiliary water or power supply, driven by a motor like any machine tool. The ram, which moves vertically upward, carries a "U" block into which the armature shaft or mandrel may project. The top yoke swings about one rod on ball bearings, so that it can be easily pushed out of the way while "building up" the armature.

We build many other labor saving tools for the electric railway, including jacks, benders, shears, punches, presses, etc.

Write for catalogs.

The Watson-Stillman Co.

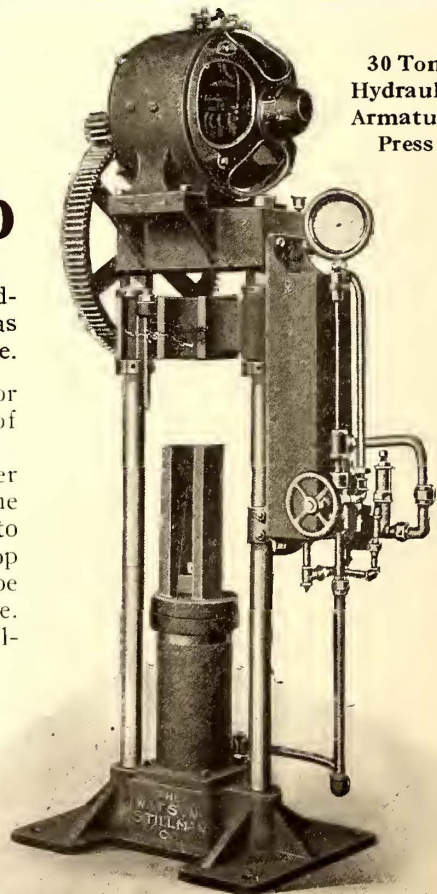
Engineers and Builders of Hydraulic Machinery

46 Church St., New York

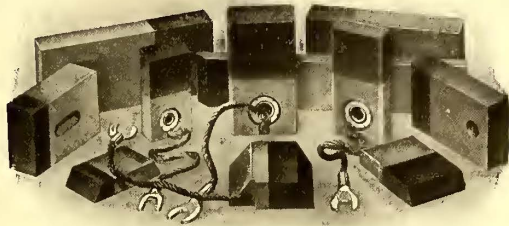
Chicago—McCormick Building



30 Ton
Hydraulic
Armature
Press



*Your commutators
reflect the performance
of your brushes*



If you use

DIXON'S Graphite Brushes

their perfect service will be reflected in the polished smooth surface they will produce on the commutators of your generators and rotaries.

Dixon brushes are non-scratching—they're self-lubricating; it's impossible for them to score commutators.

And they're eminently suitable for railway station service because graphite brushes adapt themselves peculiarly well to high voltage work.

Let us send you prices on your particular type.

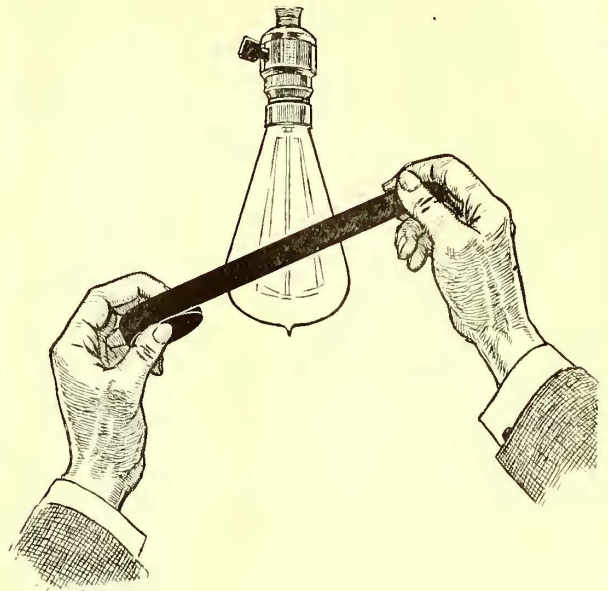
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Made in JERSEY CITY, N. J., by the

Joseph Dixon Crucible Company



Established 1827



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NO DIRT
LUMPS
PIN HOLES
FREE SULPHUR

The various brands of Friction and Rubber Tapes made by this company fully

Meet Your Expectations

The compounds are unusually smooth and even, and the fabrics are closely woven and uniform.

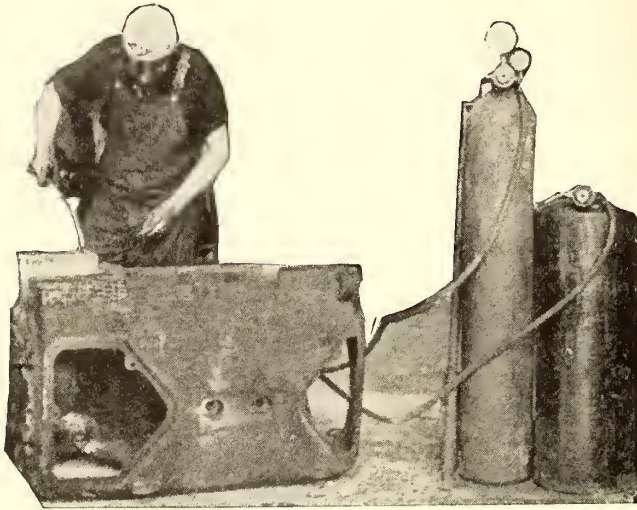
They unroll easily, and are especially adhesive and durable.

Placing your order now insures prompt delivery.

Mechanical Rubber Co.

Cleveland, Ohio

Dodging the Scrap Pile



by means of

OXWELDING

Many street railways are cutting down maintenance expense tremendously. Broken or worn car and machine parts, formerly junked, now come back into service—good as new—quickly and cheaply.

In some cases, even, new parts are being cut out of scrap steel plate. And around the shop and out on the line, in emergencies, Oxweld portable equipment frequently proves itself "worth its weight in gold."

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is the big, distinctive thing that you'll appreciate most. It places at your disposal the accumulated experience of not only the biggest street railways, but of other industries all over the country as well. It takes up its work right where most "service" stops—after the sale. Oxweld users have at their command an Advisory, Inspection and Repair Service which is absolutely unique.

You see, we've taken a leaf from the Public Utility Company's policy—we're making Good Will as fast as we're making good customers.

You ought to have Bulletin Series 700-R. You ought to know the practical reasons why

OXWELD APPARATUS
WORKS FASTEST, CHEAPEST
AND MOST EFFICIENTLY.

Oxweld Acetylene Co.

NEWARK, N. J. CHICAGO LOS ANGELES

*America's Largest Makers of Welding and Cutting
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Protect Cars and Power-plant

Don't trust to your more limited facilities for refilling fuses. As fuse specialists, we furnish reliable and carefully *tested Renewal Links* all ready to insert in

ECONOMY renewable cartridge FUSES

when they blow. These Links cost but a trifle and assure a complete break in the circuit at the required overload.



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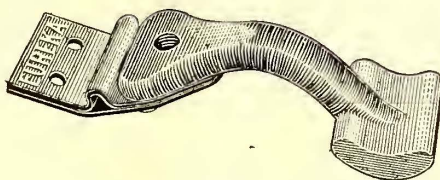
Write now for Bulletin No. 17 and our catalog.

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EUREKA CONTROLLER PARTS AND COMMUTATORS

are standard design, interchangeable with original manufacturer



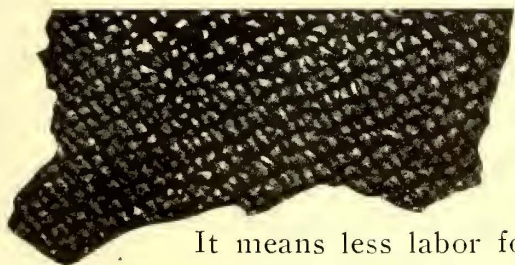
We have bulletins for

*Controller Parts, Commutators, Brushholders, Trolley
Wheels and Line Material*

Send for those desired.

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North East, Pennsylvania

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This elegant super-substitute for leather gives pleasure and comfort to your passengers on account of its rich, clean, inviting appearance.

It means less labor for your employees, for Fabrikoid can be cleaned like glass with soap and water. Its cost is less than leather and its service economy greater than any other upholstery material.

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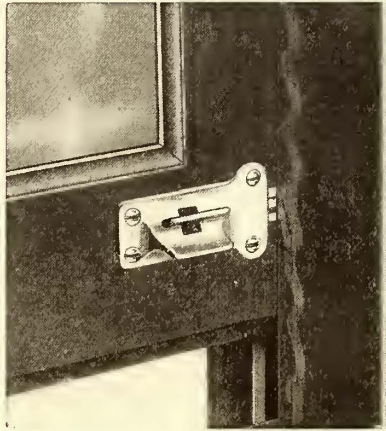
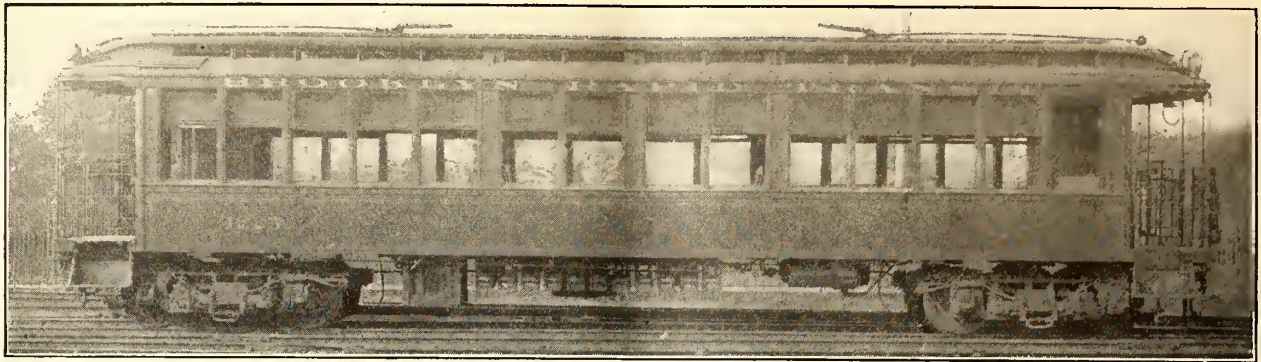
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An Ideal Car Seating



Chosen for Safety and Efficiency by the Brooklyn Rapid Transit

Everything for the safety, convenience and comfort of passengers receives careful consideration in the selection of equipment for this great railway—and it chose "Edwards" as the "safety and efficiency" sash fixture for hundreds of its big cars.

