

ELECTRIC RAILWAY JOURNAL

Volume 46
Number 1
July 3, 1915

McGraw
Publishing
Co., Inc.



The right place to effect economy is at the mill.
\$2.00 invested in TITANIUM here yields \$20.00
in rail saving. It's up to you to specify

TITANIUM Treatment

TITANIUM ALLOY MANUFACTURING CO.
Niagara Falls, N. Y.

No. 307-CV

45 HP at
500 Volts
55 HP at
600 Volts

Weight
Complete
2630 lbs



An Excellent Motor

Box frame type. For medium city or light, moderate speed interurban service.

Embodies all of the desirable features known to the art—pressed steel gear case, effective ventilation, “through bolts”, axle dust guards, minimum weight, combined with maximum capacity and great mechanical durability. Built to stand the severity of service where frequent starts and stops are made.

Write our nearest office for leaflet No. 3832.

Westinghouse Electric & Manufacturing Co.

East Pittsburgh, Pa.

Sales Offices in all Large Cities.

Electric Railway Journal

New York, July 3, 1915

Volume XLVI No. 1

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JAMES H. MCGRAW, President. A. E. CLIFFORD, Secretary. J. T. DE MOTT, Treasurer. H. W. BLAKE, Editor.

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DENVER, Boston Bldg.
LONDON, 10 Norfolk St., Strand.

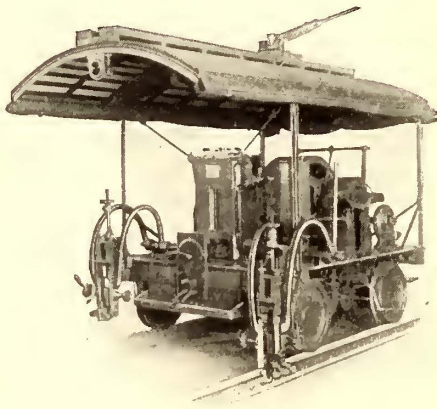
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Circulation of this issue 8000 copies.

ERICO

Rail Bonds

Electric Weld and Copper Weld



Portable Combination Plant
For Electric and Copper Welding



Electric Weld

THE well known Welded Rail Bonds as manufactured by The Electric Railway Improvement Company have been on the market for the last ten years.

After a careful investigation of the service this type of bond has given, the Westinghouse Company came to the conclusion that they should be added to their list of railway supplies.

Our salesmen in your locality will be pleased to discuss this method of bonding with you.

Write for Catalogue and Bonding Notes

Westinghouse Electric & Manufacturing Co.

East Pittsburgh, Pa.

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Bluefield, W. Va.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.

Charleston, W. Va.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
*Dallas, Tex.

Dayton, Ohio
Denver, Colo.
Detroit, Mich.
*El Paso, Tex.
*Houston, Tex.
Indianapolis, Ind.
Joplin, Mo.



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Los Angeles, Cal.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.

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Omaha, Neb.
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Pittsburg, Pa.
Portland, Ore.
Rochester, N. Y.

St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Seattle, Wash.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
*W. E. & M. Co. of Texas.

FRICTION

(Its relation to efficient brake control
of moving trains)

FRICTION IS A RETARDING FORCE IN SOCIETY, POLITICS, BUSINESS AND RELIGION.

BUT FRICTION REPRESENTS A CURIOUS PARADOX IN THE VARIOUS FIELDS OF ENGINEERING AND MECHANICS. IT IS AT ONCE ESSENTIAL TO EFFICIENCY AND OPPOSED TO IT. PRACTICALLY ALL APPLICATIONS OF POWER DEPEND FINALLY UPON FRICTION; ALSO ALL POWER APPLICATIONS ARE SUBJECT TO SERIOUS LOSSES DUE TO FRICTION.

A RAILROAD TRAIN IS PECULIAR IN THAT WHILE ACCELERATION—THE HAULING CAPACITY OR TRACTIVE EFFORT OF THE LOCOMOTIVE—DEPENDS FUNDAMENTALLY UPON FRICTION—(WHEEL—RAIL); DECELERATION—BRAKE CONTROL OF ALL TRAIN MOVEMENT—ALSO DEPENDS FUNDAMENTALLY UPON FRICTION (WHEEL—SHOE).

ON THE ONE HAND WE HAVE HEAVY TRAINS AT HIGH SPEEDS REPRESENTING UNBELIEVABLE TOTALS OF FOOT TONS OF ENERGY; ON THE OTHER HAND WE HAVE, TO CONTROL THIS MOVING MASS, THE FRICTION OF A FEW SQUARE INCHES OF BRAKE SHOE IN CONTACT WITH A ROTATING WHEEL.

BRAKE SHOE FRICTION AND TRAIN RETARDATION RESULTING THEREFROM VARY WITH LEVERAGE, PRESSURE, TEMPERATURE, DURATION OF CONTACT, LOCATION OF BRAKE SHOE ON WHEEL, BRAKE MECHANISM DESIGN INVOLVING ABILITY TO ALTERNATE AND GRADUATE BRAKING POWER ON THE TRAIN, AND A HUNDRED OTHER FACTORS WHICH ENTER INTO THIS MOST COMPLEX AND INVOLVED BRANCH OF AIR BRAKE ENGINEERING.

AIR BRAKE ENGINEERING IS MAINLY CONCERNED WITH THE FLEXIBLE, RELIABLE AND EFFECTIVE APPLICATION OF FRICTION TO PROPERLY CONTROL ALL TRAFFIC MOVEMENT BY RAIL.

Suggested by the

Westinghouse Traction Brake Company

Works: Wilmerding, Pennsylvania

PITTSBURGH: Westinghouse Building
CHICAGO: Railway Exchange Building

NEW YORK: City Investing Building
ST. LOUIS: Security Building

PUBLISHER'S PAGE

Buy, Boom and Use Advertised Products Because :

[1]

Advertising is a sign of good faith whereby the promise is irrevocably set before the eyes of the buying world.

[2]

Advertising is a symbol of progressive methods that recognize the sound business sense of "satisfaction first."

[3]

Advertising conserves the buyer's time by acquainting him with a product at his leisure, long before the buying need arises.

[4]

Advertising is useful only to those who have a message of genuine service to tell.

[5]

Advertising is a bond of fair dealing, for only a promise performed can justify the cost of a promise published.

[6]

Advertised statements bear the stamp of authority from those responsible for the conduct of the organization whose signature is published.

[7]

Advertising is an economy and cuts the cost of selling, making lower prices or better goods possible without sacrifice of the producer's profits.

[8]

Advertisers are almost invariably the most successful business men in their industry, and success in business is inseparable from service rendered.

[9]

Advertising in a given field is evidence of a well-founded belief in ability to serve it.

[10]

Advertising can long prove profitable only to producers of meritorious products.

In succeeding issues, we plan briefly to discuss the buyers' interests in connection with advertised products under each of the headings outlined above.

READ THE SERIES — APPLY IT—

Buy, Boom and Use Advertised Products



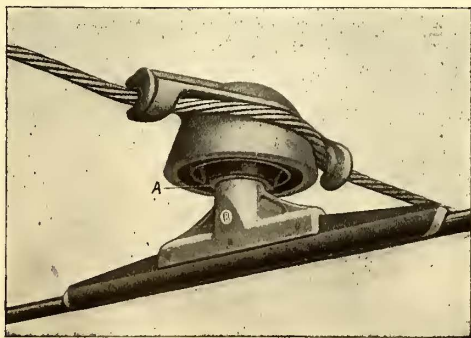
O-B Lock Hangers and Extruded Ears In Cuba

A particularly fine piece of construction in the Island Republic makes use of these two O-B Specialties that are giving universal satisfaction.

O-B Lock Hanger eliminates the loose joint between Hanger and Ear at "A". Gives a better job than the old style Hanger and requires no more of the lineman's time.

O-B Extruded Ears are easy to install and have long life. The method of manufacture of Extruded Metal imparts to it those physical properties long desired for trolley ears—ductility and toughness.

O-B Catalog No. 14 gives full details.



The Ohio Brass Co.
Mansfield, Ohio

Patch Bituminous Asphalt with a KOEHRING HOT MIXER

Cuts patching costs

Write for *authoritative* figures to prove the economy

—cuts your costs way below your best possible figures in remelting and remixing by stationary plant, or having the work done under contract—and this means a cut, *not* in remelting and remixing costs *alone*, but in the *total cost of ripping up, remixing and relaying old material.*

Besides think of the flexibility of this smaller unit. Haul it from job to job behind a car, use trolley power.

Give this cost-saving hot mixer a *hearing*, especially on its cost-cutting claims for patch work.

800 square yards per day, new 2 inch material.

That's what this mixer can do per day with new 2 inch bituminous material.

Also mixes concrete,—disconnection of asphalt tank and blower and connection of water tank turns it into concrete mixer with capacity of 180 square street yards *per hour.*

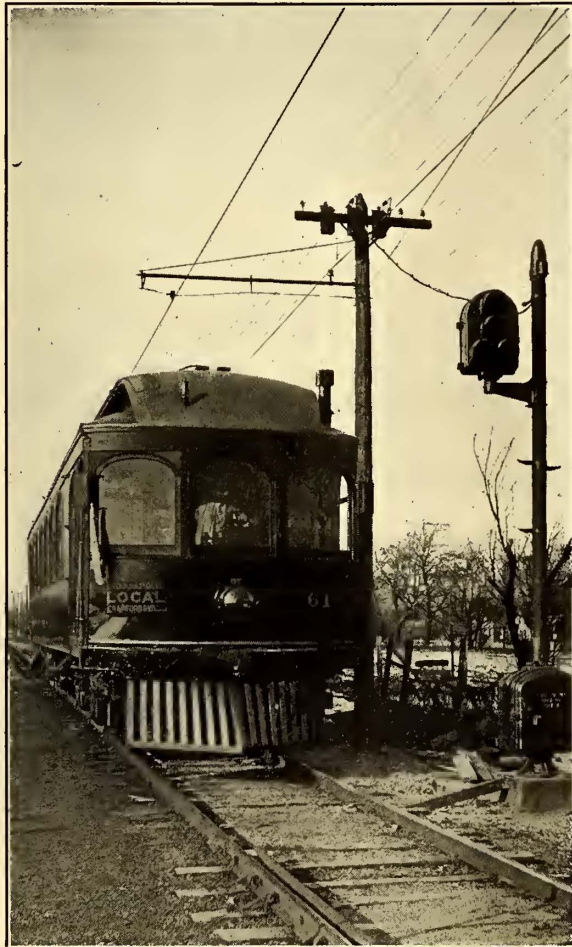
Write for cost figures of electric railways which are using this mixer—and remember, its costs-saving justifies its use even if you have a stationary plant.

KOEHRING MACHINE CO.
MILWAUKEE, WIS.



Re-melting and Re-mixing Old Asphalt

Here's What "Electric Service" Signals Are Doing



Direct View of "Electric Service" Signal on the Terre Haute, Indianapolis & Eastern Traction Co. Lines

The Terre Haute, Indianapolis and Eastern Traction Company on December 14th, 1914, placed in service one block of "Electric Service" Automatic Block Signals. To and including April 30th, 1915, they recorded 16078 car movements with but 13 failures—an efficiency of 99.919 per cent, counting all failures.

Of these 13 failures, 3 were traceable to the Signal Department, 3 were traceable to blown fuses, 6 were traceable to defective apparatus, 1 traceable to miscellaneous trouble.

Omitting the 3 failures each traceable to Signal Department and blown fuses, counting only the remaining 7, gives these "Electric Service" Signals an efficiency of 99.956 per cent—a truly remarkable showing.

A letter under date of May 26th from the company reads as follows:

"I am enclosing herewith a report of the operation of the Reliable Signals installed on our Crawfordsville Division, between Junction and Crawfordsville.

"This report is for a period of five months. The signals were put in service December 14, 1914, and taking everything into consideration, I believe that this is a pretty good showing. Judging from the performance in March and April, I believe that the longer the signals are in use the more familiar our men will be with them, and no doubt prevent, so far as practicable, avoidable failures.

"It is my opinion that the failures charged to signals not clearing when trains left block may in some cases have been due to train switching in Crawfordsville while regular train was in the block."

Complete copy of this report will gladly be sent to interested parties on request.

Why not take up your signalling problems with us now and let us prove just what the use of "Electric Service" Signals will mean to you?

ELECTRIC SERVICE SUPPLIES Co.

Manufacturer of Railway Material and Electrical Supplies

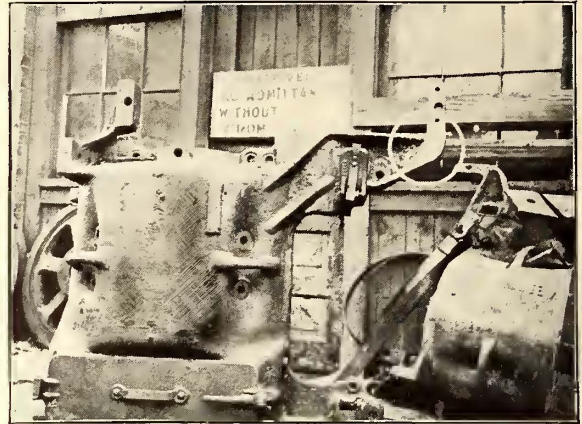
PHILADELPHIA
17th and Cambria Sts.

NEW YORK
Hudson Terminal

CHICAGO
417 So. Dearborn St.



Building up a guard rail with the Prest-O-Lite welding outfit. This simple operation obviates expensive disorganization of traffic and loss of time that replacing by any other method would require.



This motor frame was made good as new with the same welding outfit that was used for line work in the picture to the left. The arm was welded on, at trifling expense compared to any other method of repairing.

PREST-O-LITE

Dissolved Acetylene makes the Oxy-Acetylene Process of greater utility in railway work

It enables every electric railway, large or small, to enjoy *every* economy of time, labor and materials that only this process of joining or cutting metals gives. Prest-O-Lite makes good welding or cutting equipment a general purpose outfit, instead of a single purpose machine, with added capabilities, added efficiency and increase in quality of work done.

Enables you to use the same outfit for Rail Bonding and for Shop Repairs

The applications of oxy-acetylene welding are almost unlimited. New uses and added savings are being found daily. You can make immediate savings on damaged or worn equipment, avoid costly breakdowns, expensive delays and replacements by "on the spot" welding repairs. The apparatus being portable, can be taken to the job—dismantling of heavy equipment is unnecessary. Welding equipment pays for itself many times over when used for repair work alone. It is a good investment as "stand by" equipment. But the same outfit can be used to equal advantage in the yard and on the line.

No other method of rail bonding approaches the oxy-acetylene process for ensuring a contact which will not be reduced in efficiency by time and service. Thousands have been applied to new and existing track at a minimum expense and with no disorganization of traffic. The outfit stands at the side of the track.

Then, too, there are times when twenty minutes' use of an oxy-acetylene cutting blowpipe will prevent tie-ups which would be unavoidable by any other method of clearing the track.

Back Your Acetylene Supply by Permanent Service

Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

Ask us for information on Oxy-Acetylene Welding and Cutting in the electric railway field, and full details of Prest-O-Lite Acetylene service. Your name on the margin of this page will do.

The Prest-O-Lite Co., Inc., 805 Speedway
Indianapolis, Ind.

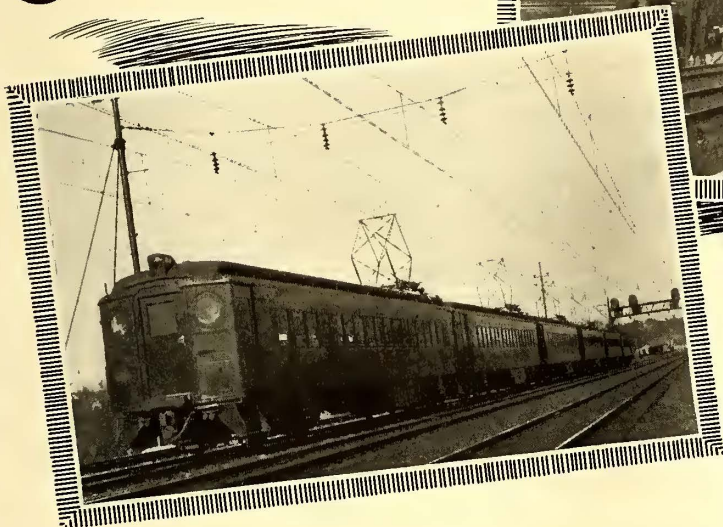
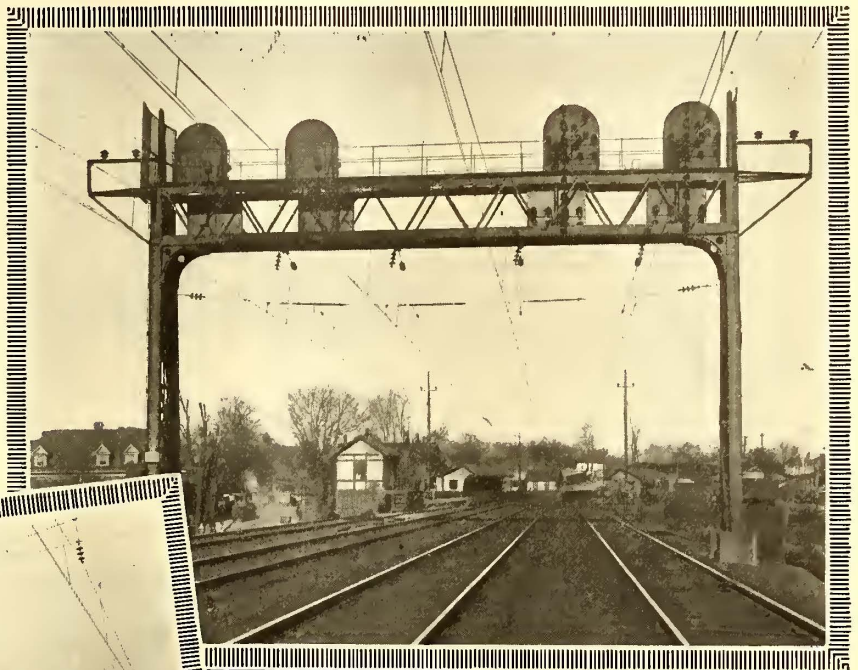
The World's Largest Makers of Dissolved Acetylene

53 direct factory branches and charging plants in principal industrial centers



Phono Electric

for
CATENARY
Or any other
Construction



It's Tough Trolley Wire

When you specify trolley wire—be sure you ask for “Phono-Electric”.