There's a world of merit in Edwards Sash Fixtures. Specify them for *your* cars today.

Our Catalog gives the details. Ask for a copy.

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Window Fixtures
Top, Bottom and Side Weather Stripping
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It's the Little Things That Count

They are right at the top of the pole
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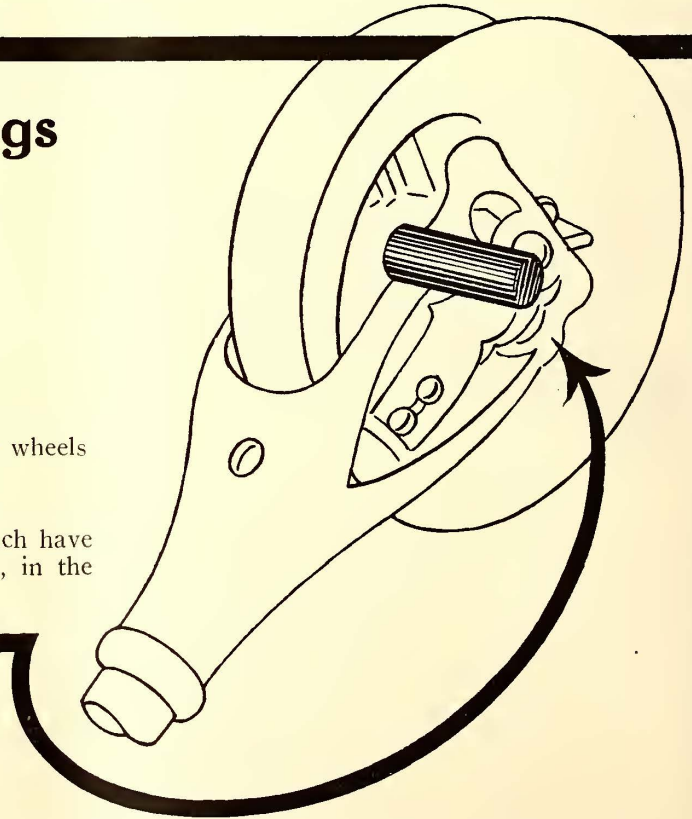
They are only small,

But millions of them are in service
Doing their work efficiently and well
Increasing car mileage

And making the LIVES of millions of trolley wheels
longer, smoother and sweeter running.

Ask the motormen what they think of—

Bound Brook genuine Oil-less Bearings—which have
always been made at Bound Brook, N. J., in the
United States of America, by the



Trade Mark

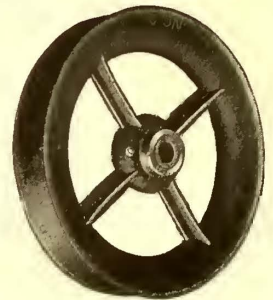
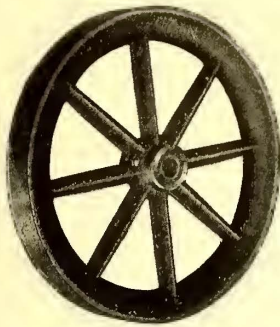
Bound Brook Oil-less Bearing Co.

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Formerly Graphite Lubricating Co.

For High Speed Operation

—Large Diameter Kalamazoo Trolley Wheels



As a solution to arcing and short wheel life on high speed electric railway work, two new Kalamazoo Wheels have been designed.

They are (No. 20) 11½ inches and (No. 21) 10 inches in diameter. An ample increase of width, depth of groove and length of hub insures a well-balanced wheel in each case.

Tests covering considerable mileage at high speeds show that these two new "Kalamazoos" greatly decrease sparking, while offering longer wheel life. There is more bearing on the wire, with consequent greater contact and current carrying capacity.

The patented Kalamazoo Harps have been enlarged to carry these wheels.

Try several on your lines. Compare their service with that of smaller wheels.

Write Today.



STAR BRASS WORKS

KALAMAZOO, MICHIGAN

EFFICIENT SERVICE AND PROMPT DELIVERY

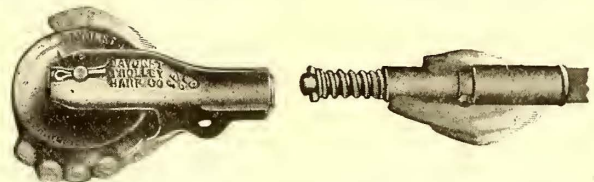
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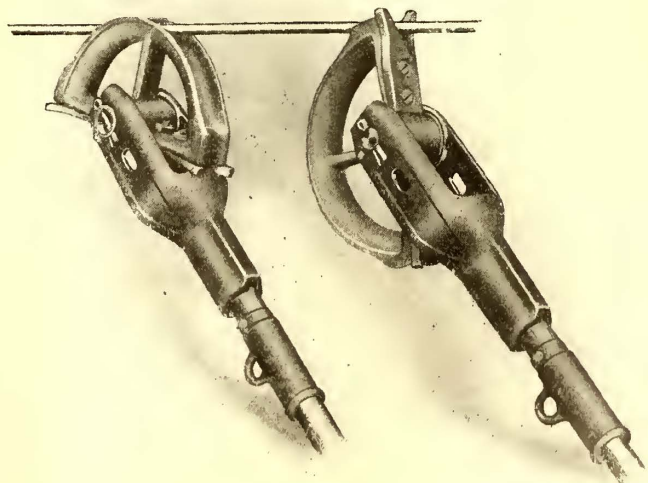
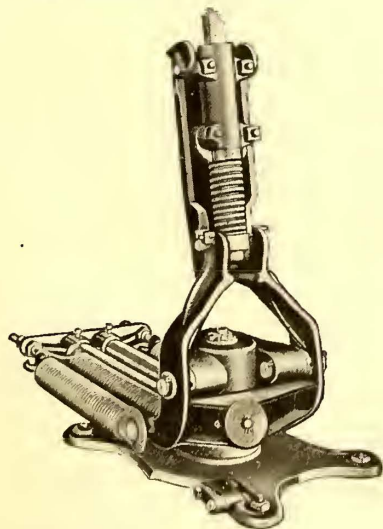
in the front rank. It keeps your cars on schedule time.

Bayonet Anti-Friction Base has all wearing parts bushed.

Self-Lubricating. Non-Breakable, Poles Changed in One Minute.



From Trolley Wheel to Semi-Rotary Sleet Cutter in 10 SECONDS without any tools



Backing Up

Going Forward

Write for full particulars and free trial

BAYONET TROLLEY HARP CO., Springfield, Ohio

FMB Grid Resistors

ARE MADE RIGHT AND STAY RIGHT

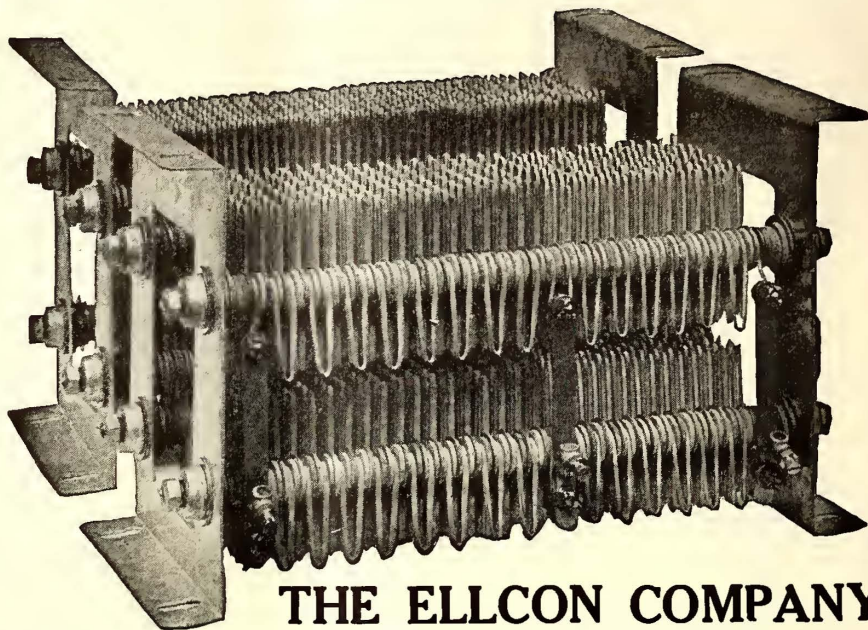
No resistors get more abuse than those under a car.

They are abused electrically by careless operation of the controller.

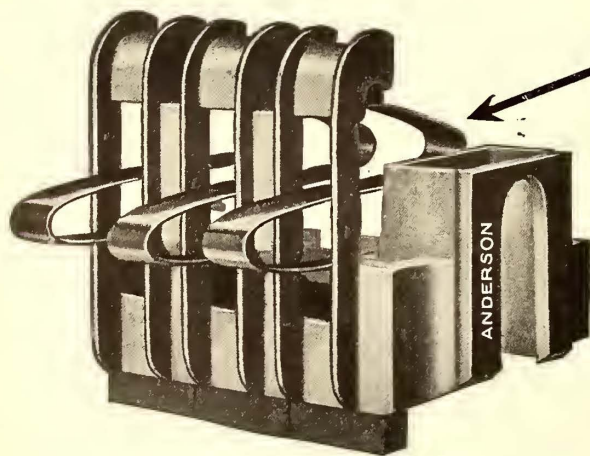
They are abused mechanically by exposure to dusty, muddy and stone-littered streets.

Until the arrival of E M B drawn, non-corroding grid resistors, troubles from these sources seemed unavoidable.

E M B grid resistors actually have made this part of your equipment troubleproof.



THE ELLCON COMPANY
50 Church Street, New York



It's all in this spring

Better commutation and reduced motor flashing is made possible in

Lindall Brush Holders

through the constant, uniform contact pressure of these phosphor-bronze springs.

They have no turns to bind and stick as is the case with coil springs.

Another big feature of Lindall Holders is

the large and efficient contact surface they afford between brush and holder, which eliminates the necessity of troublesome pigtails—any brush will fit a Lindall—no preparation of cutting or filing is needed.

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We are ready to prove that More-Jones Armature Babbitt Metal will give more mileage at lower cost than any other metal. Our long experience, laboratory research and co-operative policy has taught us that it takes more than formula to make a good Armature Babbitt Metal. It takes the best material—plus the best method of manufacture.

Babbitts composed of used scrap metals may be made to analyze the same as Babbitt made of pure, new material, but they will not give the same efficient results.

It's well to be safe and specify

More-Jones Armature Babbitt Metal

Specially developed for this particular service. Made of the highest grade material by a process evolved in over forty years of experience in alloying metals. Always uniform in quality and dependable for long service. Exceptionally strong, pliable, tough and possessing the best anti-frictional qualities.

Economical in a double sense, as it not only wears very slowly but it can be re-melted and used over and over again. And it's one-third lighter in bulk than lead-base babbitts, so it requires one-third less to line a bearing.

No one who has ever used MORE-JONES ARMATURE BABBITT METAL has been able to get equal service and economy from any other.

Further information and prices on application.

More-Jones Brass & Metal Co.

St. Louis, U. S. A.



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NOARK FUSES

"Play Safe" is a warning never too often repeated in electrical practice. Risks run high and the only barriers against loss of life or property are protective devices of absolute integrity.

If it pays to spend a thousand dollars to ground a system, doesn't it pay to select a fuse which will give positive protection to equipment—particularly when its cost is negligible compared with the value it protects?

"Noark" Fuses assure this protection because each fuse is an accurately calibrated reliable product. You place it in a circuit satisfied that it will blow when, and only when, its rating is reached.

Lock overload trouble from your circuits with this safe combination — "Noark" Fuses.

Furnished in all amperages and voltages.



Serves more people in more ways than any other Institution of its kind in the world

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10 Factories—Branches in 55 Large Cities

Le Carbone Carbon Brushes

Ever since I began selling LE CARBONE Carbon Brushes—eleven years ago—I have repeatedly asserted and reiterated that LE CARBONE Brushes—brush for brush and dollar for dollar—give better service and longer service than any other carbon brush made.

Hundreds and hundreds of you brush users have proved this for yourselves.

I could not stay in business if the quality of the LE CARBONE Brush had not backed up my statements absolutely.

**LE CARBONE
Carbon Brushes
are uniform.**

**They talk for
themselves**

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Canadian Distributors
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This Type G



Boyerized Trolley Wheel Spindle

Made of Cold Rolled Steel

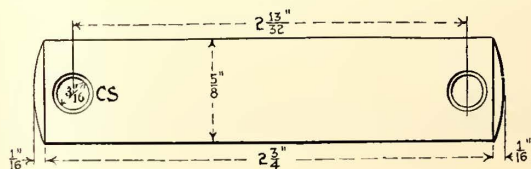
*Gives More Than 4 Times
the Life*

of the soft steel spindles that were formerly used on a system which operates more than 2000 cars.

The same road is using with equally good results Boyerized bushings and Boyerized pins for the brake rigging, live and dead lever pins, etc.

Says the Superintendent of Equipment:

"The best thing about Boyerized pins, bushings, spindles and other anti-wear parts is that they run true to form. Both the case-hardening and the manganese treatment are always uniform."



Bemis Car Truck Co., Springfield, Mass.

**HELP
RELIEVE
THE HIGH
COST AND
SHORTAGE
OF IRON—**

SMITH-WARD BRAKE CO.
INCORPORATED
WHITEHALL BUILDING
NEW YORK

June 15, 1917

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There are about 100,000 street cars in the country today; each one using from 4 to 16 brake shoes per car. If the brake shoes on these cars would give from 20 to 75% longer service it would be a large saving. S-W Adjusters will save your shoes and help you to relieve the metal shortage. Ask us about the many other savings made possible by using S-W Adjusters. Yours very truly,

SMITH-WARD BRAKE CO.

Geo. P. Smith

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ARE ECONOMICAL**

Many electric railways secure the greatest amount of mileage by the use of a pit car wheel grinder. The cars are run onto the grinder, and in twenty to forty minutes the wheels are ground truly cylindrical, eliminating service defects and making a new wearing surface of the proper taper. A wheel grinder eliminates the cost of removing wheels from the trucks, and re-applying.

The use of Chilled Iron Wheels does not involve the cost of an expensive wheel lathe.

The wear on rails due to flange friction is at a minimum.

Twenty to twenty-five per cent. in the loss of metal of brake shoes is saved.

GRIFFIN WHEEL COMPANY

McCormick Building, Chicago, Ill.

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The new high speed interurban cars recently placed in service by the Jamestown, Westfield & Northwestern Railroad are fitted with Standard No. 1062 rolled steel wheels mounted on Standard axles.
—Representative practice



STANDARD STEEL WORKS CO.

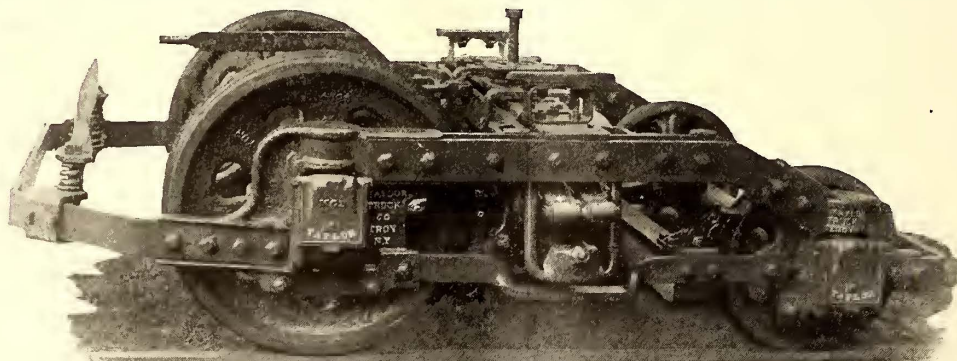
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TAYLOR MAXIMUM TRACTION TRUCK



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ABSOLUTELY SAFE
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SIMPLE IN CONSTRUCTION
REDUCE WEAR OF MOTORS
WILL INCREASE DIVIDENDS
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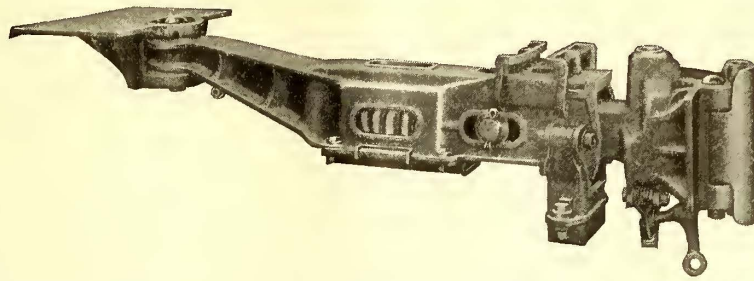
SAVE POWER
SAVE ROAD BED
LIGHT IN WEIGHT
OVERCOME FLANGE WEAR
BRAKES DO NOT CHATTER
PREVENT SIDE OSCILLATION OF CARS

TAYLOR ELECTRIC TRUCK CO., TROY, N. Y.

SPECIFICATIONS ON REQUEST

Established 1892

SEND FOR PORT-FOLIO



The Van Dorn Radial M. C. B. Coupler and Draft Gear for Interurban Service

The Vertical Pivoting of the Coupler Head prevents binding of the knuckles and relieves all other than normal strain from the CAR PLATFORMS when train of cars is operated over abrupt changes in grades.

The COUPLER Head is held in normal coupling position by TRIPLE SPRING SUPPORT located in casing directly under the coupler head.

Has a POSITIVE LOCK, LOCK SET and KNUCKLE THROW.

Couples by impact and uncouples from side of car.

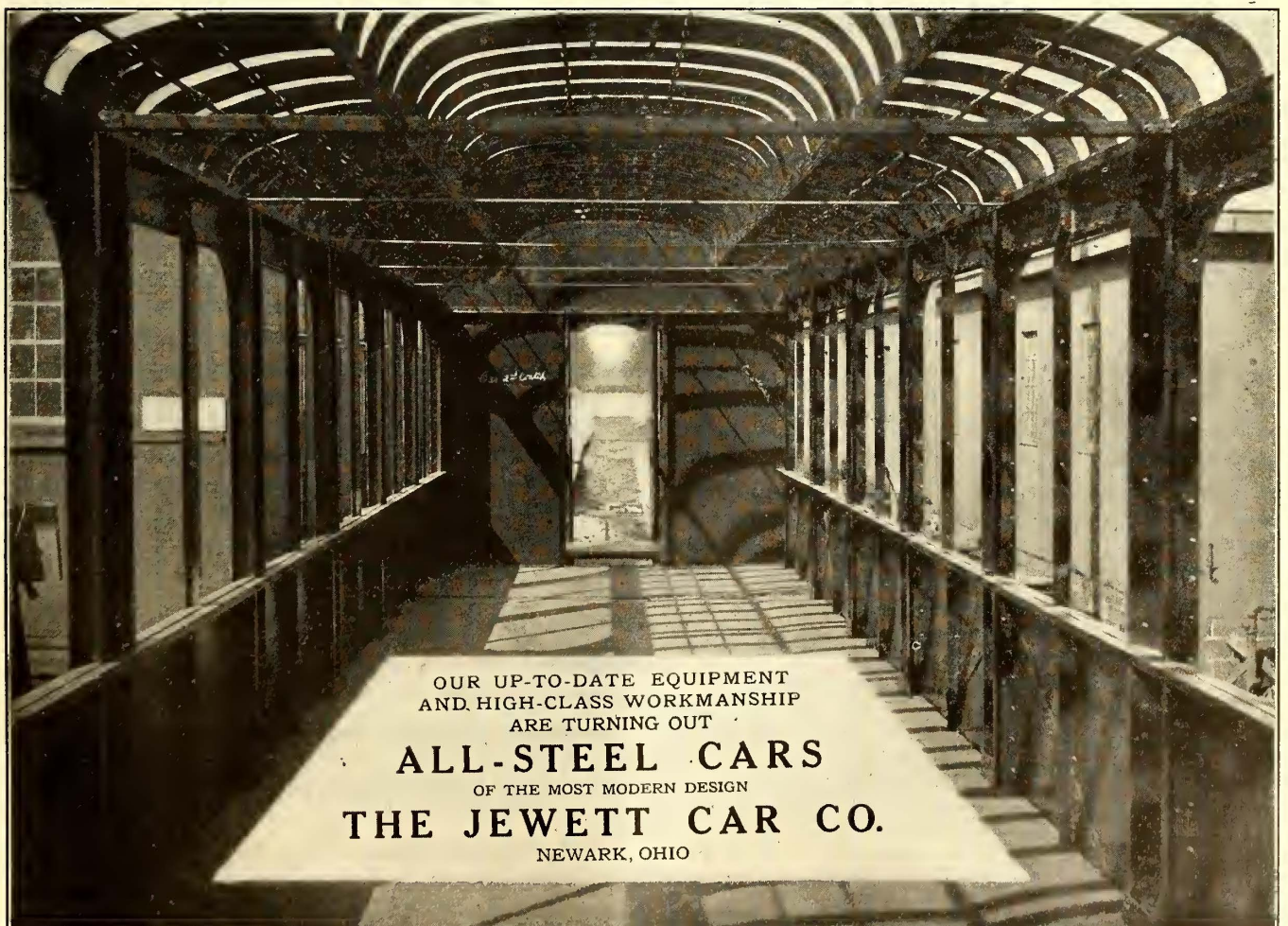
Has extended guard arm and butting wall which greatly facilitate coupling and prevent buckling.