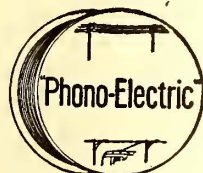
“Phono-Electric” is the best wire for keeping down maintenance costs and—that’s just what you want in an over-head wire.

The increased demand for better rolling stock and better roadbeds as well as faster schedules makes it imperative that a saving in over-head costs be maintained.

“Phono-Electric” is tough and will save you money—it will give more car mileage and longer service life.

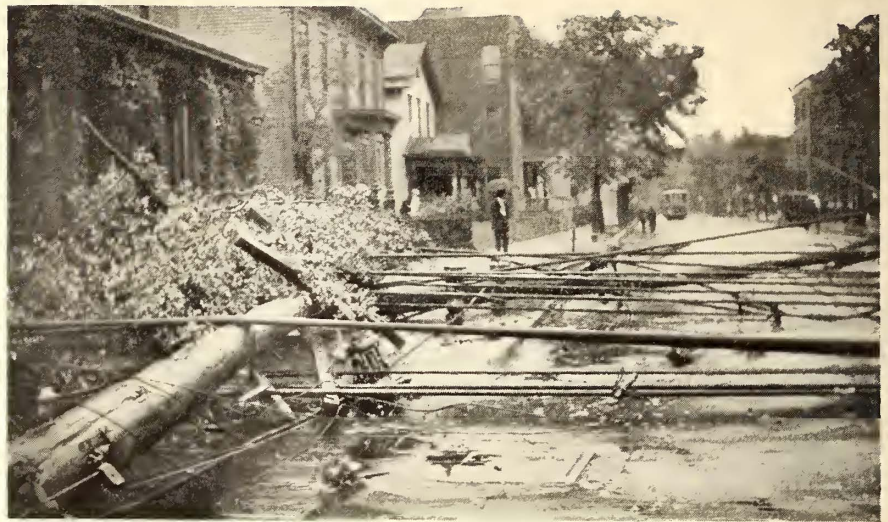
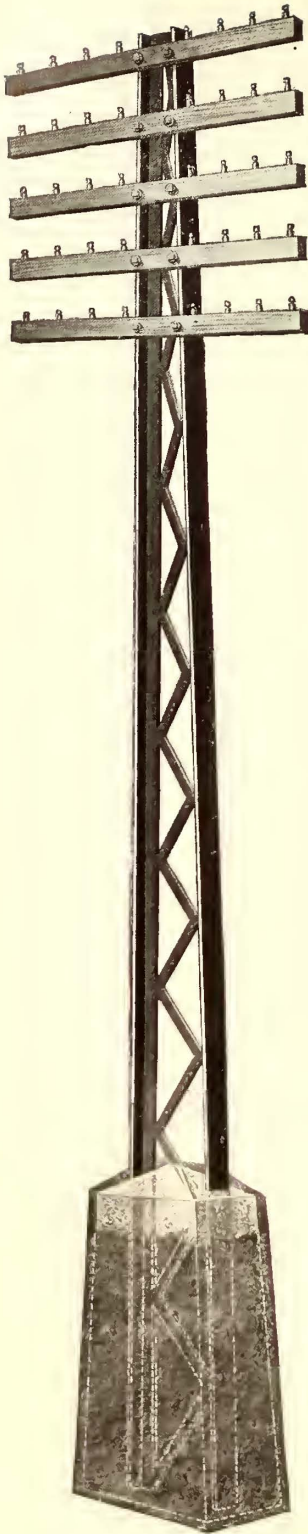
BRIDGEPORT BRASS COMPANY
BRIDGEPORT CONNECTICUT

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



Pierson, Roeding & Company
San Francisco Portland Seattle Los Angeles

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



HAVOC!

Telephone, Telegraph and Trolley Poles all felled by a storm. This may happen on any line using wooden poles. A storm—high wind—and poles are snapped like matches. Avoid the liability of break-downs. Use

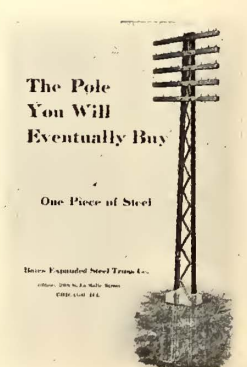
BATES One Piece Steel Poles

Their predominant feature is the one-piece steel truss construction—made of one piece of steel—not a fabricated pole. Strength is not sacrificed in keeping down the weight. Note the truss formation; it has great strength—it will not burn or break.

Small surface is exposed to the elements. Thoroughly coated with preservative.

Permanent construction in addition to remarkably low first cost. Get our prices on trolley and feeder poles.

Investigate Bates claims. Satisfy yourself as to economies. Send for this catalog.



**The Pole
You Will
Eventually Buy**

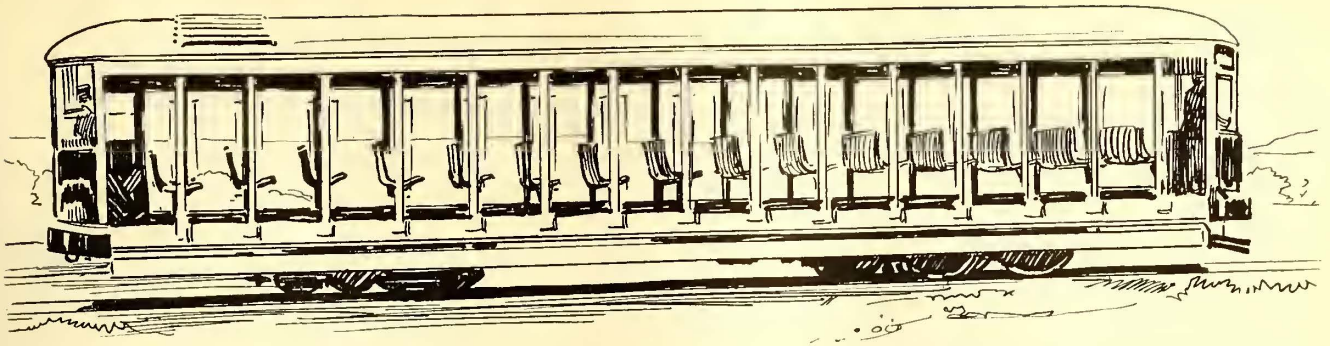
One Piece of Steel

Bates Expanded Steel Truss Co.
Office: 210 So. La Salle Street
CHICAGO, ILL.

***The Pole
You Will
Eventually
Buy***

Bates Expanded Steel Truss Co.

Office: 210 So. La Salle Street
CHICAGO, ILL.



Empty Seats

and high resistance rail joints are in the same profitless class.

Both represent power waste.

The solution of power-consuming rail joints lies in making permanent joints—in knitting them into one single circuit with

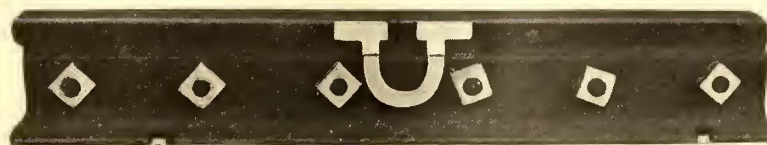
Electric Weld Rail Bonds

They can't corrode.

They can't shake loose under vibration.

They are literally one with the rails.

Write for list of users.



The Electric Railway Improvement Co.

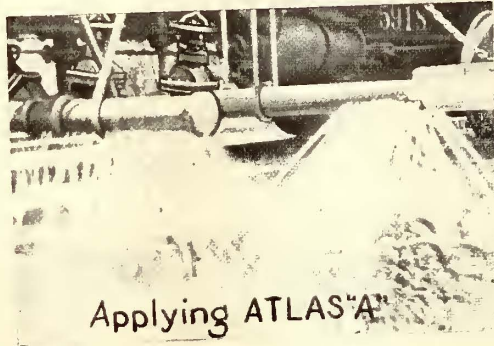
Cleveland, Ohio

Up To Date Track Weeding



The Day of
Application

Eliminating Track Vegetation
by
The Atlas "A" Method
Thereby Standardizing Costs and Results



Applying ATLAS "A"

141 Days Later—
Clean Tracks



Figuring for low track maintenance has come to include the weeding of tracks. It is a chronic case of worry with electric railway men who have not tried the

Atlas "A" Method

Not only is manual weeding expensive, but its benefits are not lasting. We have figured that three men with Atlas "A" Equipment will do twice as much weeding as 400 men. And every weed handled the Atlas "A" way will be **dead**—from top to root, and including **seed**. There will be no next generation of weeds. All you furnish are the motive power and the weeds. The responsibility is ours. **It standardizes track weeding.**

Write for the Catalog we show above. Write today.

Atlas Preservative Company of America, Inc.

95-97 Liberty Street, New York



E. R. J.

The Hundred Eyes of Fabled Argus

and the fifty heads of Briareus are literally at your command when you engage our staff of specialists to concentrate their experience on one or more of your engineering or chemical difficulties. We have already set forth in separate advertisements the various fields in which we can help you to operate your properties with greater safety at less expense, but

Our Diverse Activities in Power and Railway Consultation

may be summarized by outlining our services for each department. To co-operate with your power engineer we have specialists in fuel, water, and general equipment. For your distribution and line engineer, we have specialists in bonding, electrolysis, choice of wires and cables, insulators and insulation, etc. For your way engineer we have specialists in rails, structural material, timber and timber preservation. For your car equipment engineer, we have specialists in everything from castings and bearing composition to motors, conduit, paint and varnish. But despite this high degree of specialization, our individual chemists and engineers are checked from making decisions which might unduly favor their specialty by a system of teamwork and records that brings to bear on any single problem the broad, united experiences of all. When to this practice is added the condition that we have absolutely no commercial interest at stake other than to please you, the utility of our service calls for no further argument.



ARTHUR D. LITTLE, Inc.

Chemists and Engineers

93 Broad Street, Boston, Mass.





Use Your Old Straps

—but make them sanitary and more sightly

With Rico Sanitary Strap Covers

The advertising value of snow-white, non-absorbent sanitary straps cannot be questioned.

The fact that they are standard on the majority of roads is pretty good evidence that they have answered a demand.

No new car is properly dressed without them.

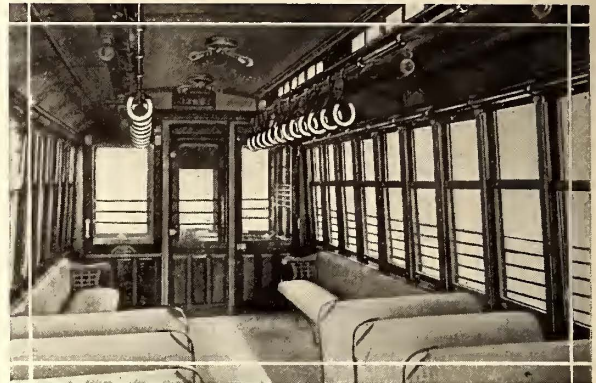
Let us show you how little they cost.

Railway Improvement Co.

61 Broadway, New York

Chicago

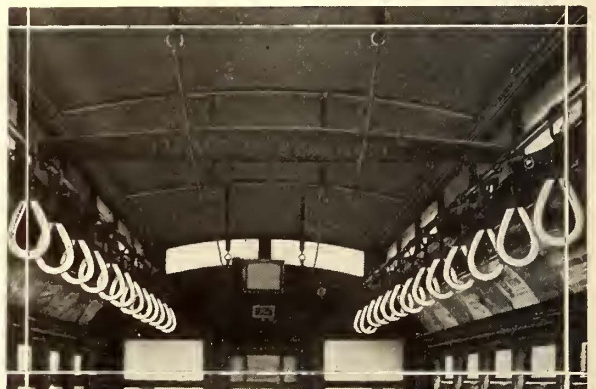
Los Angeles



MONTREAL



CHICAGO

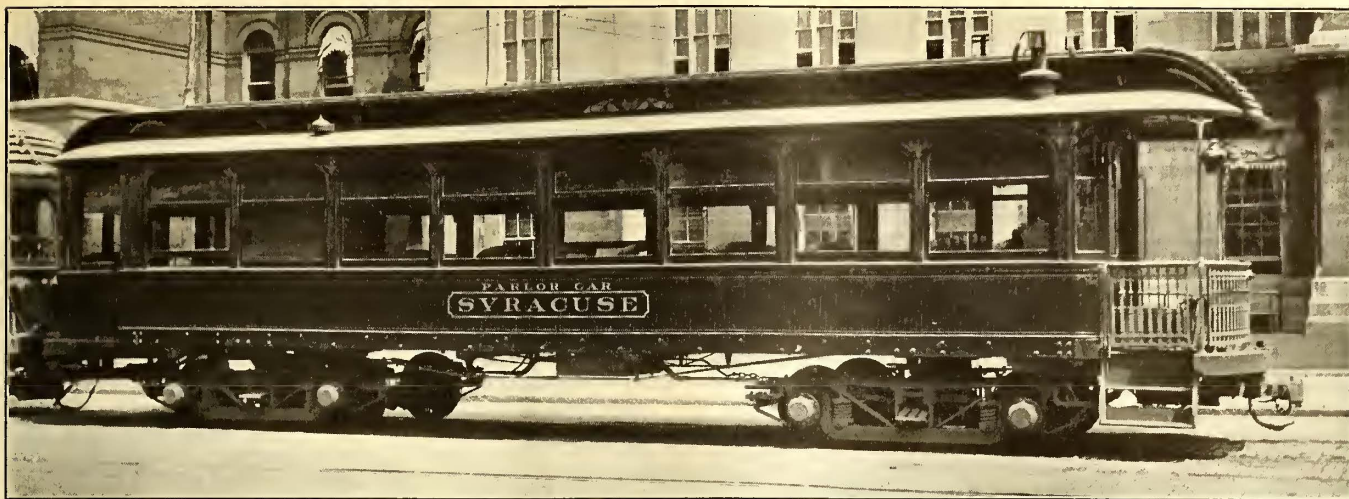


ATLANTA



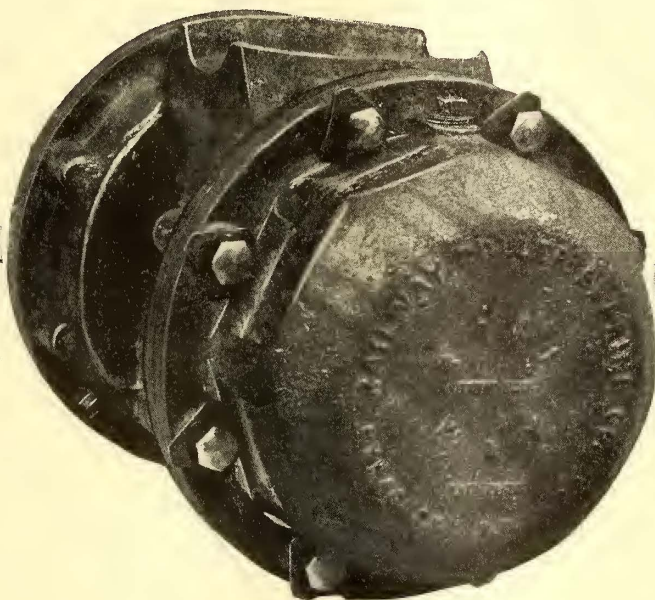
SAN FRANCISCO





High Speed Parlor Car, Empire United Ry., Syracuse, N. Y.