The deep knuckles permit wide free vertical movement.

This Coupler will interchange with all standard M. C. B. couplers.

THE DOUBLE HERCULES SPRING RADIAL DRAFT GEAR is very effective in absorbing shocks and makes a train move as one car. This equipment will operate perfectly on 30-ft. radius curves.

Van Dorn Coupler Co., 2325 So. Paulina St., Chicago, Ill.



OUR UP-TO-DATE EQUIPMENT
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ARE TURNING OUT
ALL-STEEL CARS
OF THE MOST MODERN DESIGN
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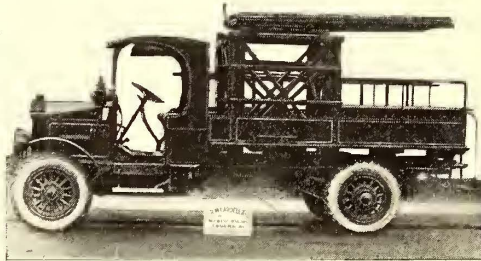
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 with maxi-
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Railway Feeders

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.

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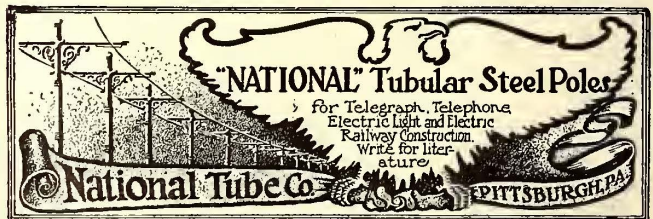
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ELECTRICAL WIRES AND CABLES

John A. Roebling's Sons Company
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The Simmen System



Direct Contact Between
 Dispatcher and Motorman

Write for Details
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For Every Pole Purpose



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Strongest STEEL POLE of like weight in the world.
Best STEEL POLE in the world for electric railway trolley service, Power Transmission or Street Lighting.
Most artistic STEEL POLE in the world for any service.
We make the lowest prices.
We have constantly on hand about two thousand tons of steel and can make immediate shipments.
A full line of convenient malleable fittings.
Our steel pole TREATISE tells a big story. Ask for it.

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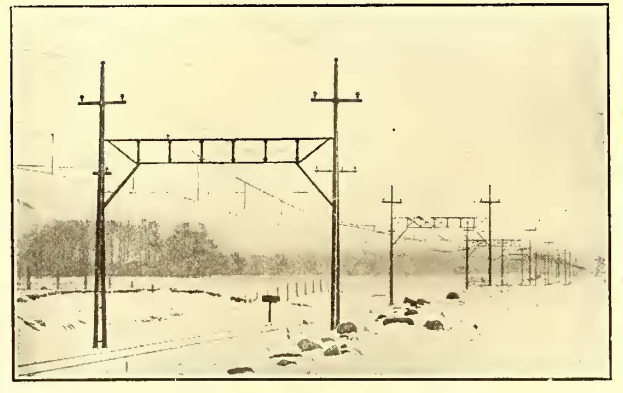
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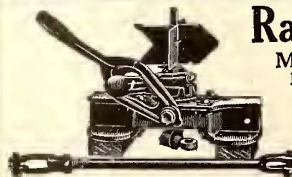
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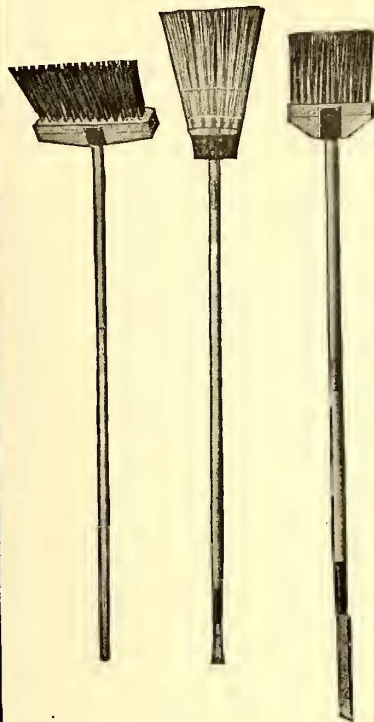


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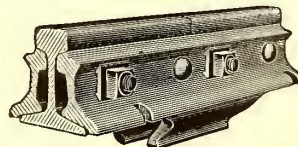


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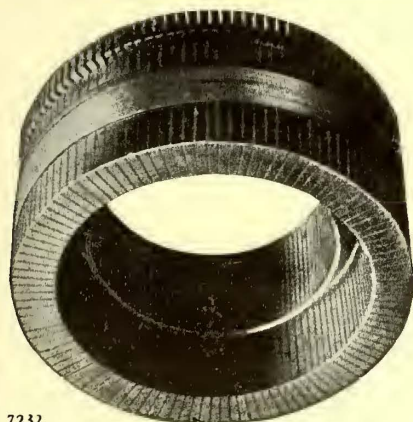
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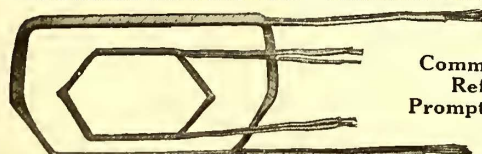
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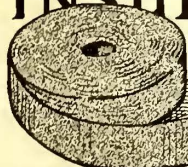
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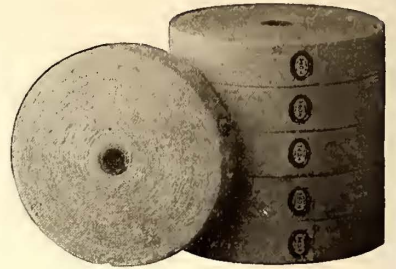
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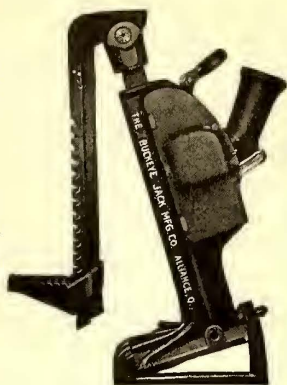
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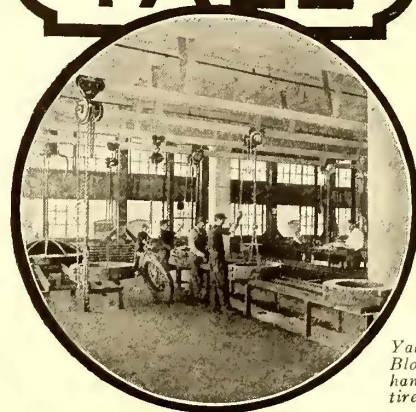
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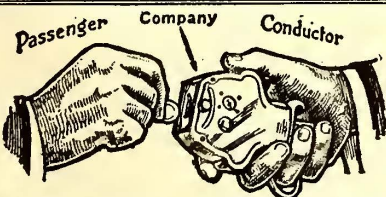
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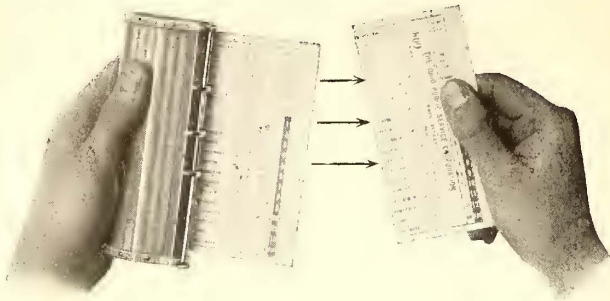
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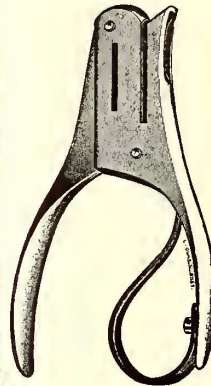
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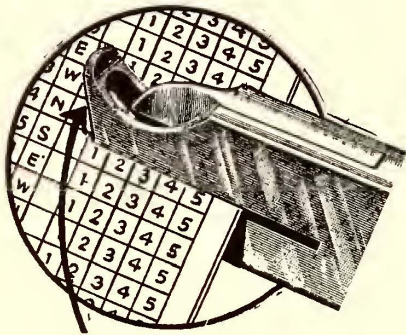
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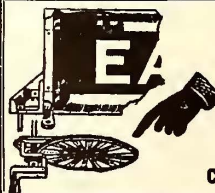
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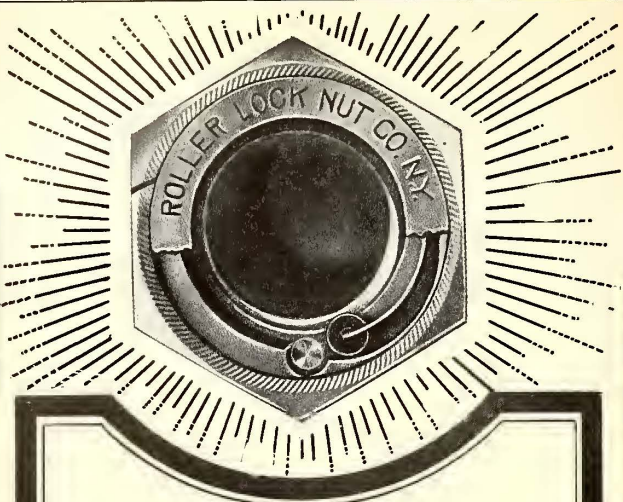
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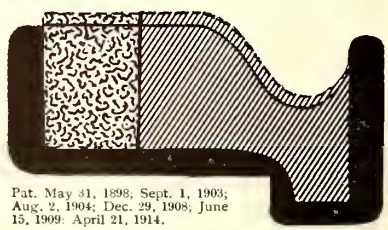
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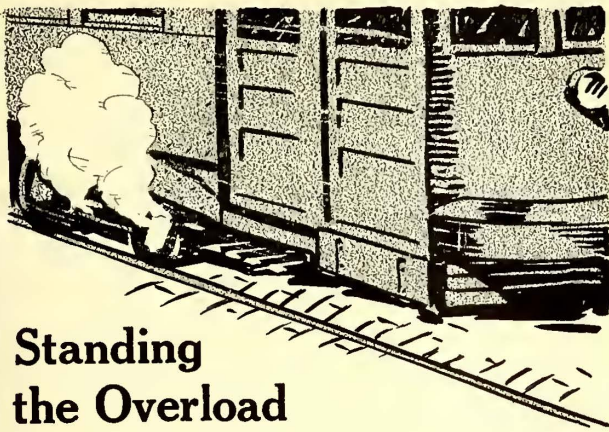
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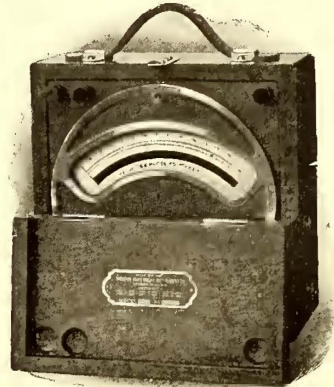
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Johnson Fare Box Co.
C. & C. Electric & Mfg. Co.
Holden & White

General Agents for Anglo-American Varnish Co.
Eastern Agents for Union Fibre Co.

WHAT AND WHERE TO BUY

Ohio Corrugated Culvert Co.
 Pennsylvania Metal Cul. Co.
 Road Supply & Metal Co.
 Sioux Falls Metal Cul. Co.
 Spokane Corr. Cul. Co.
 Tennessee Metal Culvert Co.
 Utah Corr. Cul. & Fume Co.
 Virginia Metal & Culvert Co.
 Western Metal Mfg. Co.
 Wyatt Mfg. Co.

Curtains and Curtain Fixtures.
 Brill Co., The J. G.
 Du Pont Fabrikoid Co.
 Edwards Co., Inc., The O. M.
 Electric Service Supplies Co.
 Hartshorn Company, Stewart.
 Pantasote Co., The.
 St. Louis Car Co.

Cutting Apparatus, Oxy-Acetylene.
 Davis-Bourneville Co.
 Oxweld Acetylene Co.

Derailing Devices.
 Cleveland Frog & Crossing Co.

Destination Signs.
 Columbia M. W. & M. I. Co.
 Creaghead Engrg. Co.
 Electric Service Supplies Co.

Detective Service.
 Wisch Service, P. Edward.

Dispatching Systems.
 Simmen Auto. Ry. Sig. Co.

Door Operating Devices.
 Consolidated Car-Heating Co.
 National Pneumatic Co.
 Safety Car Devices Co.

Doors, Asbestos.
 Johns-Manville Co., H. W.

Doors and Door Fixtures.
 Brill Co., The J. G.
 Edwards Co., Inc., The O. M.
 Hale & Kilburn Co.

Doors, Folding Vestibule.
 National Pneumatic Co.

Doors, Steel Rolling.
 Kinnear Mfg. Co.

Doors, Trup.
 Edwards Co., The O. M.

Draft Rigging. (See Compressors, Car.)

Drills, Track.
 American Steel & Wire Co.
 Electric Service Supplies Co.
 Long Co., E. G.
 Niles-Bement-Pond Co.
 Ohio Brass Co.

Dryers, Sand.
 Electric Service Supplies Co.
 Zelnicker Supply Co., W. A.

Engineers, Consulting, Contracting and Operating.
 Archbold-Brady Co.
 Arnold Co., The.
 Beeler, John A.
 Burch, Edw. P.
 Byllesby & Co., H. M.
 Ford, Bacon & Davis.
 Hunt & Co., Robert W.
 Jackson, D. C. & Wm. B.
 Little, Inc., Arthur D.
 Neher, Rich. & Co.
 Ridley, Albert S.
 Sanderson & Porter.
 Sargent & Lundy.
 Scofield Engineering Co.
 Stephenson Sons & Co., S.
 Stone & Webster Eng'g Corp.
 White Companies, The J. G.
 Woodmansee & Davidson, Inc.

Engines, Gas and Oil.
 Westinghouse Elec. & M. Co.

Engines, Steam.
 Westinghouse Elec. & M. Co.

Extension Platform Tramp Doors.
 Edwards Co., Inc., The O. M.

Fare Boxes.
 Brill Co., The J. G.
 Cleveland Fare Box Co.
 International Register Co., The.
 Johnson Fare Box Co.
 Olmer Fare Register Co.

Fences, Woven Wire and Fence Posts.
 American Steel & Wire Co.
 Page Woven Wire Fence Co.

Fenders and Wheel Guards.
 Brill Co., The J. G.
 Cleveland Fare Box Co.
 Consolidated Car Fender Co.
 Electric Service Supplies Co.
 Horne Mfg. Co.
 Star Brass Works.
 Trolley Supply Co.

Fibre and Fibre Tubing.
 Diamond State Fibre Co.
 Johns-Manville Co., H. W.
 Westinghouse Elec. & M. Co.

Fibre Insulation.
 National Ry. Appliance Co.

Field Coils. (See Coils.)

Filters, Water.
 Scaife & Sons Co., Wm. B.

Fire Extinguishing Apparatus.
 Johns-Manville Co., H. W.

Fire-Proofing Material.
 Johns-Manville Co., H. W.

Flooring, Composition.
 American Mason Safety T. Co.
 Johns-Manville Co., H. W.

Forgings.
 Columbia M. W. & M. I. Co.
 Eureka Co.
 Standard Steel Works Co.

Furniture, Metal Office.
 Edwards Co., Inc., The O. M.

Fuses and Fuse Boxes.
 Chicago Fuse Mfg. Co.
 Columbia M. W. & M. I. Co.
 D & W Fuse Co.
 Daum, A. F.
 General Electric Co.
 Johns-Manville Co., H. W.
 Westinghouse Elec. & M. Co.

Fuses, Refillable.
 Columbia M. W. & M. I. Co.
 Economy Fuse & Mfg. Co.
 General Electric Co.
 Horne Mfg. Co.

Gages, Oil and Water.
 Ohio Brass Co.

Gaskets.
 Diamond State Fibre Co.
 Johns-Manville Co., H. W.
 Power Specialty Co.

Gas-Electric Cars.
 General Electric Co.

Gas Producers.
 Westinghouse Elec. & M. Co.

Gates, Car.
 Brill Co., The J. G.
 Jewett Car Co.

Gear Blanks.
 Carnegie Steel Co.
 Diamond State Fibre Co.
 Standard Steel Wks. Co.

Gear Cases.
 Columbia M. W. & M. I. Co.
 Electric Service Supplies Co.
 Kerschner Co., Inc., W. R.
 National Ry. Appliance Co.
 Westinghouse Elec. & M. Co.

Gears and Pinions.
 Bemis Car Truck Co.
 Columbia M. W. & M. I. Co.
 Diamond State Fibre Co.
 Electric Service Supplies Co.
 General Electric Co.
 Kerschner Co., Inc., W. R.
 Long Co., E. G.
 National Ry. Appliance Co.
 Nuttall Co., R. D.

Generating Sets, Gas-Electric.
 General Electric Co.

Generators.
 Dick, Kerr & Co.
 General Electric Co.
 Westinghouse Elec. & M. Co.

Gongs. (See Bells and Gongs.)

Graphite.
 Dixon Crucible Co., Joseph.
 Morgan Crucible Co.

Gates, Chain.
 Green Eng'g Co.

Greases. (See Lubricants.)

Grinders and Grinding Supplies.
 General Electric Co.
 Railway Track-work Co.

Grinding Blocks & Wheels.
 Norton Co.

Guards, Cattle.
 American Bridge Co.

Guards, Trolley.
 Electric Service Supplies Co.
 Ohio Brass Co.

Harps, Trolley.
 Anderson M. Co., A. & J. M.
 Bayonet Trolley Harp Co.
 Electric Service Supplies Co.
 Hensley Trolley & Mfg. Co.
 More-Jones Brass & M. Co.
 Nuttall Co., R. D.
 Star Brass Works.

Headlights.
 Electric Service Supplies Co.
 General Electric Co.
 Long Co., E. G.
 Ohio Brass Co.
 St. Louis Car Co.
 Trolley Supply Co.
 Westinghouse Elec. & M. Co.

Headlinings.
 Kerschner Co., Inc., W. R.
 Keyes Products Co.
 Pantasote Co., The.

Heaters, Car, Electric.
 Consolidated Car-Heating Co.
 Gold Car Heating & Lighting Co.
 Smith Heater Co., Peter.

Heaters, Car, Hot Air and Water.
 Cooper Heater Co.
 Smith Heater Co., Peter.

Heaters, Car, Stove.
 Electric Service Supplies Co.
 Smith Heater Co., Peter.

Hoists and Lifts.
 Columbia M. W. & M. I. Co.
 Duff Manufacturing Co.
 Ford Chain Block & Mfg. Co.
 Niles-Bement-Pond Co.
 Yale & Towne Mfg. Co.