Rollway Bearings in Interurban Service



They Conserve
Energy

They Save
Lubrication

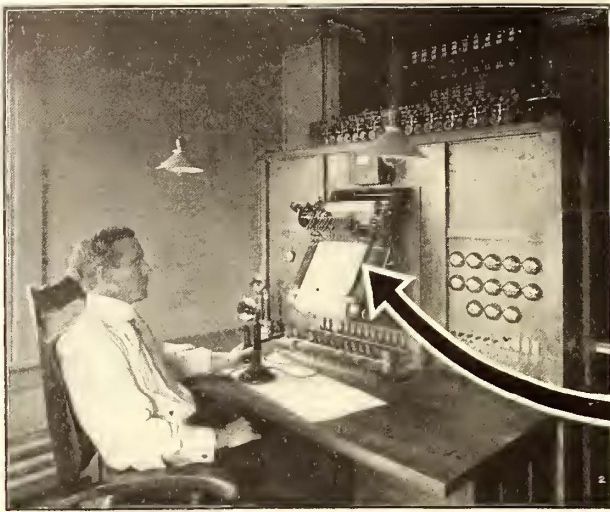
They prolong equipment life

- ☐ Above is shown a car equipped with Rollway Bearings in daily service between Syracuse and Rochester, N. Y.
- ☐ Tests show that Rollway Bearings effect a current saving over plain journals ranging from 15% to 20%. Lubrication costs are reduced because of minimized friction and the oil-tight, dust-proof design of the bearings. The wear on wheels, track and car is minimized.
- ☐ Rollway Bearings can be applied to any type of car. Write for all the facts. Better still, write and arrange to test a set in service.

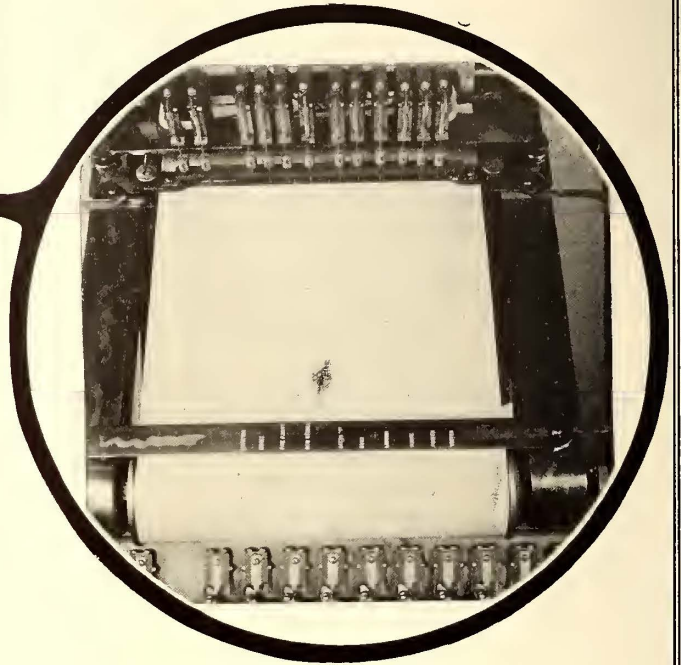
The Railway Roller Bearing Co.

SYRACUSE, N. Y.

Rollway Bearings for Journals and Motors



Automatic Recording of Car Movements



THE instant a car enters the block, it automatically records on this sheet its entry to that block, and the exact time at which it entered. The sheet then records automatically the length of time the car remains in the block and records the time of its entry to the next block.

With this continuous graphic train sheet, as utilized in

The Simmen System

the dispatcher has before him, every instant, the location of every car on the division, and that location is visualized to him. He has literally a moving picture of the movements of every car on the road all the time, a permanent record of the time of entry to every block, and a permanent record of the length of time each block is occupied.

By means of interlocked control levers on his table, the dispatcher controls continuous cab signals in every car on the division. These signals positively indicate the dispatcher's orders to each motorman, and are so placed in the cab that the motorman **MUST** see them. By consulting his record sheet, the dispatcher can see the location of every car, and if he desires to change the signals given to any of them, he can do so by simply turning one of his control levers. This combination provides

SAFE OPERATION and greatly increases **FACILITY OF OPERATION.**

The value of this permanent record sheet does not by any means end with its value to the dispatcher in moving cars safely and expeditiously. It forms a permanent document of the highest value for improving schedules, and for fixing individual responsibility under all circumstances.

The indication of the records cannot be questioned, as they are automatically made by the movement of the cars themselves.

Automatic recording of car movements is only one of the interesting features of the Simmen System. This system presents a flexibility which enables it to meet varying conditions of traffic from those encountered on the light traffic interurban road to those found in the heavy traffic subways.

*May we tell you how we can meet **your** conditions?*

Simmen Automatic Railway Signal Co.

1575 Niagara Street, Buffalo, N. Y.



The Old Way



The New Way

Finigan Says:

I submit views of our old and new style of protecting single-track lines; view 1 is of the old type of hand-throw signal used, having to entirely depend upon crew to operate Signal, which caused a certain amount of delay and a chance of running past signal.

On our new installation of the United States Automatic Electric Signals we have done away with that certain amount of delay and the chances.

These signals are used to protect about a mile of single track, with a turn-out about half way, over which two different railways operate a line of cars, each road using the turn-out as a meeting-point.

Under old conditions when one line would run late it would naturally delay the other line, but under the present conditions these delays have been done away with.

In December, 1914, 2 sets of the United States Automatic Electric Signals were installed on this line and have been operating successfully up to the present.

Yours respectfully,

Chas. Finigan, Line Foreman

Westchester Electric
Railroad Company

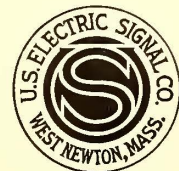
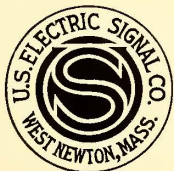
And they will do the same for you. Why don't you ask us about "Signals Without an Appropriation"?

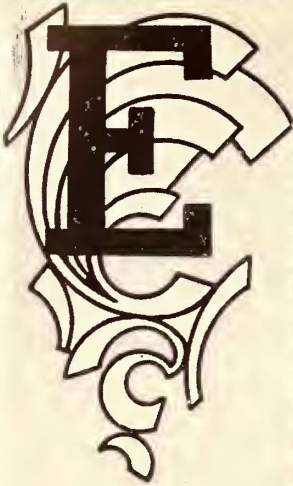
United States Electric Signal Company

West Newton, Massachusetts

Foreign Representatives

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

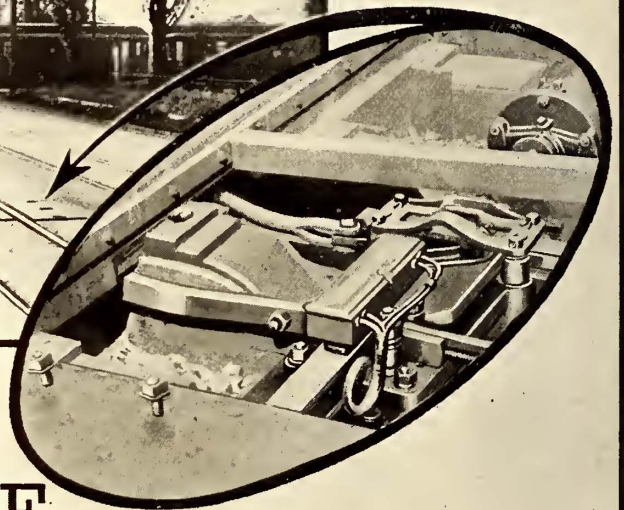
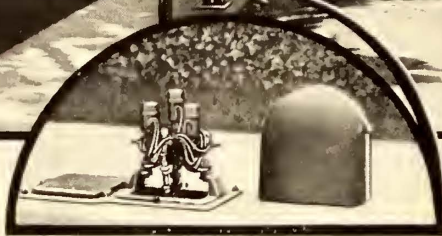




LECTRO-PNEUMATIC



INTERLOCKING



BEST EVERYWHERE

This Electro-pneumatic Interlocking is operating successfully in paved streets.

A. C. Magnets - No Batteries - Switch Valves on curb.

The Union Switch & Signal Co.

Founded by Geo. Westinghouse 1881.

SWISSVALE, PA.



Hudson Terminal Bldg.
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MONTREAL ATLANTA

Peoples Gas Bldg.
CHICAGO

Railway Exchange Bldg.
ST. LOUIS MO.

Pacific Bldg.
SAN FRANCISCO



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



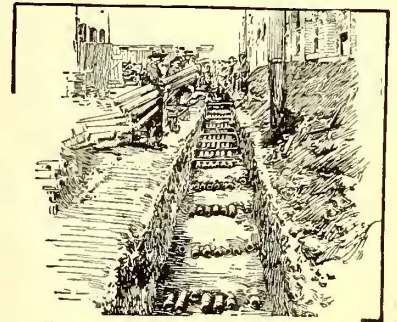
Let us **SERVE** you first—afterward we hope to sell you, because if we can gain your confidence you will **WANT** to buy from us.

Every engineer has individual problems—problems of gaining power, of cutting down waste—problems that need all his experience and knowledge in the solving. The H. W. Johns-Manville Company, through its organization of experts and its vast army of representatives, is constantly in touch with thousands of such individual problems and is constantly helping electrical engineers and central station managers by suggestions and recommendations leading to greater efficiency in their work.

When a J-M salesman calls on you, give him a chance. Perhaps there is a question in the back of your mind that you have not quite found the answer for. Perhaps Johns-Manville Service answered that question for an engineer a thousand miles away from you. If so, the answer is for you, too. Put it up to the J-M salesman, and if he has not got the answer at the time, he'll get it. For that is J-M Service—to serve first, sell afterward.

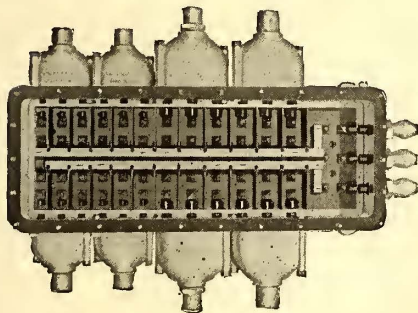
Your installation crew will move along three times as fast when they work with J-M Fibre Conduit

Every time they nipple up a length—five feet of duct is finished, with an airtight joint made in a trice. They will work quicker and easier too, because of the lightness of this conduit; nor can they break it easily when it gets thrown around, as it often does. J-M Fibre Conduit answers every underground conduit requirement, electrical or mechanical. It can be used generally all over the underground system in Generating Stations, Sub-Stations, back of Switchboards, on Feeders and on Signal Systems. Why not use it on your system?



Pacific Light & Power Co., Los Angeles, Cal., installing J-M Fibre Conduit

Every "Noark" Subway Box you order is subjected to an internal hydraulic test of 15 lbs. per sq. inch



This is the severest ordeal to which a cast iron box can be subjected. You will note that not only is the box water-tight from the outside, but is also air-tight from the inside. Doesn't this argue well for its manhole efficiency; for protection of your feeders, subfeeders and other cables—against seepage and subterranean gases? When you install "Noark" Subway Boxes you are using a box with a big factor of safety—a box that is electrically and mechanically perfect, from the nuts that hold down the cover to the slate base on which the copper is mounted. The copper in "Noark" Subway Boxes is ample and well assembled. All contacts are carefully ground. The line is complete, embracing every network and distribution condition.

Write for literature on both these products.

H. W. JOHNS-MANVILLE CO.

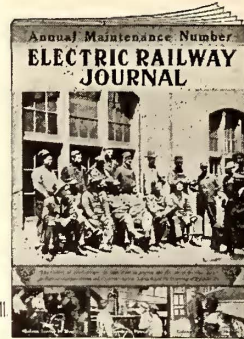
Manufacturers of Service, Subway and Transformer Boxes; Line Materials; Insulating Materials; Fibre Conduit; Fireproof Wood; Friction Tapes; Dry Batteries, Lighting Systems, etc.

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The advantages of being a personal subscriber for the Journal are these:

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Better send your order today before it is forgotten. Use this  order form.

.....1915

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

You may send ELECTRIC RAILWAY JOURNAL beginning at once for one year to address below. I will remit subscription price of \$3 within 30 days.

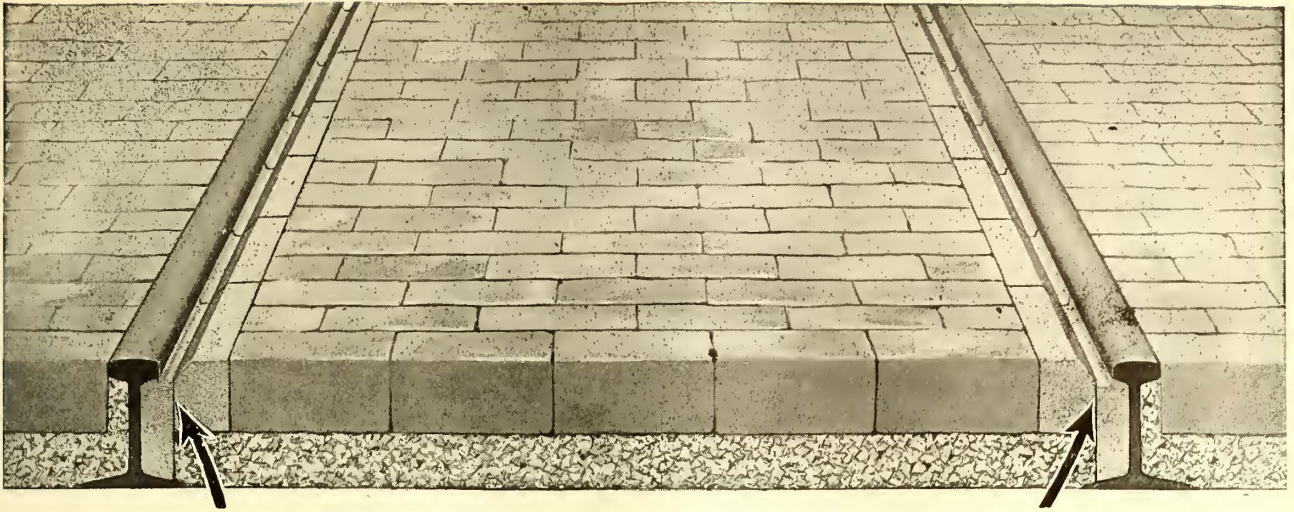
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COMPANY



The Joint is Left UngROUTED

City Officials Approve T-Rail

When the Paving is Protected by

NELSONVILLE Filler and Stretcher Brick

T-Rail construction in cities was given a bad name by the failures of paving due to the use of "nose-brick." The economical T-Rail was barred out of many municipalities on this account.

Now the T-Rail is **welcomed**—when paving is protected by Nelsonville Filler and Stretcher Brick.

Over a thousand miles of our brick are in use in American and Canadian cities. Officials of one hundred and twenty-five cities are prepared to show you how Nelsonville Filler and Stretcher Brick has given them better paving and fewer repairs.

The old-fashioned method of using "nose-brick" with T-Rail resulted in breaking up the paving slab between the rails. The "nose-brick" projected beneath the ball of the rail and were literally "pried-up" by rail vibration.

Compare the diagram above with such construction.

The economies of "Nelsonville" T-Rail construction—both in **lower first cost** and **decreased maintenance** are considerable.

Write for the **data**.

The Nelsonville Brick Company
Nelsonville, Ohio



The Rail Joint Company
 185 Madison Avenue
 New York

Best Quality Hot-Worked

High Carbon Steel

used exclusively in

**Continuous
 Weber
 Wolhaupter**

and

**One Hundred Per Cent
 Rail Joints.**

Oil-Quenched when desired.

Patented in United States and Canada.

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Catalog on request



Stop Building Perishable Track

Make your road a highway of steel in every sense of the word. The steel rails should rest on a foundation of steel. They should not go down on ties that begin to rot soon after they are buried. Put them on

International Steel Twin Ties

They are a permanent addition to your road values. They do not have to be pulled up every little while for replacement, interfering with schedules, increasing maintenance cost, "de-stabilizing" your whole system.

All that is necessary to see why roads throughout the country are making International Steel Twin Ties part of their standard equipment is to try the ties on a section of your track, or ask your neighbor for results obtained with the International Steel Twin Ties.

Creeping and spreading of the rails are virtually unknown with these steel Ties.

Tie rods are dispensed with. Gauge spacers are unnecessary. Unskilled labor can take care of the installation.

And the first cost in paved street construction is less than wooden tie construction.

We will be pleased to furnish an estimate of cost, together with working plans of different types of construction now in use.

Write us for the facts.

International Steel Tie Co.
General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES:

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 San Francisco, Cal.
 Los Angeles, Cal.