Hose Bridges.
 Ohio Brass Co.

Hose, Pneumatic & Fire.
 Johns-Manville Co., H. W.

Hydraulic Machinery.
 Niles-Bement-Pond Co.
 Watson-Stillman Co.

Hydrogrounds.
 Horne Mfg. Co.

Inspection.
 Elec'l Testing Laboratories.
 Hunt & Co., Robert W.

Instruments, Measuring, Testing and Recording.
 General Electric Co.
 Johns-Manville Co., H. W.
 Sangamo Electric Co.
 Westinghouse Elec. & M. Co.
 Weston Elec'l Instrument Co.

Insulating Cloths, Paper and Tape.
 Anchor Webbing Co.
 Diamond State Fibre Co.
 General Electric Co.
 Hope Webbing Co.

Insulation. (See also Paints.)
 Anderson M. Co., A. & J. M.
 Diamond State Fibre Co.
 Electric Service Supplies Co.
 General Electric Co.
 Holden & White Inc.
 Johns-Manville Co., H. W.
 Mechanical Rubber Co.
 Mica Insulator Co.
 Okonite Co.
 Packard Electric Co.
 Standard Paint Co.
 Standard Underground Cable Co.
 Standard Woven Fabric Co.
 Westinghouse Elec. & M. Co.

Insulators. (See also Line Material.)
 Anderson M. Co., A. & J. M.
 Creaghead Engrg. Co.
 Drew Elec. & Mfg. Co.
 Electric Ry. Equipment Co.
 Electric Service Supplies Co.
 General Electric Co.
 Johns-Manville Co., H. W.
 Macallen Co.
 Ohio Brass Co.
 Westinghouse Elec. & M. Co.
 White Elec. Supply Co., T. C.

Insulator Pins.
 Hubbard & Co.

Insurance, Fire.
 Marsh & McLennan.

Inventions, Developed and Perfected.
 Peters & Co., G. D.

Jacks. (See also Cranes, Hoists and Lifts.)
 Brill Co., The J. G.
 Buckeye Jack Mfg. Co.
 Columbia M. W. & M. I. Co.
 Duff Manufacturing Co.
 National Ry. Appliance Co.
 Watson-Stillman Co.

Joints, Rail.
 Atlantic Welding Co.
 Carnegie Steel Co.
 Rail Joint Co., The.
 Zelnicker Supply Co., W. A.

Journal Boxes.
 Bemis Car Truck Co.
 Brill Co., The J. G.
 Gurney Ball Bearing Co.
 Hess-Bright Mfg. Co.
 Long Co., E. G.
 Railway Roller Bearing Co.

Junction Boxes.
 Johns-Manville Co., H. W.
 Standard Underground Cable Co.

Laboratories.
 Elec'l Testing Laboratories.
 Little, Inc., Arthur D.

Lamp Guards and Fixtures.
 Anderson M. Co., A. & J. M.
 Electric Service Supplies Co.

General Electric Co.
 Westinghouse Elec. & M. Co.

Lamps, Arc and Incandescent.

Anderson M. Co., A. & J. M.
 General Electric Co.
 Westinghouse Elec. & M. Co.

Lamps, Signal and Marker.
 Ohio Brass Co.

Lathes, Car Wheel.
 Niles-Bement-Pond Co.

Lighting Regulators, Car.
 Holden & White, Inc.

Lightning Protection.
 Anderson M. Co., A. & J. M.
 Electric Service Supplies Co.
 General Electric Co.
 Horne Mfg. Co.
 Ohio Brass Co.
 Westinghouse Elec. & M. Co.

Line Material. (See also Wire, etc.)

Anderson M. Co., A. & J. M.
 Archbold-Brady Co.
 Columbia M. W. & M. I. Co.
 Creaghead Engrg. Co.
 Diamond State Fibre Co.
 Dick, Kerr & Co.
 Drew Elec. & Mfg. Co.
 Electric Ry. Equipment Co.
 Electric Service Supplies Co.
 Eureka Co.
 General Electric Co.
 Holden & White, Inc.
 Hubbard & Co.
 Johns-Manville Co., H. W.
 Macallen Co.
 More-Jones Brass & M. Co.
 Ohio Brass Co.
 Westinghouse Elec. & M. Co.
 White Elec. Supply Co., T. C.

Lockers, Metal.
 Edwards Co., Inc., The O. M.

Locks.
 Yale & Towne Mfg. Co.

Locomotives, Electric.
 Baldwin Locomotive Works.
 Brill Co., The J. G.
 General Electric Co.
 Westinghouse Elec. & M. Co.

Lubricants, Oil and Grease.
 Borne, Strymer Co.
 Dearborn Chemical Co.
 Dixon Crucible Co., Jos.

Lumber. (See Poles, Ties, Posts, etc.)

Machine Work.
 Columbia M. W. & M. I. Co.
 Horne Mfg. Co.

Machine Tools.
 Columbia M. W. & M. I. Co.
 Niles-Bement-Pond Co.
 Watson-Stillman Co.

Manganese Parts.
 Bemis Car Truck Co.

Mats.
 Johns-Manville Co., H. W.

Meters, Car, Watthour.
 Sangamo Electric Co.

Meters. (See Instruments.)

Mica.
 Drew Elec. & Mfg. Co.
 Long Co., E. G.
 Macallen Co.

Motorists' Seats.
 Electric Service Supplies Co.
 Wood Co., C. N.

Motor Generator, Bonding and Welding.
 Lincoln Bonding Co.

Motors and Generators Sets.
 General Electric Co.

Motors, Electric.
 Br. Westinghouse E. & M. Co.
 Dick, Kerr & Co.
 General Electric Co.
 Westinghouse Elec. & M. Co.

Nuts and Bolts.
 Bemis Car Truck Co.
 Columbia M. W. & M. I. Co.
 Hubbard & Co.
 Long Co., E. G.
 National Ry. Appliance Co.
 Roller Lock Nut Co.

Oils. (See Lubricants.)

Overhead Equipment. (See Line Material.)

Oxy-Acetylene. (See Cutting Apparatus, Oxy-Acetylene.)

Packing.
 Diamond State Fibre Co.
 Electric Service Supplies Co.
 Horne Mfg. Co.

Johns-Manville Co., H. W.
 Mechanical Rubber Co.
 Power Specialty Co.

Packing Rings.
 Johns-Manville Co., H. W.

Paints and Varnishes. (Insulating.)
 General Electric Co.
 Holden & White, Inc.
 Johns-Manville Co., H. W.
 Long Co., E. G.



The Standard Paving Pitch

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

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

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

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

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

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

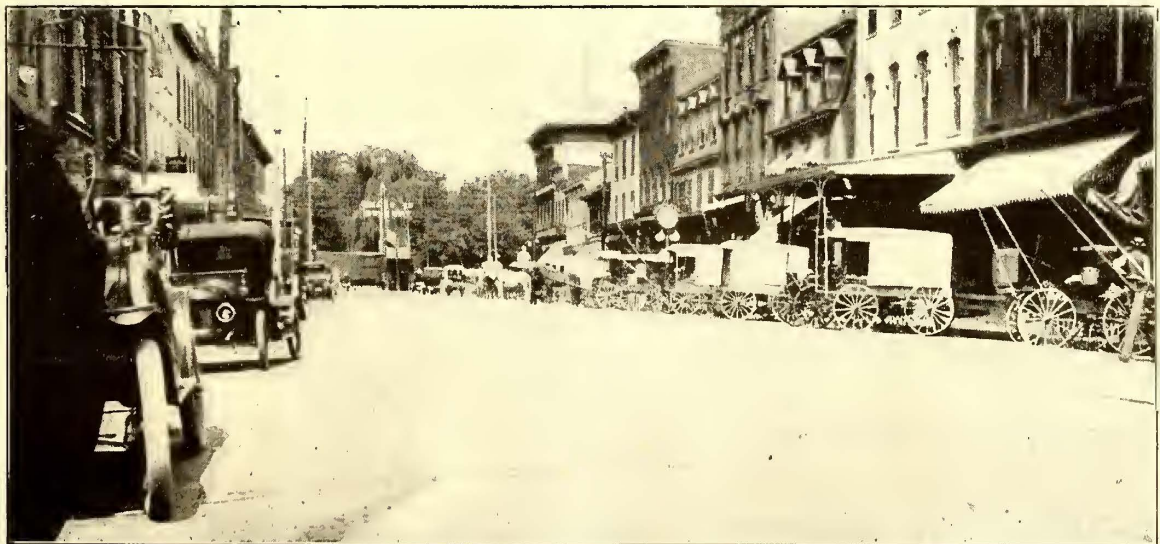
In preferring pitch to cement or sand, the municipal engineer knows that he will get a pavement where every joint is an *expansion-joint*; a pavement in which cracks, breaks, blow-outs are unknown and impossible; a pavement that will not expand and thrust the curbing out of line or damage tracks or manholes;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

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

Booklets on request. Address our nearest office.

The Barrett Company

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



Sunbury, Pa. Brick pavement laid in 1891 and filled with Barrett's Paving Pitch. The street car tracks were laid some time thereafter without injury to the pavement.

Mica Insulator Co.
Packard Electric Co.
Standard Paint Co.

Paints and Varnishes. (Preservative.)
Dixon Crucible Co., Jos.
Johns-Manville Co., H. W.
Long Co., E. G.
National Ry. Appliance Co.
Standard Paint Co.

Paints and Varnishes for Woodwork.
National Railway Appliance Co.

Paving Brick. (Filler and Stretcher.)
Nelsonville Brick Co.

Paving Material.
American B. S. & Fdy. Co.
Barrett Co., The.
Nelsonville Brick Co.

Paving Pitch.
Barrett Co., The.

Pickups. (Trolley Wire.)
Electric Service Supplies Co.
Ohio Brass Co.

Pinion Pullers.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
General Electric Co.
Wood Co., C. N.

Pinions. (See Gears.)
 Pins, Case Hardened, Wood and Iron.
Bemis Car Truck Co.
Electric Service Supplies Co.
Long Co., E. G.
Ohio Brass Co.

Pipe.
National Tube Co.

Pipe Fittings.
National Tube Co.
Power Specialty Co.
Standard Steel Works Co.
Watson-Stillman Co.