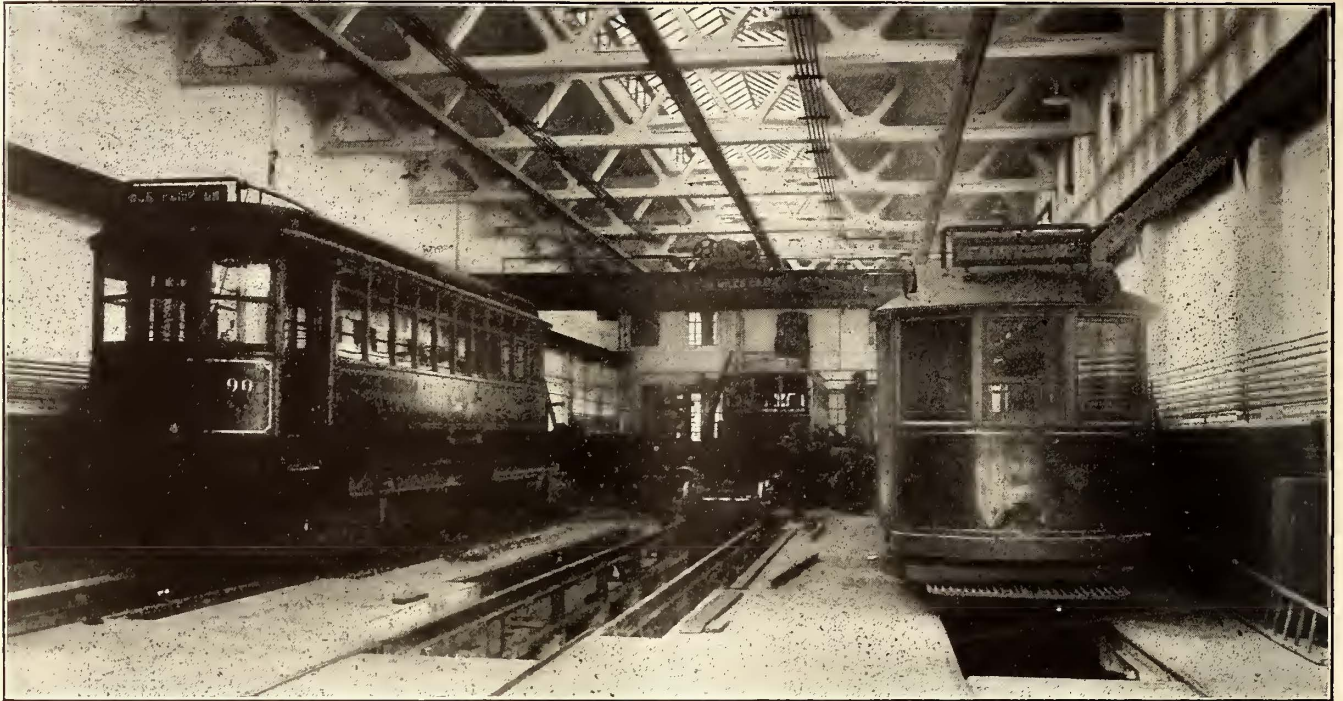
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R. J. Cooper Co.,
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J. E. Lewis & Co.,
 Dallas, Texas

Maurice Joy,
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William H. Ziegler,
 Minneapolis, Minn.



Columbia Electric Hoist in service lifting 40 foot 20 ton car.

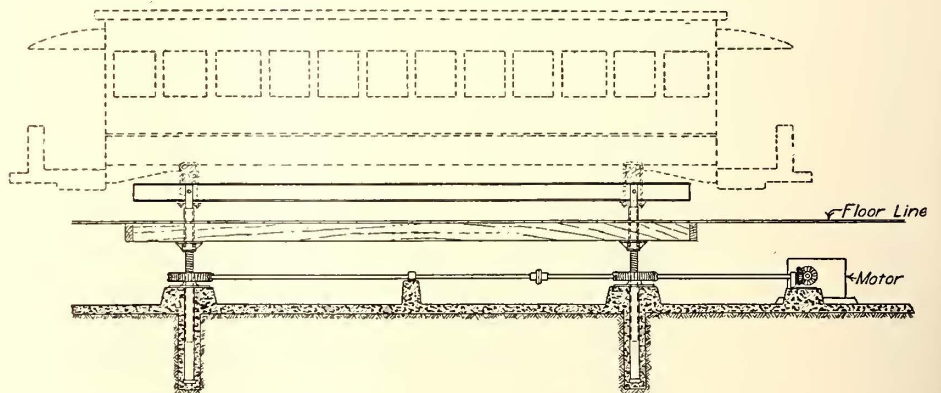
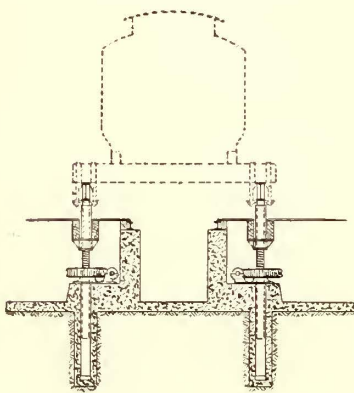
Columbia Electric Hoists

in the

Holyoke (Mass.) St. Ry. Co. Shops

In the repair shop bay of its new carhouse, the Holyoke Street Railway Company has provided two Columbia Electric Car Hoists for lifting car bodies from the trucks. Columbia Hoists were chosen because of their superior design, their ease of

operation, their extra factor of strength and their contribution to repair work economy. We can serve you just as efficiently. Write us regarding your needs.



Columbia Electric Car Hoist

Columbia Repair Shop Specialties and Car Equipment Include

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

Banding and Heading Machines.
Coil Winding Machines for field and armature coils.
Coils for Armatures and Fields.
Coil Taping Machines for Armature Leads.
Rolls for Flattening Leads of Armature Coils.
Car Trimmings, Car Signs—Day and Night.
Commutators, Controller-Handles, Door Locks.

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Fuses, N. W. Cartridge.
Car Wheel Hoists and Special Track Work.

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

The Ohmer System

HARD TIMES, JITNEYS, WARS—don't let these things get on your nerves. Tighten up the leaks and stick to methods which are *absolutely safe* in matters of finance.

THE OHMER SYSTEM for making fare collections safe is a fare protection certainty. It has made good under the most adverse conditions. New applications are being made of it continually. It is a *standard* method. It is a *successful* method. It is a *safe* method.

The benefits to be derived from it are the result of our years of experience. We are specialists in such matters and stand ready to serve you.

Let us analyze your troubles and we will show you a way out. If you even suspect that your local conditions are capable of improvement let us give you our expert opinion. You will be under absolutely no obligation to us. We are anxious to meet new problems for our own good as well as yours. We have met and overcome so many for our clients and others that we are confident of our ability to solve yours. Will you let us try?

Ohmer Fare Register Company
Dayton, Ohio

For better accounting and greater economy

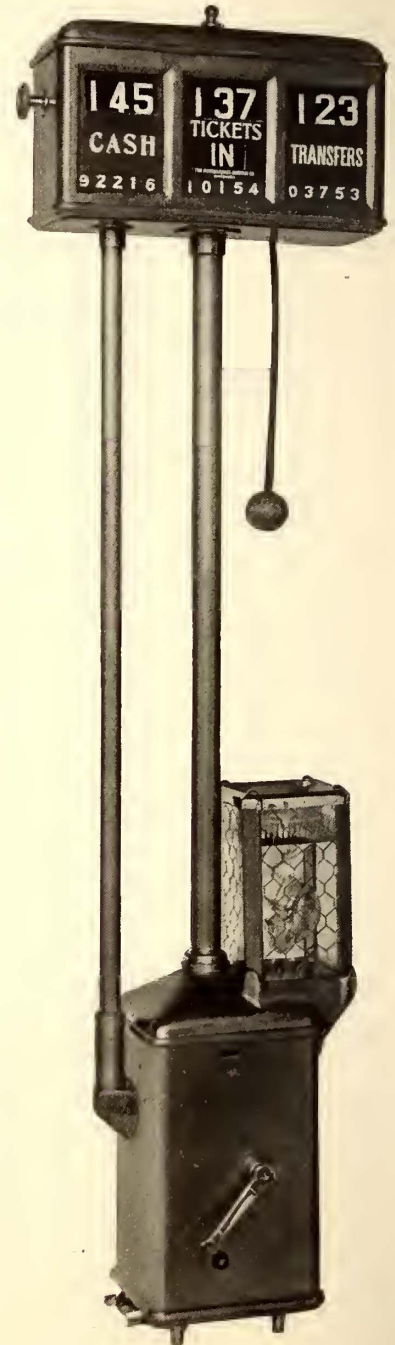
the Lincoln (Neb.) Traction Company changed from paper to metal tickets. The register illustrated and described below was especially designed by us for them to meet the new conditions and all their cars are thus equipped.

INTERNATIONAL COMBINED COIN, METAL TICKET AND TRANSFER REGISTER, TYPE C24

THE Type C24 register is adapted for use on single end and center entrance prepayment cars. Cash Fares and Tickets are received in the one hopper of the machine and are automatically registered on separate dials. But one crank is used for operation. Transfers are received by the conductor and registered by him on a separate dial of the same machine. Bells of three differing tones also give audible indication of the class of fare registered. The three trips reset to zero by the one operation of the resetting knob.

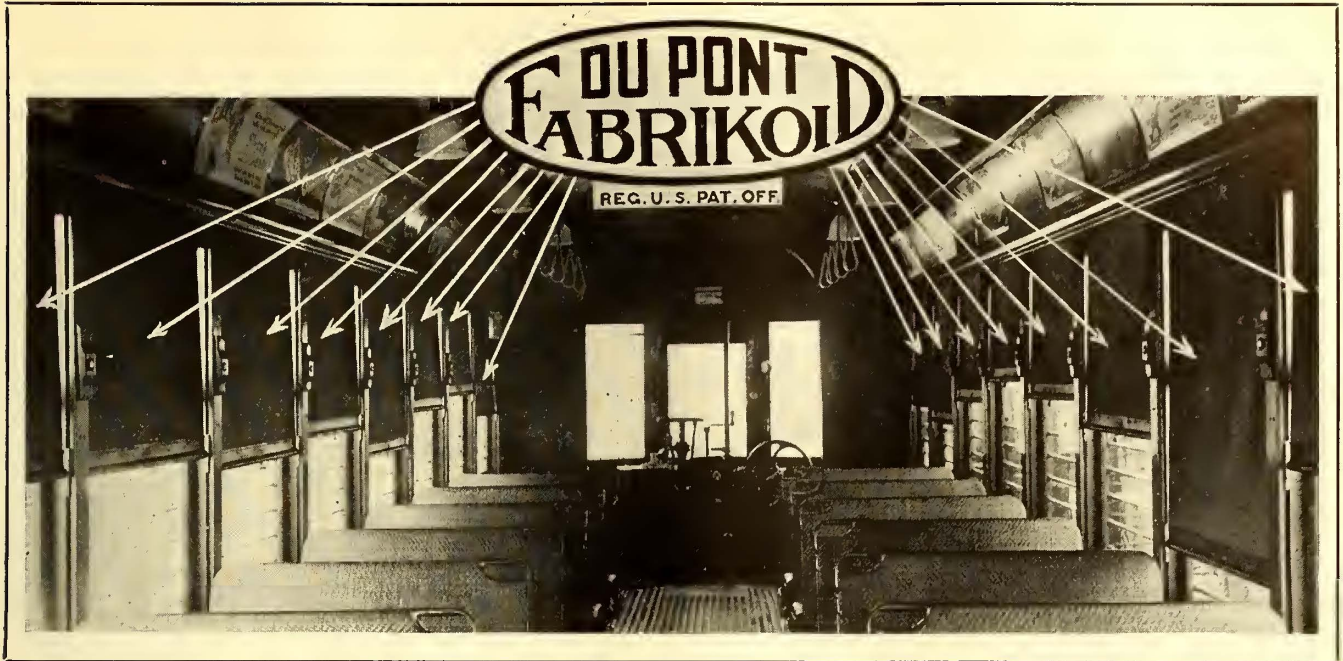
THIS machine gives the decided advantages of one compact, simple device combining all three functions, performing them easily, quickly and economically, at the same time, giving the conductor greater freedom for attention to other duties.

Consistent with their cost, the price has been kept at the lowest possible figure. The savings attained will cover their cost in a very short time. We can demonstrate that your revenue can be increased by the use of some of the various types of our Coin counting registers. We seek an opportunity to prove our claims. If, from the many types we now manufacture, we fail to meet your requirements, we shall be glad to investigate conditions and design a machine that will.



The International Register Company, 15 South Throop St.
CHICAGO

Manufacturers of Coin Registers, Fare Boxes, Double and Single Car Registers and Fittings, Conductors' Punches and Exclusive Agents for Heeren Enamel Badges



The Economical Material for Car Seating and Curtains

A
Non-Splitting
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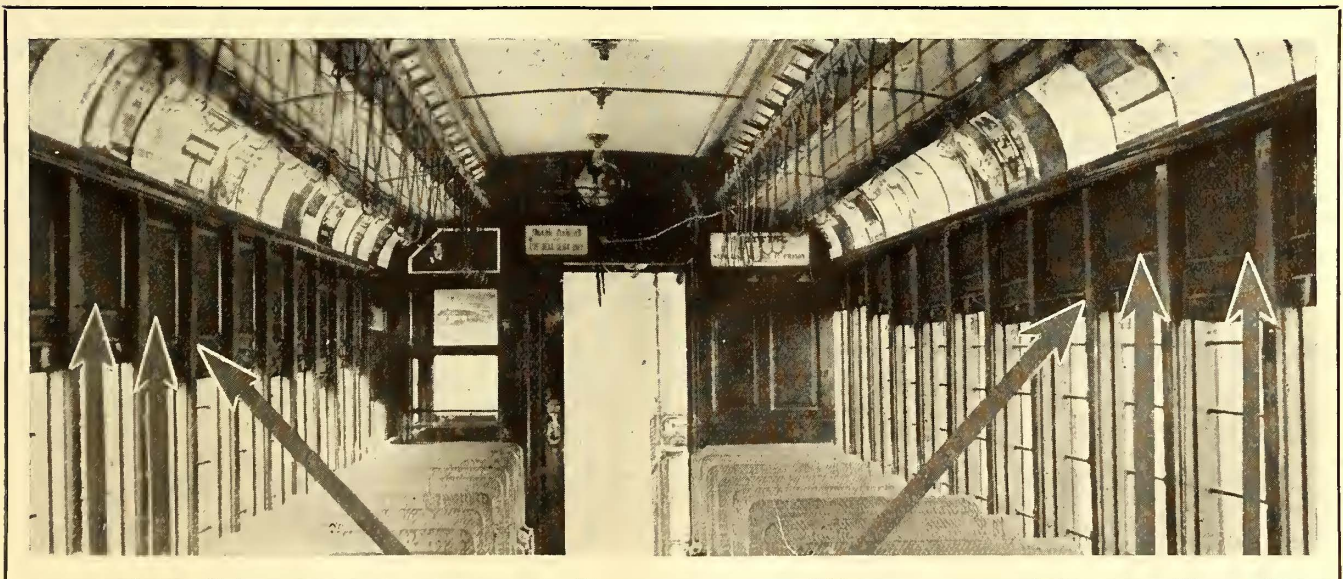
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Tough
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Du Pont Fabrikoid Company
Du Pont Building, Wilmington, Del.

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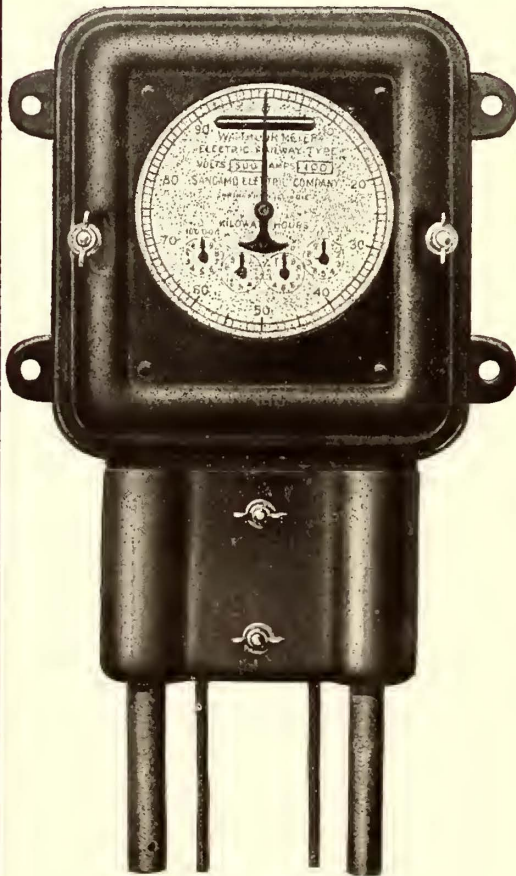
WENDELL & MACDUFFIE CO.

63 BROADWAY, NEW YORK



ECONOMY METERS

BUILT LIKE A WATCH



Type of Sangamo Economy Meter producing net saving of more than \$12,000 per year for one interurban road.

There is every reason to expect, however, that maintenance charges for the present year will show a substantial decrease over those of 1914, and this can largely be attributed to the use of meters.