Poles, Metal Street.
Bates Expanded Steel Truss Co.
Electric Ry. Equipment Co.
Hubbard & Co.
National Railway Appliance Co.
National Tube Co.

Pole Sleeves.
Drew Elec. & Mfg. Co.

Poles, Ties, Posts, Piling and Lumber.
Carney & Co., B. J.
Lindsay Bros. Co.
Page & Hill Co.
Valentine-Clark Co.

Poles and Ties, Treated.
Lindsay Bros. Co.
Page & Hill Co.
Valentine-Clark Co.

Poles, Trolley.
Anderson M. Co., A. & J. M.
Bayonet Trolley Harp Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Long Co., E. G.
National Tube Co.
Nuttall Co., R. D.

Pole Reinforcing.
Hubbard & Co.

Pothheads.
Okonite Co.

Power Saving Devices.
Arthur Power-Saving Recorder Co.

Pressure Regulators.
General Electric Co.
Ohio Brass Co.

Pumps.
Watson-Stillman Co.

Punches, Ticket.
American Railway Supply Co.
Bonney-Vahslage Tool Co.
International Register Co., The.
Wood Co., C. N.
Woodman Mfg. & Supply Co., R.

Punching Machinery.
Watson-Stillman Co.

Purifiers, Feed Water.
Scaife & Sons Co., Wm. E.

Rail Grinders. (See Grinders.)

Rails, Relaying.
Zelnicker Supply Co., W. A.

Rail Welding. (See Welding Processes and Apparatus.)

Rattan.
Brill Co., The J. G.
Electric Service Supplies Co.
Hale & Kilburn Co.
Jewett Car Co.
St. Louis Car Co.

Recorders, Power Saving.
Arthur Power-Saving Recorder Co.

Registers and Fittings.
Bonham Recorder Co.
Brill Co., The J. G.
Electric Service Supplies Co.
International Register Co., The.
Long Co., E. G.
Omber Fare Register Co.
Rooke Automatic Register Co.

WHAT AND WHERE TO BUY

Reinforcing Concrete.
American Steel & Wire Co.

Repair Shop Appliances. (See also Coil Banding and Winding Machines.)
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.

Repair Work. (See also Coils, Armature and Field.)
Cleveland Armature Works.
Coil Mfg. & Repair Co.
Columbia M. W. & M. I. Co.
General Electric Co.
Independent Lamp & W. Co.
Westinghouse Elec. & M. Co.

Replacers, Car.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.

Resistance, Grid.
Columbia M. W. & M. I. Co.
Elleon Co.

Resistance, Wire and Tube.
General Electric Co.
Westinghouse Elec. & M. Co.

Retrievers, Trolley. (See Catchers and Retrievers, Trolley.)

Rheostats.
Elleon Co.
General Electric Co.
Mica Insulator Co.
Westinghouse Elec. & M. Co.

Roofing, Building.
Barrett Co., The.
Johns-Manville Co., H. W.
Standard Paint Co.

Roofing, Car.
Johns-Manville Co., H. W.
Keyes Products Co.
Pantastote Co., The.

Rubber Specialties of all Kinds.
Mechanical Rubber Co.

Sand Blasts.
National Ry. Appliance Co.

Sanders, Track.
Brill Co., The J. G.
Cleveland Fare Box Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Holden & White, Inc.
Horne Mfg. Co.
Jewett Car Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Balances.
Edwards Co., Inc., The O. M.

Sash Fixtures, Car.
Brill Co., The J. G.
Edwards Co., Inc., The O. M.

Sash, Metal, Car Windows.
Edwards Co., Inc., The O. M.
Hale & Kilburn Co.

Scales, Weights, Balances and Dynamometers.
Horne Mfg. Co.

Seating Material. (See also Rattan.)
Brill Co., The J. G.
Du Pont Fahrkoid Co.
Pantastote Co., The.

Seats, Car.
Brill Co., The J. G.
Hale & Kilburn Co.
Jewett Car Co.
Peters & Co., G. D.
St. Louis Car Co.

Second-Hand Equipment. (See also pages 82, 83.)
Archer & Baldwin.
Kerschner Co., Inc., W. R.
MacGovern & Co.

Shade Rollers.
Hartshorn Co., Stewart.

Shades, Vestibule.
Brill Co., The J. G.
Electric Service Supplies Co.

Shovels.
Hubbard & Co.

Signals, Car Starting.
Consolidated Car-Heating Co.
National Pneumatic Co.

Signals, Highway Crossing.
Electric Service Supplies Co.
Simmen Auto. Ry. Signal Co.
U. S. Electric Signal Co.

Signal Systems, Block.
Electric Service Supplies Co.
Federal Signal Co.
Simmen Auto. Ry. Signal Co.
Union Switch & Signal Co.
U. S. Electric Signal Co.
Wood Co., C. N.

Slack Adjusters. (See Brake Adjusters.)

Sleet Wheels and Cutters.
Anderson M. Co., A. & J. M.
Bayonet Trolley Harp Co.
Bonney-Vahslage Tool Co.
Columbia M. W. & M. I. Co.
Drew Elec. & Mfg. Co.
Holden & White, Inc.
More-Jones Brass & M., Co.
Nuttall Co., R. D.

Snow-Plows, Removers, Sweepers, etc.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car Fender Co.

Soldering and Brazing Apparatus. (See Welding Proc. & App.)

Speed Indicators.
Johns-Manville Co., H. W.
Wood Co., C. N.
Woodman Mfg. & Supply Co., R.

Spikes.
American Steel & Wire Co.

Splicing Compounds.
Johns-Manville Co., H. W.
Mechanical Rubber Co.
Standard Woven Fabric Co.
Westinghouse Elec. & M. Co.

Splicing Sleeves. (See Clamps and Connectors.)

Springs, Car & Truck.
American Steel Foundries.
American Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Long Co., E. G.
Standard Steel Works Co.
Taylor Elec. Truck Co.
Union Spring & Mfg. Co.

Sprinklers, Track and Road.
Brill Co., The J. G.
St. Louis Car Co.

Steps, Car.
American Mason S. T. Co.
Universal Safety Tread Co.

Stokers, Mechanical.
Babcock & Wilcox Co.
Green Engrg. Co.
Murphy Iron Works.
Westinghouse Elec. & M. Co.

Storage Batteries. (See Batteries, Storage.)

Straps, Car, Sanitary.
Holden & White, Inc.
Railway Improvement Co.

Structural Iron. (See also Bridges.)

Sub-Stations.
Delta Star Electric Co.

Superheaters.
Babcock & Wilcox.
Power Specialty Co.

Sweepers, Snow. (See Snow-Plows, Sweepers and Brooms.)

Switchstands.
Kilby Frog & Switch Co.
Ramapo Iron Works.

Switches, Track. (See Track, Special Work.)

Switches and Switchboards.
Anderson M. Co., A. & J. M.
Cutter Electrical & Mfg. Co.
Delta Star Electric Co.
Electric Service Supplies Co.
General Electric Co.
U. S. Electric Signal Co.
Westinghouse Elec. & M. Co.

Tampers, Tie.
Ingersoll-Rand Co.

Tapes & Cloth. (See Insulating Cloths, Paper and Tape.)

Telephones and Parts.
Electric Service Supplies Co.

Terminals.
Frankel Connector Co.

Terminal Cables.
Standard Underground Cable Co.

Testing Clips.
Frankel Connector Co.

Testing, Commercial and Electrical.
Electrical Testing Laboratories.
Hunt & Co., Robert W.

Testing Instruments. (See Instruments, Electrical, Measuring, Testing.)

Thermostats.
Consolidated Car-Heating Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter.

Ticket Boxes.
Macdonald Ticket & Ticket Box Co.

Ticket Choppers and Destroyers.
Electric Service Supplies Co.
Patten Co., Paul B.

Tickets and Transfers.
American Railway Supply Co.

Ties and Tie Rods, Steel.
American Bridge Co.
Carnegie Steel Co.
International Steel Tie Co.

Ties, Wood. (See Poles, Ties, etc.)

Tools, Track and Miscellaneous.

American Steel & Wire Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Johns-Manville Co., H. W.
Klein & Sons, M.
Railway Track-work Co.

Torches, Acetylene. (See Cutting Apparatus, Oxy-Acetylene.)

Towers and Transmission Structures.

American Bridge Co.
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Delta Star Electric Co.
Westinghouse Elec. & M. Co.

Tower Wagons and Auto-Trucks.
McCardell & Co., J. R.

Track, Special Work.
American Frog & Switch Co.
Cleveland Frog & Crossing Co.
Columbia M. W. & M. I. Co.
Kilby Frog & Switch Co.
New York S. & Cross Co.
Ramapo Iron Works.

Transfers. (See Tickets.)

Transfer Issuing Machines.
Olmer Fare Register Co.

Transfer Tables.
American Bridge Co.
Archbold-Brady Co.

Transformers.
General Electric Co.
Packard Electric Co.
Westinghouse Elec. & M. Co.

Treads, Safety, Stair Car Step.
American Mason Safety Tread Co.
Universal Safety Tread Co.

Trolley Bases.
Anderson M. Co., A. & J. M.
Electric Service Supplies Co.
General Electric Co.
Holden & White, Inc.
Horne Mfg. Co.

More-Jones Brass & M. Co.
Nuttall Co., R. D.
Ohio Brass Co.
Trolley Supply Co.

Trolley Bases, Retrieving.
Holden & White, Inc.

Trolley Shoes.
Holden & White, Inc.

Trolleys and Trolley Systems.
Ford Chain Block & Mfg. Co.

Trucks, Car.
American Steel Foundries.
Baldwin Locomotive Works.
Bemis Car Truck Co.
Brill Co., The J. G.
Long Co., E. G.
St. Louis Car Co.
Taylor Elec. Truck Co.

Tubing, Steel.
National Tube Co.

Turbines, Steam.
General Electric Co.
Westinghouse Elec. & M. Co.

Turnstiles.
Percy Mfg. Co., Inc.

Union Couplings.
National Tube Co.

Valves.
National Tube Co.
Ohio Brass Co.

Varnishes. (See Paints, etc.)

Ventilators, Car.
Brill Co., The J. G.
Globe Ventilator Co.
Holden & White, Inc.
Railway Utility Co.
St. Louis Car Co.