EFFECT ON VOLTAGE REGULATION

One other interesting fact was brought out, and that was that the voltage at the car was far better as a result of using power only when necessary. Obviously, this is equivalent to increased trolley-wire cross-section, especially where full voltage is necessary to make the scheduled time. In 1914 the limited trains could not maintain schedule time just south of Milwaukee, due both to an exceedingly severe schedule and to the fact that they had a number of meeting points where the power distribution also was not very good. This year, with the same schedule and all other conditions the same, there has been a marked absence of delays. This is attributed principally to the fact that while the motormen are still unable to coast to any great extent, the heavy drafts of current are less continuous which results in more voltage at the car.

From Electric Railway Journal, May 22, 1915.

Better Voltage

One prominent high-speed road installed Sangamo Economy Car Meters primarily to reduce energy consumption—and gained a net annual return of more than \$12,000 on an investment of one-fifth of this amount.

Lower energy consumption per car mile was but one of the several benefits.

In addition, many other maintenance economies and schedule improvements were accomplished by means of the Economy meters.

Another improvement, that of *higher average voltage*, is described above. Note that this was accomplished with the same power equipment and the same schedule, but because *Economy Meter Service* had smoothed out the demand peaks, it was easier for the motormen to meet the schedule requirements.

Let us supply you with interesting data and a copy of Bulletin 416, giving complete details.

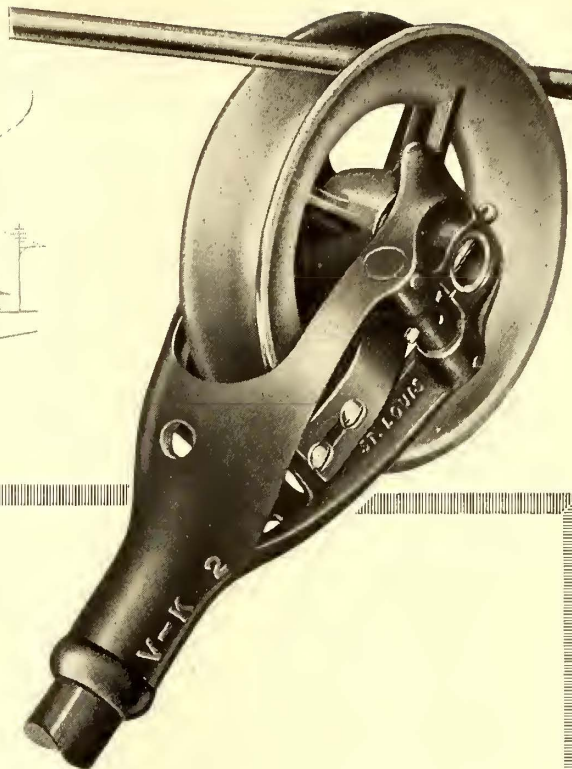
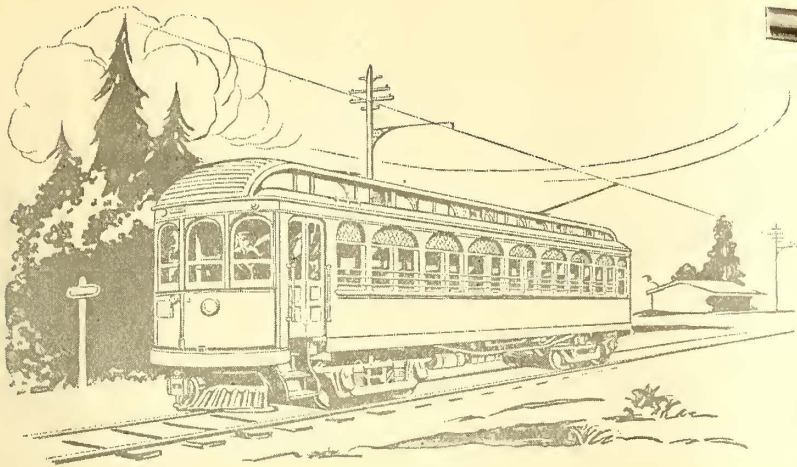
Sangamo Electric Company

Springfield, Illinois

NEW YORK
50 Church Street

MINNEAPOLIS
Metropolitan Life Building

ROCHESTER
Mercantile Building



You—Who Specify

It's a hard road you've got to travel these days—that of holding down expenses when nearly every cost item keeps climbing steadily upwards.

You're trying earnestly to select equipment and material for your road that will prove really economical—work long and work well. We realize how many problems of this kind come up to you and how difficult some of them are to solve the right way.

We've studied one of them thoroughly—that of trolley equipment. We've worked on it for years. The outcome is the development and perfection of a new type of trolley wheel and harp that we know will simplify your trouble along this line. The

V-K OILLESS TROLLEY WHEEL and NON-ARCING HARP

is not only more economical in operation—saving power, material, labor and renewals—but it is more efficient as well. You are spared worry and assured of the most improved trolley service possible to obtain.

In the V-K OILLESS TROLLEY WHEEL you have a practical, reliable, efficient self-lubricating wheel. Once installed you've no further expense for attention or lubrication. And it lasts longer, provides greater conductivity, saves the wire, eliminates the harm that dripping oil or grease from the bearings of other wheels causes to the car roof, besides keeping shopmen off it.

With the V-K NON-ARCING HARP you get a harp in which all wear on the pin-hole is impossible. You know that such wear is the commonest of all reasons for having to replace harps. Its patented gripping device locks the pin firmly and solidly in its socket—preventing looseness and arcing. It furnishes the best form of contact yet devised.

Just compare these points about the V-K equipment with any other type. We believe you'll see where and how it can help you.

Send for our new illustrated catalog. It contains full information on sizes, styles, etc., covering our whole line of wheels and harps.

More-Jones Brass & Metal Co.
St. Louis, Mo.

Manufacturers of Trolley Wheels and Harps, Contact Springs, Motor Axle Bearings, Armature Bearings, Truck Journal Bearings, Air Compressor Bearings, Armature Babbitt Metal and similar products.

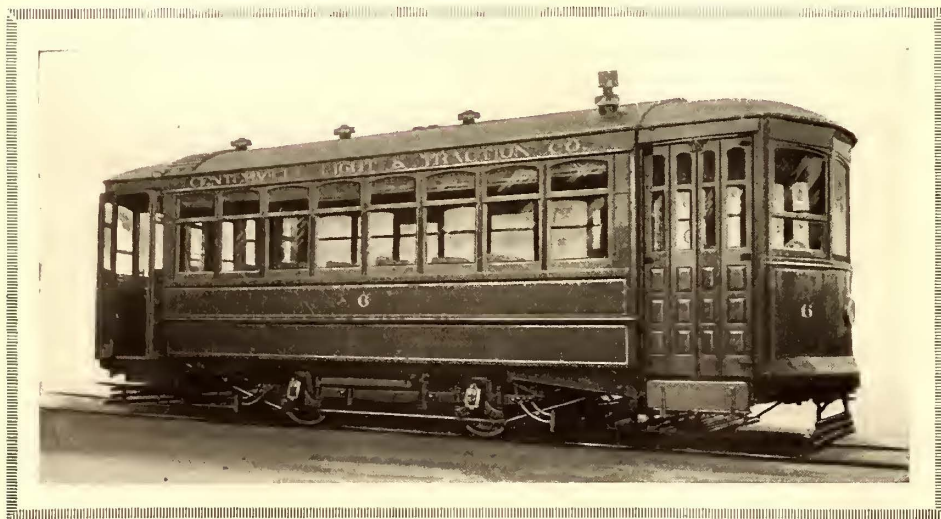
Proper
Public
Policy
and
Private
Interests



become identified in **PROVIDENCE
FENDERS**

and

**H-B
LIFE-
GUARDS**



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

Manufacturers of The Providence Fender and H-B Life Guard

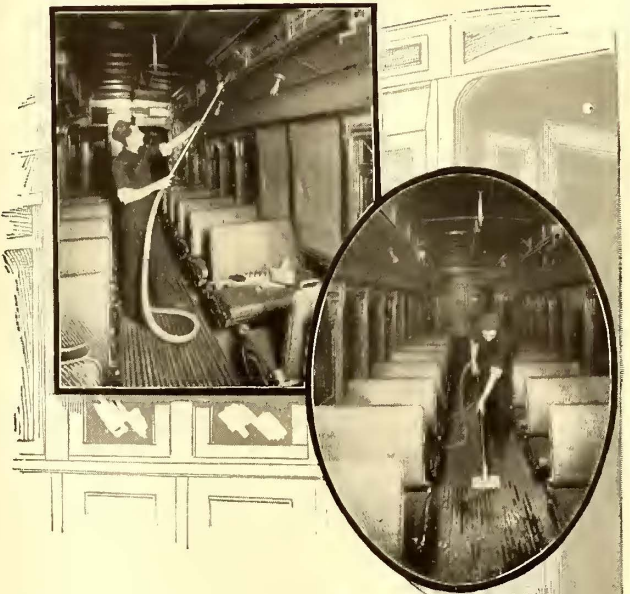
Wendell & MacDuffie Co., 61 Broadway, New York

General Sales Agents

*Clean your cars thoroughly, quickly
and economically*

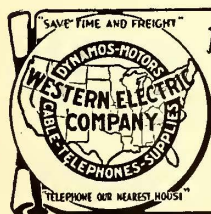
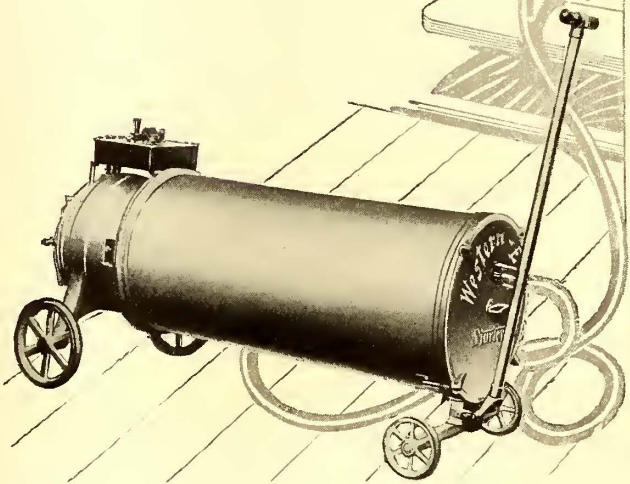
with

Western Electric
Sturtevant
Vacuum Cleaners



Get your copy of
our booklet,
The Clean Way To Clean,
from our nearest house.

It is fully illustrated and
will show you the latest
way to higher efficiency.

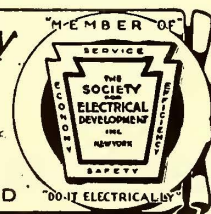


Western Electric Company

Manufacturers of the 8,000,000 "Bell" Telephones

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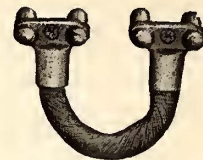




Form D



Form E



Form M 1



Form F



Form C



Form A

Use G-E Railbonds This Summer And Make Fewer Replacements

The three million G-E railbonds in service to-day give positive proof that G-E bonds stand the test of time.

Clean copper, perfect welds, soft terminals, and accurately formed tucks insure lasting qualities and high conductivity. G-E bonds are easy to install and remain in service for many years.

It pays to insist on G-E Railbonds

General Electric Company

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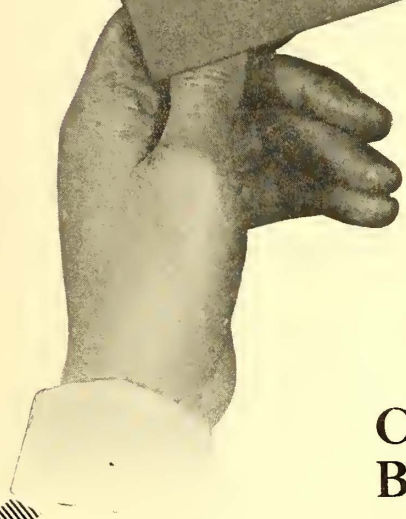
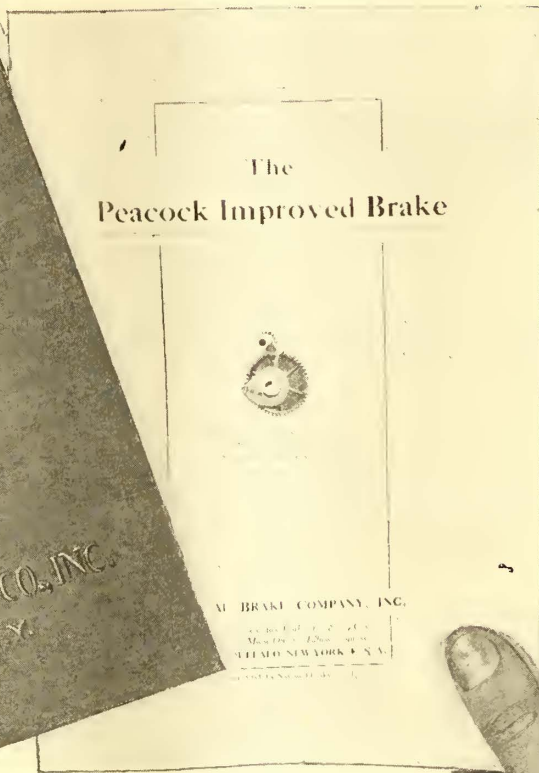
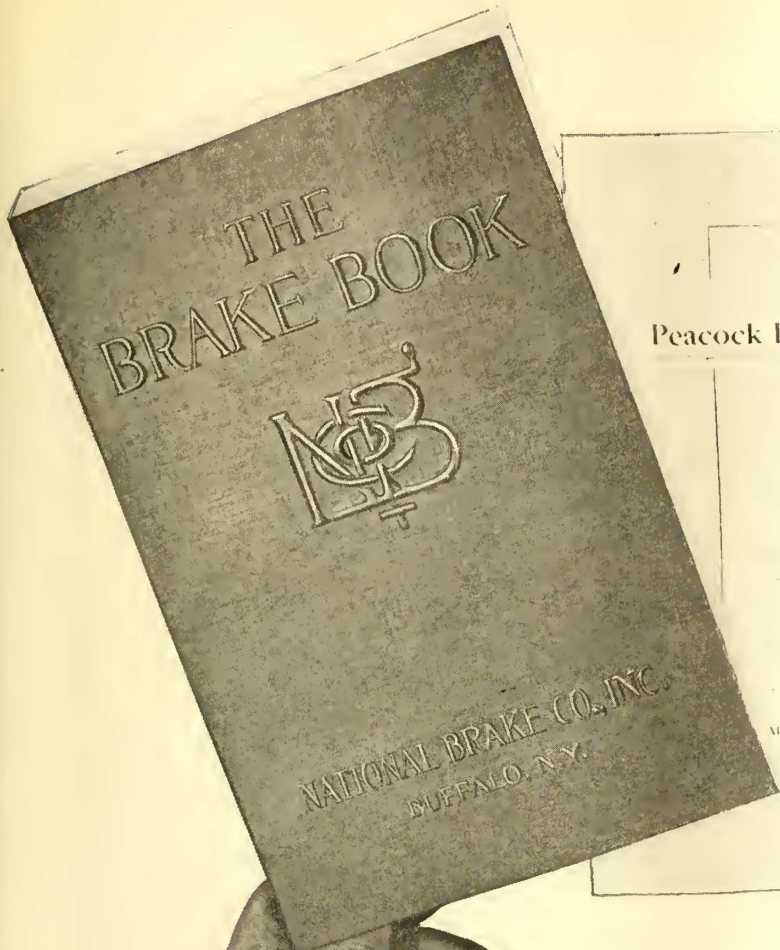
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For Michigan business refer to General Electric Company of Michigan, Detroit.
For Texas, Oklahoma and Arizona business refer to Southwest General Electric Company (formerly Hobson Electric Co.), Dallas, El Paso, Houston and Oklahoma City. For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

It's about this



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Consisting of Separate Binder and Loose Leaf Insertions

The Data you want in the way you want it

You've heard of Peacock Improved Brakes. You may know in a general way that they reduce braking costs per car and increase safety. Perhaps if you have all the essential FACTS before you, you will discover points that will make plain their exact relation to YOUR cars. Why not send for the Binder and first insertion of the Brake Book, and have a file of exact data ready for consultation? Not a bulky "catalog"—a series of time-saving data-sheets. Just send your name today, and let us put them on file in your office.

A Quick and Convenient Way to Send for It.

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YOU
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The Wonderful Single Service Chilled Iron Car Wheel

THE economy in the use of the Chilled Iron Car Wheel for street railway service is recognized. In 90 out of 100 cities in the United States and Canada operating 100 cars or over the chilled iron wheel is the standard.

The reasons are:

- 1st. Chilled iron wheels will give a larger mileage per unit of wheel cost.
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The Wonderful Single Service Chilled Iron Car Wheel

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
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Representing forty-eight wheel foundries throughout the United States and Canada.
Capacity 20,000 Chilled Iron Wheels per day.



The STANDARD for RUBBER INSULATION

Railway Feed Wires insulated with OKONITE are unequalled for flexibility, durability, and efficiency, and are in use by the leading Electric Street Railway Companies. OKONITE is preferred above any other insulation for Car Wiring, Telegraph and Telephone Purposes.

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

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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.