Volt Meter. (See Instruments.)

Washers.
Bound Brook Oil-less Bearing Co.
Diamond State Fibre Co.

The On-Time Advertiser

who gets his copy and cuts to us well before the day his advertisement should go to press, gets better type composition, better location and a better opportunity to make necessary corrections on the proofs, which can then be submitted before publication.

The Last-Hour Advertiser

whose copy and cuts come in at the last minute or even later, gets the best attention we can possibly give him. We work overtime to do what we can for him. But the lack of sufficient time makes it physically impossible to do as well for him as for the advertiser whose instructions come in well before the last hour.

Get Your Copy and Cuts in Early

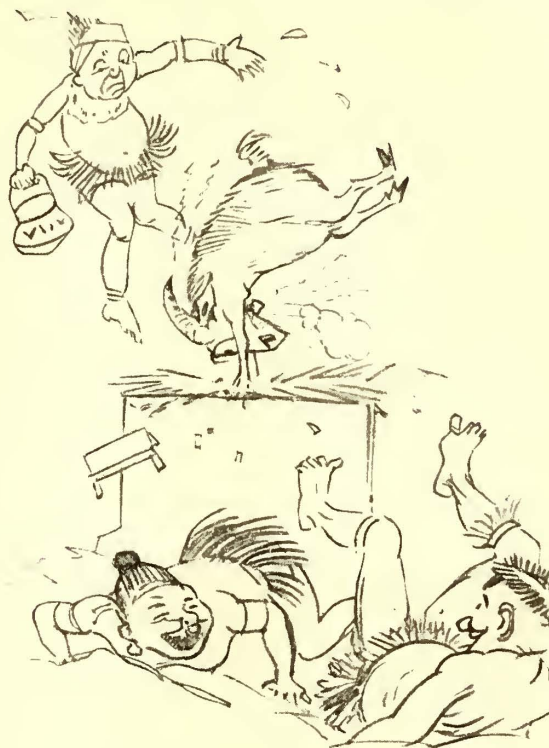
Do this, not on our account, but for the sake of your own advertising. We want to serve all advertisers equally well—but we can't put more hours into a day, and the advertiser who gives us the most time gets the best results.

Copy and cuts should be in our hands by Thursday of the week preceding the date of issue. This means that Thursday is the *last* day on which copy can be handled normally.

After that we cannot promise proofs, and we cannot insure classification.

For good advertising, get your cuts and copy in every week *before* Thursday.

Electric Railway Journal
239 West 39th Street, New York



Tunda

During a marriage among the Tottiyans of the Tamil country a red ram without blemish is sacrificed.

It is first sprinkled with water and if it shivers this tunda is a good omen.

If it doesn't shiver, they keep picking until one with the right qualifications is secured.

This choose-and-try method is all right in picking rams or cheap carbon brushes if you're intent on making a sacrifice.

But if you don't want to sacrifice commutation and commutators permit us to suggest that you have Morganite carbon brushes *prescribed* for your service by engineers.

Rams or choose-and-try brushes have considerable BUTT to them.

There are no IFS or BUTS to the Morganite proposition.



Main Office and Factory
519 West 38th St., New York City

DISTRICT AGENTS:

Lewis & Roth, 1012 Liberty Bldg., Philadelphia
Electrical Engineering & Mfg. Co.,
First National Bank Bldg., Pittsburgh
W. L. Rose Equipment Co.,
La Salle Bldg., St. Louis, Mo.
Herzog Electric & Engineering Co.,
150 Stewart Street, San Francisco, Cal.
W. R. Heudrey Co., Hoge Bldg., Seattle, Wash.
Charles Farnham, I. W. Hellman Bldg., Los Angeles, Cal.

Water Softening and Purifying Systems. Scaife & Sons Co., Wm. B.

Welding Processes and Apparatus. Atlantic Welding Co., Davis-Bourbonville Co., Electric Railway Improve. Co., General Electric Co., National Ry. Appliance Co., Oxweld Acetylene Co., Westinghouse Elec. & M. Co.

Wheel Grinders. Wheel Truing Brake Shoe Co.

Wheel Guards. (See Fenders and Wheel Guards.)

Wheels, Car, Cast Iron. American Steel & Wire Co., Association of Mfrs. of Chilled Car Wheels.

WHAT AND WHERE TO BUY

Bemis Car Truck Co., Griffin Wheel Co., Long Co., E. G.

Wheels, Car, (Steel and Steel Tired.) American Steel Foundries, Bemis Car Truck Co., Carnegie Steel Co., Standard Steel Works Co.

Wheels, Trolley. Anderson M. Co., A. & J. M., Bayonet Trolley Harp Co., Bound Brook Oil-less Bearing Co.

Columbia M. W. & M. I. Co., Electric Service Supplies Co., Eureka Co., General Electric Co., Hensley Trolley & Mfg. Co., Holden & White, Inc., Johns-Manville Co., H. W. Long Co., E. G., More-Jones Brass & M. Co., Nuttall Co., R. D., Star Brass Works.

Whistles, Air. General Electric Co., Ohio Brass Co.

Wire Rope. American Steel & Wire Co., Roelbling's Sons Co., John A.

Wires and Cables. Aluminum Co. of America, American Electrical Works, American Steel & Wire Co., Bridgeport Brass Co., D & W Fuse Co., General Electric Co., Kerite Insulated Wire & Cable Co., Okonite Co., Packard Electric Co., Page Woven Wire Fence Co., Roelbling's Sons Co., John A., Standard Underground Cable Co., Westinghouse Elec. & M. Co.

Wood Preservatives. Barrett Co., The., Lindsley Bros. Co., Valentine-Clark Co.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Table with 4 columns: Company Name, Page, Company Name, Page. Lists companies from A to Z with their corresponding page numbers.



The Owners of These Fine Homes Don't Want to Be Disturbed

by the dirt, dust and delay inevitable to retracking and repaving.

To be sure, rails must be renewed some time, but why not keep your streets clear, your cars moving and your public happy just as long as possible?

THE USE OF TITANIUM-TREATED RAIL

should not be limited merely to places of exceptional traffic. It will pay in revenue and good relations to use it everywhere.

The Los Angeles Railway, the Boston Elevated Railway and the Pittsburgh Railways are some of the roads that use Titanium-Treated rail in residential districts, too.

TITANIUM ALLOY MANUFACTURING COMPANY

Operating Under Rossi Patents

Processes and Products Patented

General Office and Works:
Niagara Falls, N. Y.



Pittsburgh Office: Oliver Building
Chicago Office: Peoples Gas Building

New York Office: 165 Broadway

AGENTS:

Pacific Coast: ECCLES & SMITH CO., Los Angeles, San Francisco, Portland

Great Britain and Europe: T. ROWLANDS & CO., Sheffield, England

Railway Roller Bearings

“Installing

Using

Inspecting

Checking Up Savings

Rollway Bearings is as easy as rolling off a log,” said the Master Mechanic. “We get the boxes from the Rollway Factory with all parts completely assembled. Here at the shop the journal sleeve is taken from the box by removing the end cap and is placed on the axle journal with a light drive or press fit. The box and rollers (still assembled) are then placed on the journal sleeve. The end thrust, which is completely assembled on the thrust nut, is then screwed on the journal extension and locked in position, no adjustments being required. The end cover is then put on and held in position by eight cap screws. We put three pounds of heavy oil in the box through the oil tap in the front cover. After two Rollway journal-boxes have been thus placed on the axle and truck frames are dropped into position, we make no further adjustments of the journal-box or bearings.”



The Railway Roller Bearing Co.
Syracuse, New York

BRILL

Spreading its Wings

Extending the journal box wings to enable the large-diameter spiral springs, which they support, to come directly under the body spiral springs, provides a longer spring base to the truck frame and this enables the frame in turn to provide a longer spring base to the car body. Length of spring base, together with correct location and combination of spiral and plate springs, gives steady riding qualities and the support needed for the long body with its frequently heavily-loaded, overhanging platforms. "Wide-wing" journal boxes also preserve a better balance which insures their free movement in the yokes. Brill "Wide-wing" Journal Boxes, Brill "Half-ball" Brake Hangers, Brill Solid Forged Side Frames, are three of the distinctive features of the Brill 21-E Truck. Bulletin 220 tells of the others.

THE J. G. BRILL COMPANY, PHILADELPHIA, PA.
AMERICAN CAR COMPANY, ST. LOUIS, MO.
G. C. KUHLMAN CAR CO., CLEVELAND, OHIO.
JOHN STEPHENSON CO., ELIZABETH, N. J.
WASON MANFG. CO., SPRINGFIELD, MASS.
CIE J. G. BRILL, 49 Rue des Mathurins, PARIS.

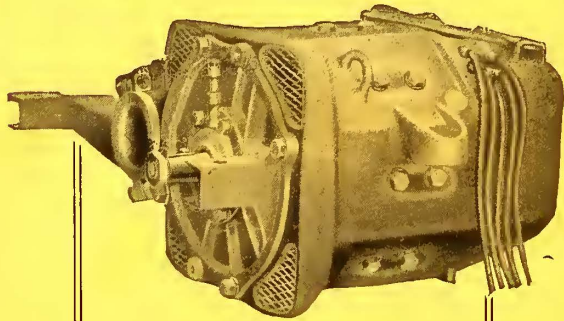
*"Look it up in
Brill Magazine"*



BRILL



Cars Grow No Lighter With Age!



G-E 258 Ventilated Railway Motor

is a 600-volt box frame motor for light weight 24-in. wheel cars. One hour rating—25 h.p. 600 volts. A sturdy little motor built with ball bearings and full multiple ventilation for single truck two-motor equipments.

Many of the cars on which your older motors are in use are not only heavier than your later cars—

They are also heavier than they were when first equipped.

The addition of vestibules to open platform cars to make use of prepayment, or door and step operating mechanisms, of rails and stanchions, of air brakes, of other new safety and convenience accessories—

Has put a burden of hundreds—even thousands—of extra pounds on the same old motors.

Call for a report from your armature room today to see how many of those old over-worked motors are lying there burnt out.

Then, with the figures before you, consider the economy and service satisfaction of replacing them with modern General Electric motors.

6787



General Electric Company

General Office: Schenectady, N. Y.

Sales offices in all large cities