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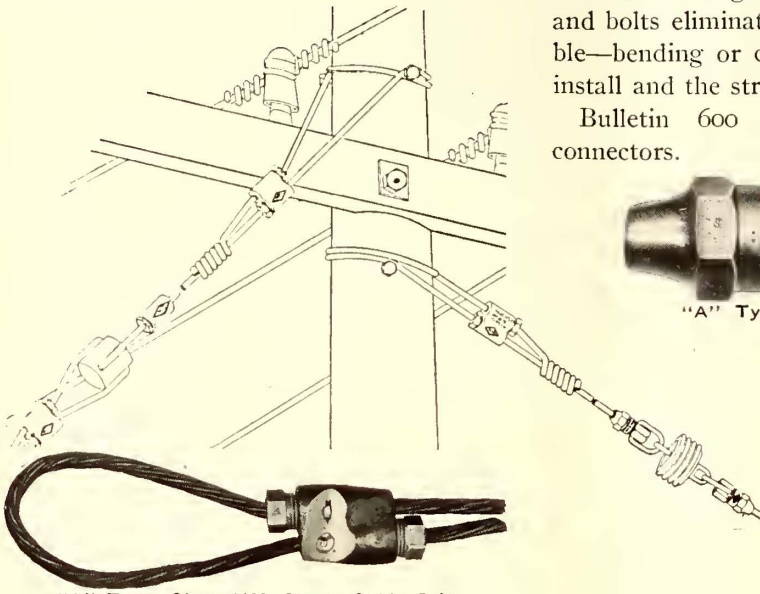
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Examine this New Cable Grip

The F. M. C. Cable Grip or Guy Clamp is the most compact and has the longest life of any clamping device. Set screws and bolts eliminated. Slack can be taken up without trouble—bending or cutting of strands is eliminated. Easy to install and the strongest cable grip made.

Bulletin 600 describes this and other mechanical connectors.



"A" Type, Class 4400 Street Cable Grip.



"A" Type, Class 9100. Transmission Connection.

F. M. C. Transmission Line Connection

Strongest and Highest Conductivity. Prevents loose joints due to expansion and contraction strains. Bulletin 402 describes this and other F. M. C. electrical connections.

Fargo Mfg. Co., Inc., Poughkeepsie, N. Y.

ORANGEBURG FIBRE CONDUIT

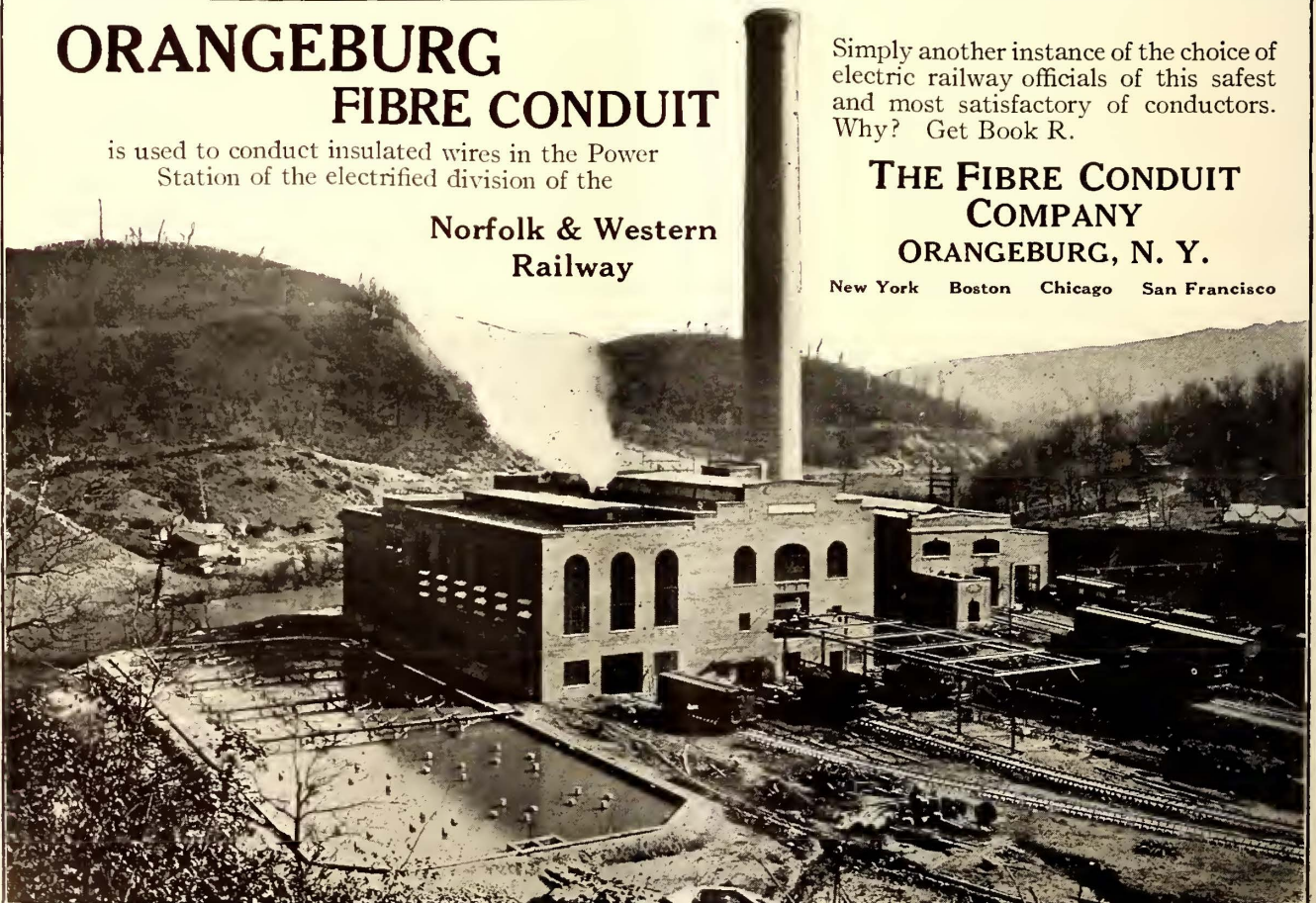
is used to conduct insulated wires in the Power Station of the electrified division of the

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Simply another instance of the choice of electric railway officials of this safest and most satisfactory of conductors. Why? Get Book R.

THE FIBRE CONDUIT COMPANY
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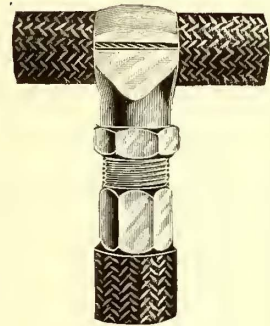
New York Boston Chicago San Francisco



“Just stick in the wire and tighten with a wrench!”

DOSSERT CONNECTORS

connect *without* solder — *without* trouble — *without* delay. They're ready-made joints — wonderful little means of efficiency when it comes to making quick changeovers on your switchboards, transformers or brush holders. You can use them for connections *everywhere*—in shop, car, power-house and out on the line. Let us tell you about Dossert Service at the same time we send free sample—write.

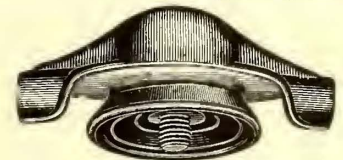
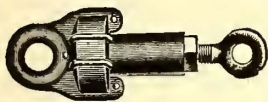


Dossert Cable Tap

Have you our Tenth Year Catalog?

Dossert & Company

H. B. LOGAN, President, 242 West 41st Street, N. Y.

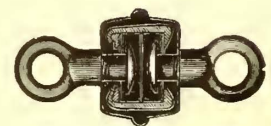


Little things these—but vital to your line

A weak strain insulator—a faulty hanger—a defective splicing ear—may cause a lot of trouble at a most inconvenient moment. Big responsibilities rest on these “little” details of overhead construction. The selection of materials—the painstaking care and skill devoted to design and construction—the scrupulous inspection—that goes into the production of Macallen overhead specialties is in every way commensurate with the importance of the work these “little things” must do.



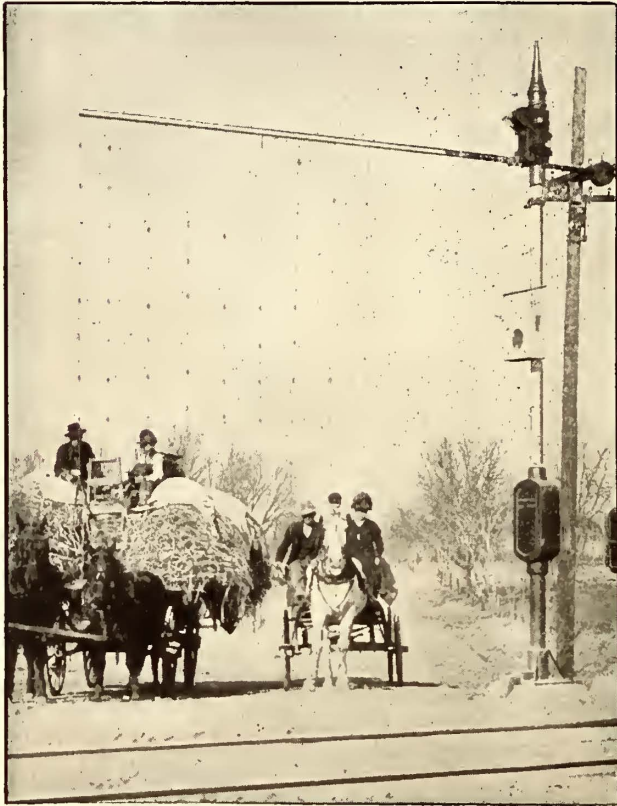
The least detail of the Macallen Line is of the First Importance



The Macallen Company
Macallen and Foundry Sts., Boston



This Crossing Is Safe



It is Positively Guarded

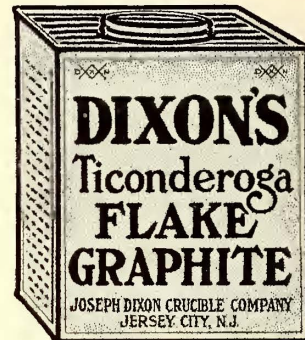
by a barrier that cannot be ignored and a warning bell which clangs out the coming of the car.
Prevention of accidents is here practically assured by the

Cook Automatic Signal Gate

At night there are the flashing red light and the illuminated semaphore.
Claims for damages weaken, when the "Cook" looms as a convincing witness.
Don't you think you ought to investigate? Do it at once—before the heavy traffic (both car and highway) of the summer season sets in.
You cannot afford to let those crossings go unprotected during this season of straw rides, joy rides, etc.

The Cook Railway Signal Co.
1793 South Broadway, Denver, Colo.

The "teeth of friction"
can't bite if you
lubricate with—



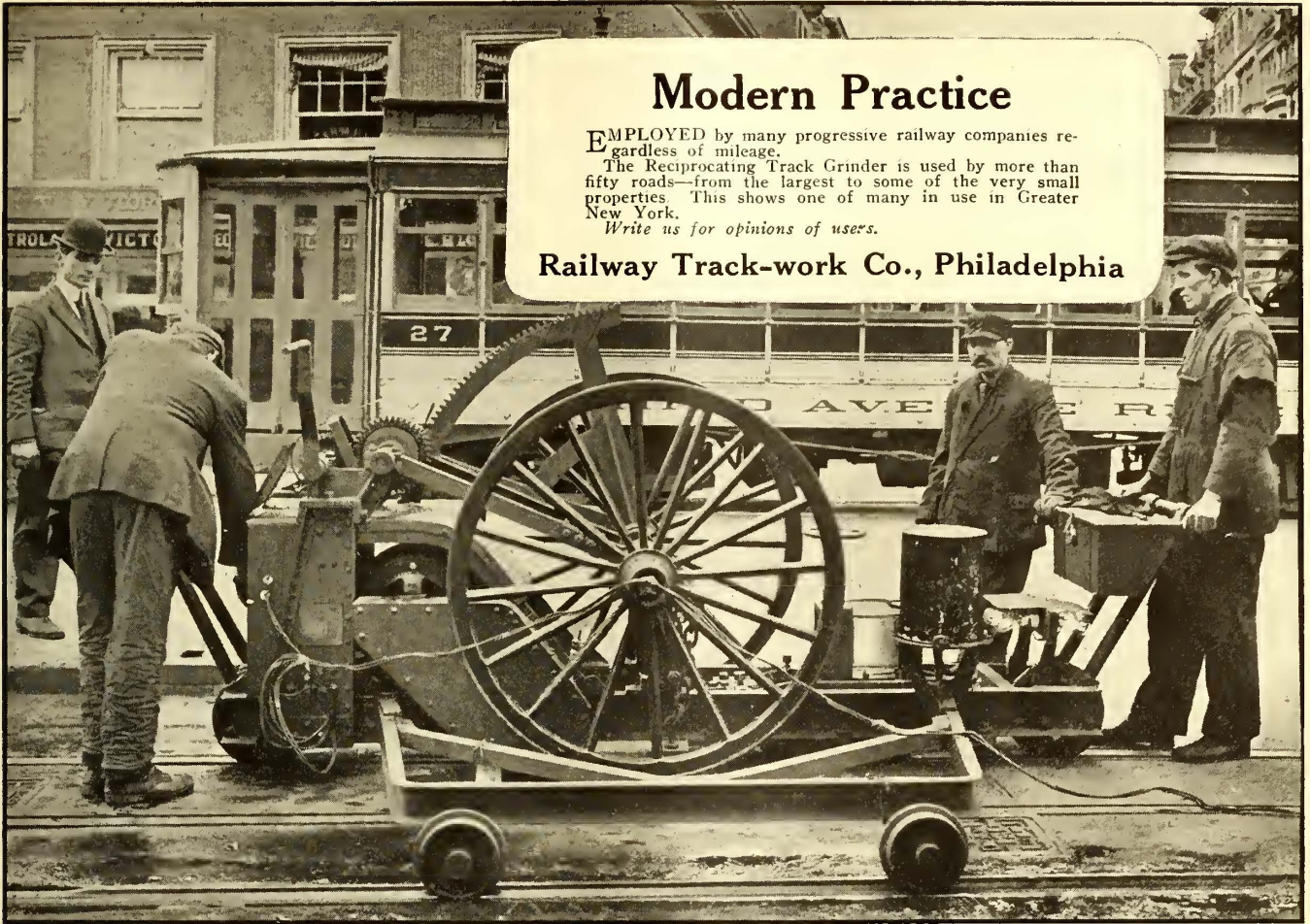
There's only one way to get perfect lubrication, and that way is to eliminate the "teeth of friction" the minute imperfections which, in even the most highly finished bearing surfaces show, under microscope, like hills and dales. Oils or plain grease are only transitory lubricants, subject to the whims of load, pressure, climatic and other conditions. Flake graphite, unlike oil or plain grease, is not squeezed out by pressure, and unlike other forms of graphite, does not remain suspended in oil, and is therefore not floated away. Pressure forces flake graphite upon the tiny projections—"the teeth of friction"—the flakes become pinned and form over the surface a most marvelous veneer-like coating, unctuous and wonderfully smooth. Dixon's Flake Graphite will improve the efficiency of the oil or grease that you are using. Thousands of expert engineers all over the world have proven this to *their* satisfaction. Why not write for sample No. 108-C and prove it to *your own*?

Made in Jersey City, N. J., by the

Joseph Dixon Crucible Co.

Established 1827





Modern Practice

EMPLOYED by many progressive railway companies regardless of mileage. The Reciprocating Track Grinder is used by more than fifty roads—from the largest to some of the very small properties. This shows one of many in use in Greater New York.

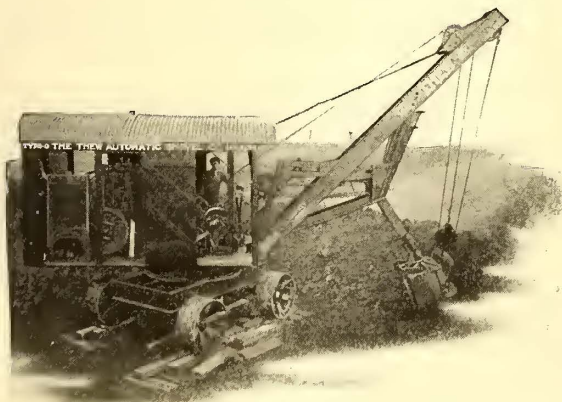
Write us for opinions of users.

Railway Track-work Co., Philadelphia



The Thew Gasoline Shovel—

Ideal for Excavating New Lines or Grading Interurban Roadbeds



Type O Thew Gasoline Shovel— $\frac{3}{4}$ -yard Dipper.

IN instances such as these, when power cables are not already strung or the source of fuel is far removed, the Thew Gasoline Shovel is ideal.

It has all the advantages of standard Thew Shovels; is strictly a one man machine; consumes only 20 to 30 cents worth of gasoline per hour; requires no licensed operator; avoids expense of hauling coal and inconvenience of this kind of firing; is economical in use of water; can later be changed to an electric shovel if desired, by substituting an electric motor and equipment instead of the gasoline engine, and has many other advantages.

These are explained in a special gasoline shovel circular which will be sent upon request.

Sign and Mail or Use for Memorandum

The
THEW
Automatic
Shovel Co.,
Lorain, O.

Send me special gasoline shovel circular with any other interesting data about gasoline shovel as advertised in Electric Railway Journal.

Name.....

Address.....



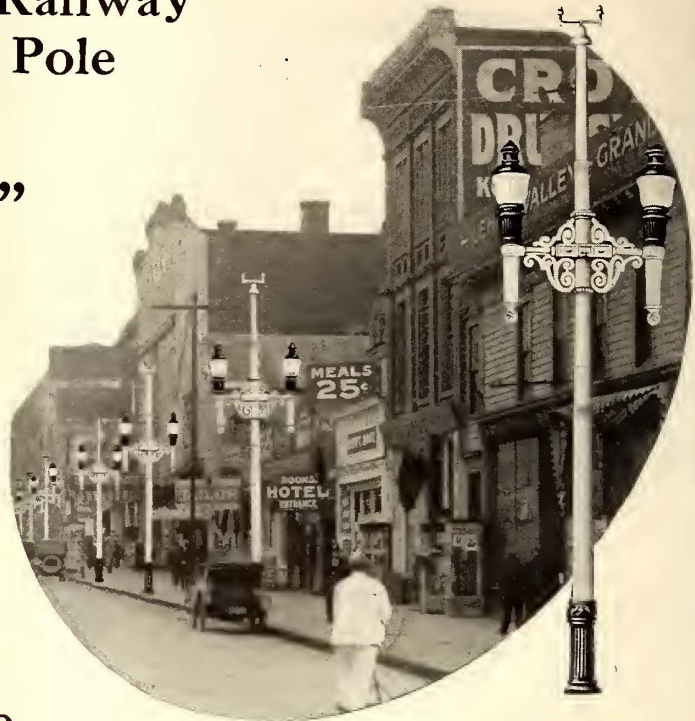
Combine Your Electric Railway and Electric Lighting Pole "ELRECO COMBINATIONS"

are your big opportunity for cutting line upkeep. Here is the economy you have been considering, discussing and advising. These "double-purpose" poles will halve your initial cost.

And at the same time their patented "Wire-Lock" Swedge Joint features make "Elreco" poles corrosion-resisting and proof against telescoping.

Sounds good?

Get the data.



Electric Railway Equipment Co.
Cincinnati, Ohio

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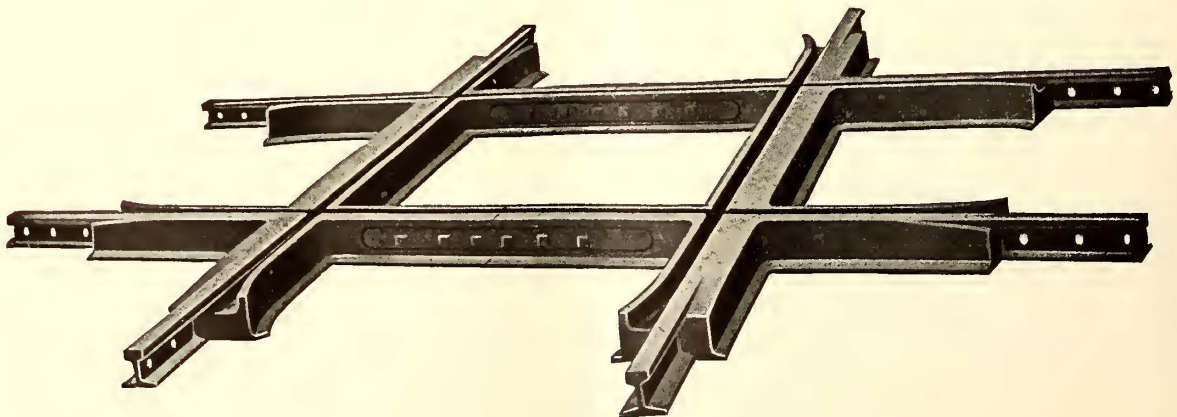
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Frogs, Crossings, Switches and Mates for Electric Railway Service

Products of the Highest Grade Workmanship and Material.

May we Estimate on Your Requirements?



BARBOUR-STOCKWELL CO.

205 Broadway, Cambridge, Mass.

Falk Special Track Work

DOES REDUCE YOUR MAINTENANCE CHARGES



Solid Manganese Steel Switch

For Maximum Service

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NEW YORK CITY—Wendell & MacDuffie Co.

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NEW ORLEANS—A. M. Lockett & Co.

The Double Take-Up Saves Time

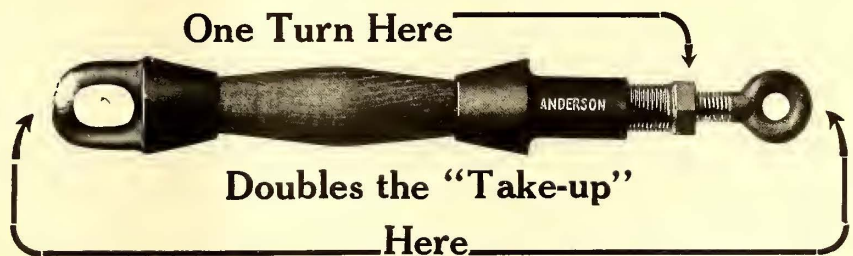
which is one reason why

Anderson Improved Wood Strain Insulators

are economical

Another point which means money to you is that the Insulators have great tensile strength. Break-downs are well-nigh impossible. All parts are rust-proof, preventing setting of the threads.

From the electrical standpoint, you are offered the absolute insulation which is a feature of all



Anderson line insulators.

Modern electric railway practice has found an important adjunct in Anderson Products.

Send for the Catalog today.

Made the Anderson Way

Albert & J. M. Anderson Mfg. Co.

289-293 A Street

(Established 1877)

Boston, Mass., U. S. A.



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 Chicago, 105 So. Dearborn Street
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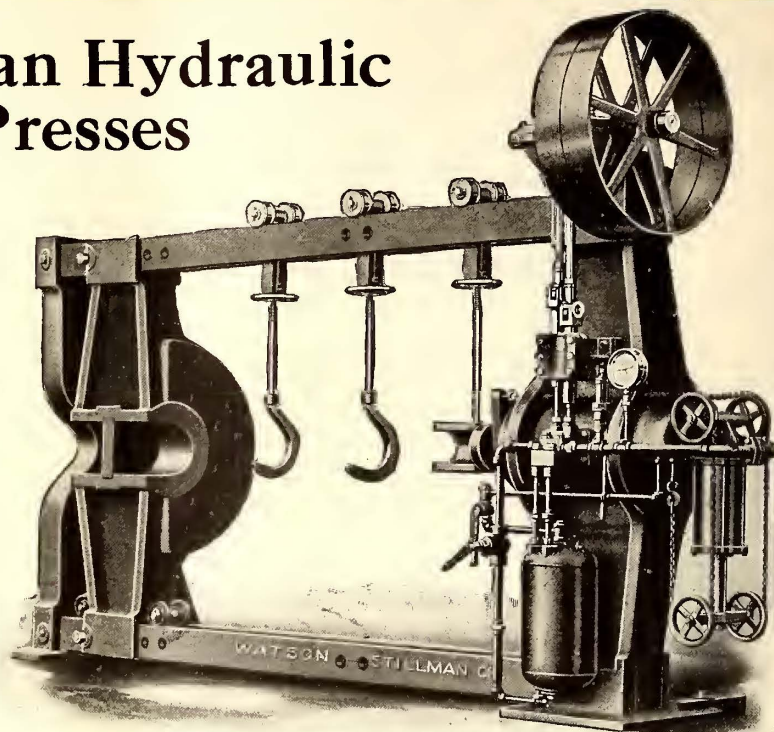


Watson-Stillman Hydraulic Wheel Presses

EMBODY THE MOST ADVANCED IDEAS IN WHEEL PRESS CONSTRUCTION. WE SHOW ONE HERE, OUR MOST RECENT DEVELOPMENTS IN WHICH THE RAM MOVEMENTS ARE CONTROLLED BY OUR PATENTED HYDRO PNEUMATIC DEVICES.

In this type compressed air is used for the run-out of the ram and also for the pull-back, in place of counterweights.

We build a number of efficiency producing hydraulic tools for railway service, including jacks, pit jacks, shears, benders, forcing presses, box forcing presses, shaft straighteners, bulldozers, etc.



Write for Catalog 82.

300 Ton Hydro Pneumatic Wheel Press



The Watson-Stillman Co., 46 Church St., NEW YORK

Engineers and Builders of Hydraulic Machinery

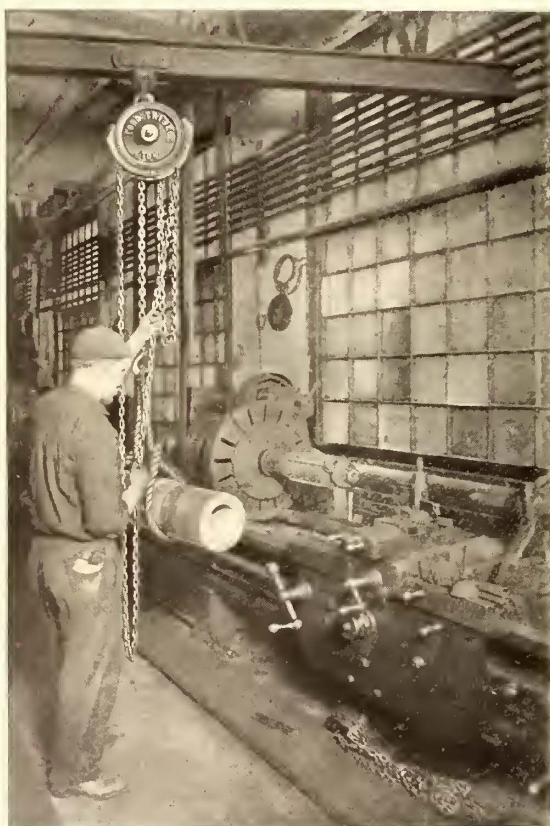
CHICAGO—McCormick Building

PHILADELPHIA—The Bourse



290

The Hand Chain Cannot "Gag" if you use the



FORD

TRIBLOC CHAIN HOIST

because the Tribloc is provided with the patented Loop Hand-Chain Guide, which prevents overriding of the Hand Chain and insures a safe and easy-running hoist.

Steel parts are used instead of iron, thereby increasing the life and strength of the Block.

Eighty per cent. of the power applied to the hand chain of a Tribloc is converted into lifting energy. We guarantee Triblocs for five years—if they were not as strong and as good as it is possible to make a hoist we could not do it.

Write for our catalogue

FORD CHAIN BLOCK & MFG. CO.

142 Oxford Street

PHILADELPHIA, PA.

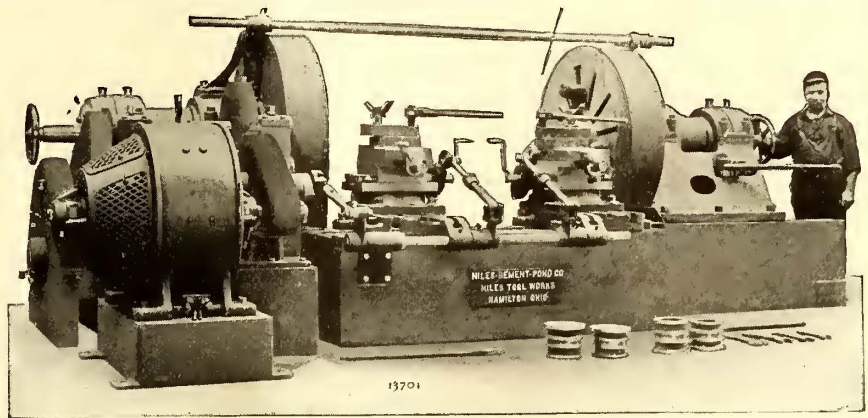
A More Rapid and Efficient Repair Shop

Don't neglect your repair shop equipment. Get away from the idea that any machine that can do the job is good enough. N.B.P. Machine Tools for Electric Railway Repair Shops are heavy and powerful, yet easily and conveniently handled.

They will

Get Out the Work as Fast As Possible

and do it right.



Niles Standard Car Wheel Lathe

Especially adapted for rapid turning of trolley-car wheels. It is turning 12 to 18 pairs every day in several of the largest street railway shops. Provided with convenient calipering device, "Sure-Grip" drivers and patented tool clamps operated by a single screw.

NILES-BEMENT-POND CO.

111 BROADWAY, NEW YORK

Boston Pittsburgh Birmingham, Ala. Philadelphia Cleveland Chicago St. Louis San Francisco London

For Safety's Sake—For Economy's Sake

install the

S. W. B.

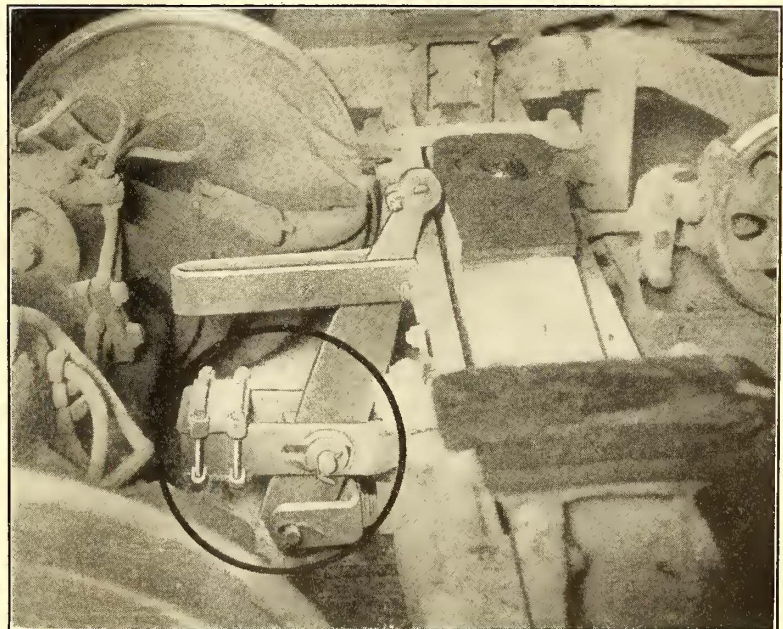
Automatic Shim Slack Adjuster

on *all* your cars

It gives the motorman quick, powerful control of his brakes. It gives brake shoes a double lease of life. Flat wheels are unknown on "S.W.B." equipped lines.

The "S.W.B." takes up the slack as fast as the shoes wear.

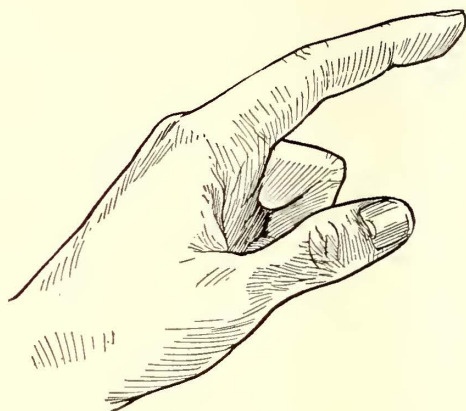
There's a money saving story in our descriptive bulletin. Write for it.



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Agents for Virginia, North and South Carolina and Georgia: J. B. N. Cardoza & Co., Citizens Bank Bldg., Norfolk, Va.
W. R. Kerschner Co., Inc., 50 Church St., New York, Eastern Sales Agt.



A Guarantee
of faultless
Punch Service

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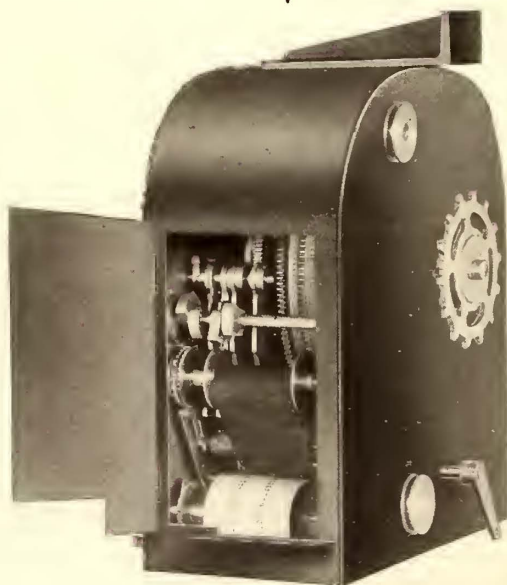
BONNEY-VEHSLAGE TOOL COMPANY

124 Chambers Street, New York

Factory, Newark, N. J.

The Machine

↓ that does the work



Scientific design to cover every contingency that might arise in fare recording has produced a machine well-nigh perfect in the

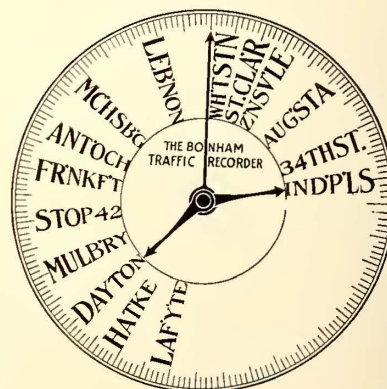
Bonham Traffic Recorder

The fare collection is a distinct act of publicity. The fare recording is a complete statement for the accounting department.

The result from the company's standpoint is profitable rail-roading with the uncertainty left out.

The Dial

↓ that creates publicity



Send for the Catalog

"Earnings per Passenger Mile"

The Bonham Recorder Co., Hamilton, O.

For Low Window Maintenance

EDWARDS Car Window Fixtures



Your car windows are either costly or low in maintenance, depending upon their proper working of the fixtures.

In this respect Edwards fixtures bring costs down to bed rock.

They are permanently rattle-proof, permanently tight without binding, permanently positive in holding qualities. Small prices for big service.

Write for details and prices.

The O. M. Edwards Co., Inc.

Metal Extension Platform Trap Doors
Top, bottom & side Weather-stripping
Railway Devices

Syracuse, N. Y.

Window Fixtures
All-Metal Sash Balances and Shade Rollers
Metal Sash and Mouldings

CAMBRIA

T-RAILS

Open Hearth and Bessemer
Track Bolts and Nuts

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Cambria Special

Rolled in the old way—the Cambria way. Slow reduction from ingot means maximum density and homogeneity.



Our axles represent the highest development in the art of heat treating. Axles for street and interurban lines, our Specialty.

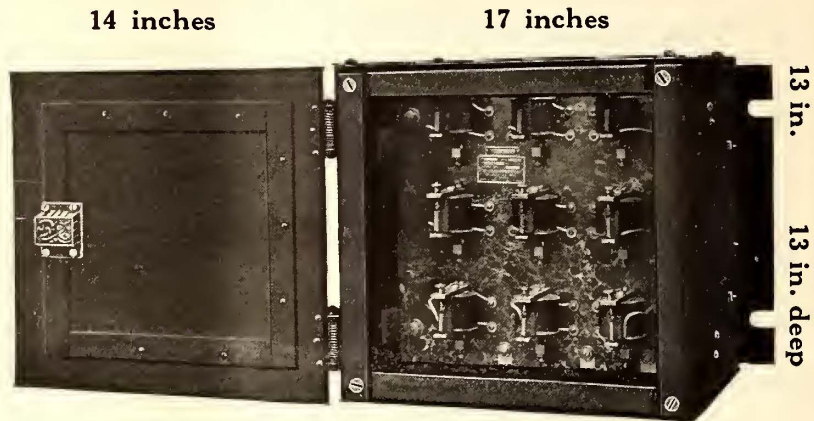
CAMBRIA STEEL COMPANY

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End Car Lamp Flickering

Install the Watson Voltage Regulator



PATENTS PENDING

IT WILL KEEP THE VOLTAGE IN THE LIGHTING CIRCUITS WITHIN 7% VARIATION EVEN WHEN LINE VOLTAGE FLUCTUATES FROM 650 TO 300 VOLTS.

You do not have to make any important car wiring changes.

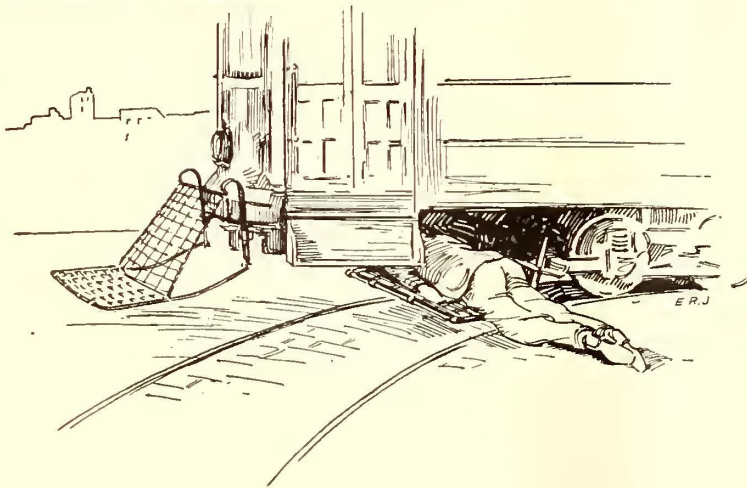
The Regulator itself is simple in character and requires

no attention after installation, except a yearly change of small contacts.

Acquaint yourself at once with the Watson. Full information will be sent you at your request.

If desirous of knowing cost of installing the Regulator on your cars, send us wiring diagrams and voltage and amperage of headlight.

Thos. S. Watson Company, Milwaukee, Wis.



*It happened on
a Curve!*

But the

PARMENTER WHEEL GUARD Saved Him

Make your cars ready for *any* emergency. When rounding curves fenders project out on a tangent leaving the front wheels exposed—careless pedestrians often stumble on curves. Be ready for the emergency.

Parmenter Fenders and Wheel Guards do great "team-work." On curves and at all times the wheel guard furnishes that final perfection in safety which

every street railway needs. Anybody who gets by the fender is protected *positively* from the wheels. Your claim agent will welcome the advent of this combination.

Parmenter Fenders are called the "four-way" safeguard. The latest model is locked against the dangerous rebound action. *Write for the interesting details of this new model Parmenter.*

Parmenter Fender & Wheel Guard Co.

89 State Street, Boston, Mass.



27,633 Miles

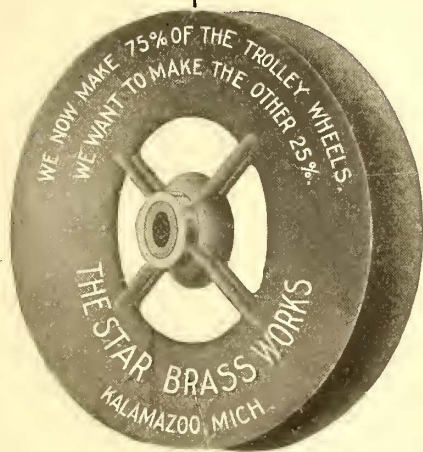
A "Bound Brook" Trolley Wheel Bushing record

While a 4" wheel was worn out the "Bound Brook" was not

All genuine graphited "Oil-less Bearings" have always been made at Bound Brook, N. J., in the United States of America.

Graphite Lubricating Co.

Reason It Out—



- ☞ You want a metal in the *rim* of your trolley wheel that won't hurt the wire, but that will last—a metal that will be *soft* yet *tough*.
- ☞ You want a metal in the *bushing* of your trolley wheel which will be strictly a *bearing* metal.
- ☞ You want both in the same trolley wheel.
- ☞ Well, you get it in

Kalamazoo Trolley Wheels

- ☞ It saves the wire. It saves current loss. It saves the wheel.
- ☞ Economy as well as common sense dictate that you come to the largest exclusively trolley wheel makers in the world.

THE STAR BRASS WORKS

KALAMAZOO, MICH., U. S. A.

STERLING



Fare Registers

Sterling single and double registers are full geared throughout. Therefore they cannot be manipulated. Having comparatively few parts—maintenance cost is negligible.

Trolley
Supplies



Trolley Retrievers

Famous for their prompt, positive action and few moving parts. Only a wrench needed to remove the case. Backed by the Sterling five-year guarantee.

THE NEW HAVEN TROLLEY SUPPLY COMPANY

NEW HAVEN, CONN.

MANUFACTURERS OF FARE REGISTERS AND RAILWAY SUPPLIES

The McLain

No. 25

Extended Dash

*The Lightest
Headlight Made*

7 lbs.

Complete

Strong, compact with the casing of No. 18 Gauge Pressed Steel throughout. The front door is carried on an extra strong hinge riveted to the main casing.



Perfect Focussing

Brilliant Light

using a

Concentrated

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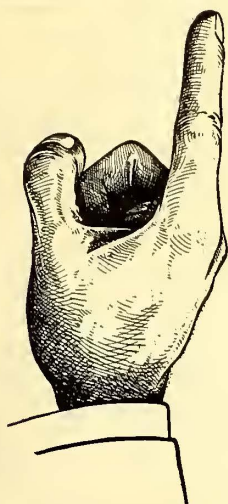
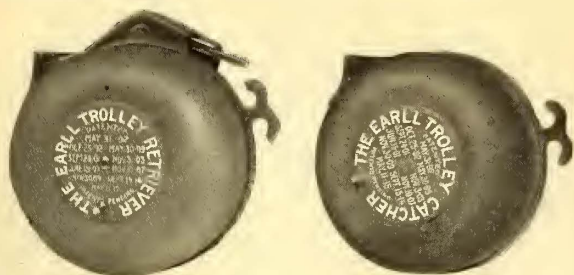
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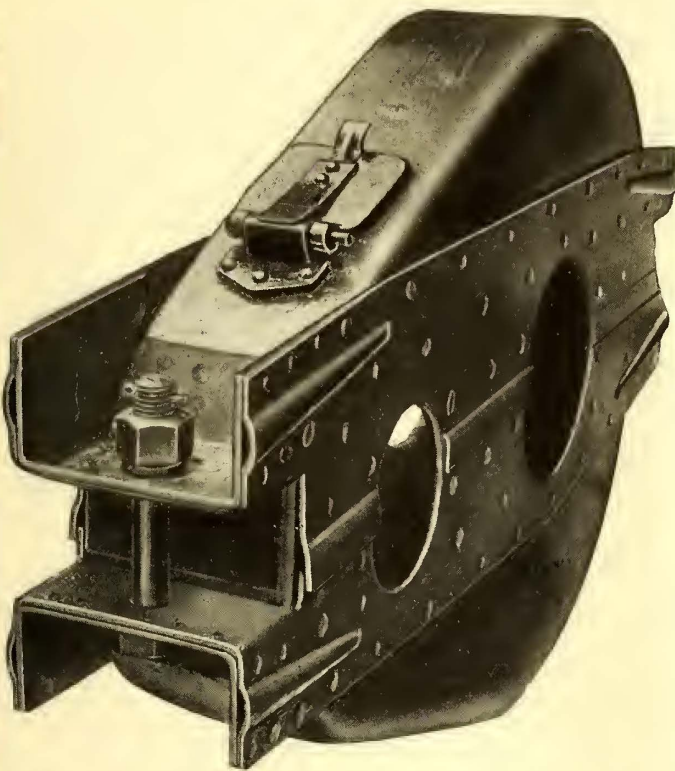
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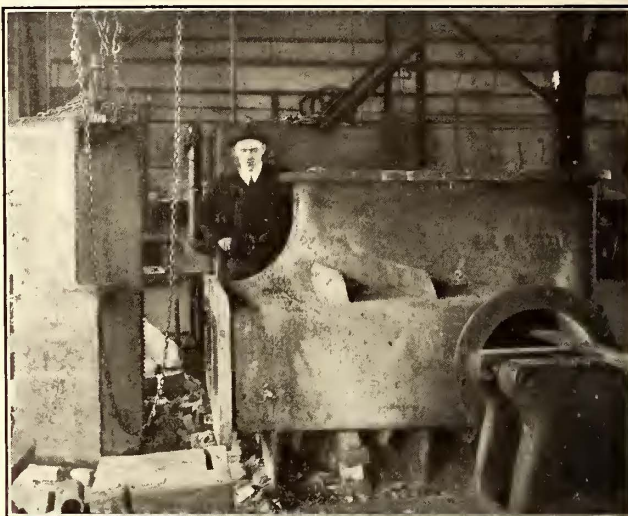
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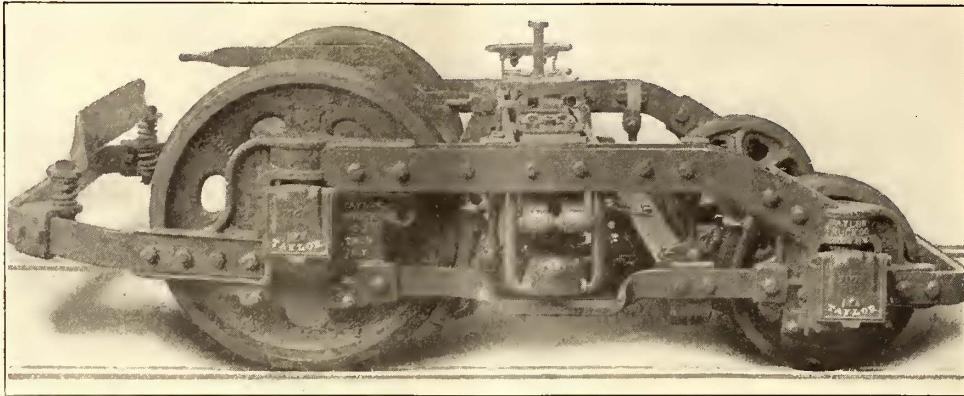
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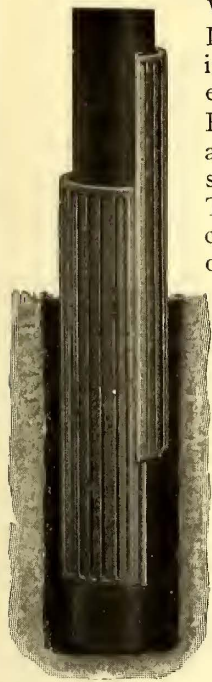
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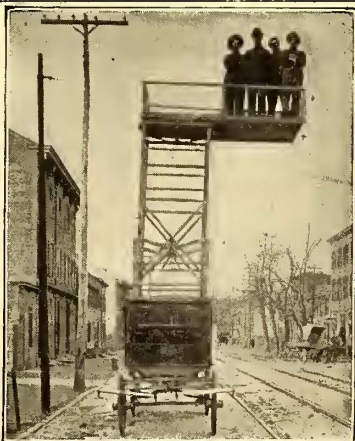
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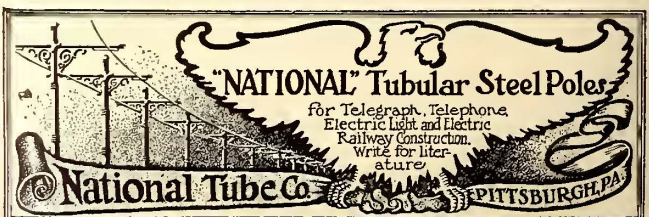
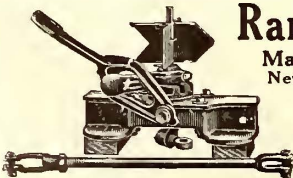


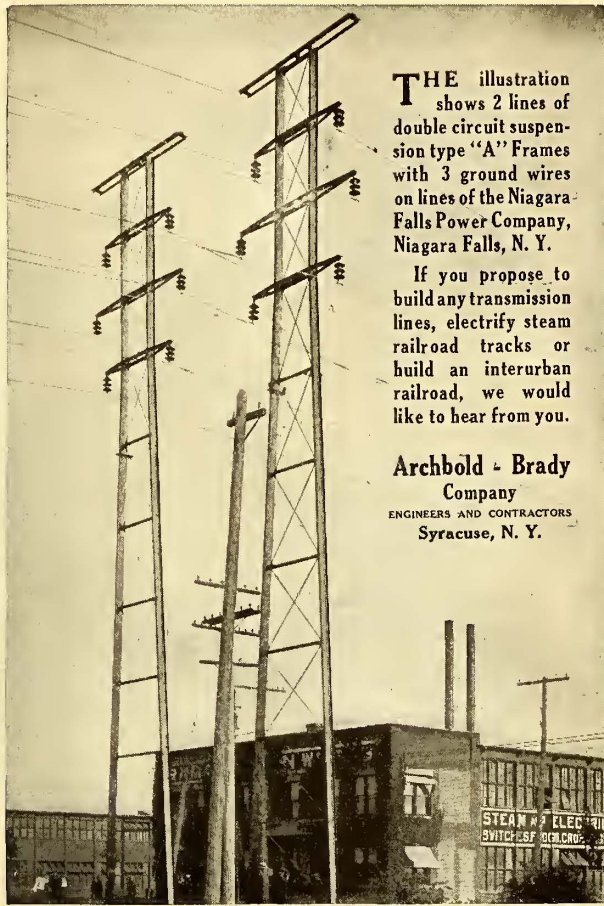
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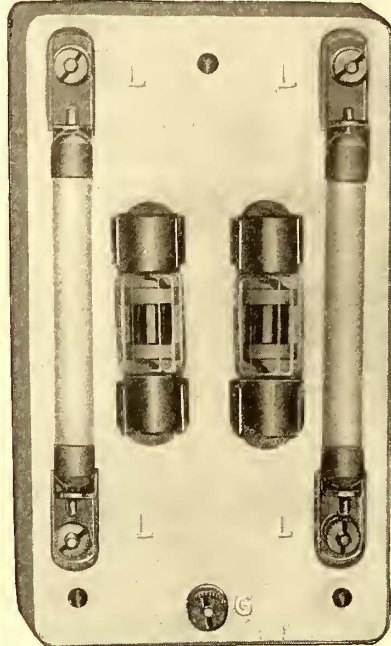


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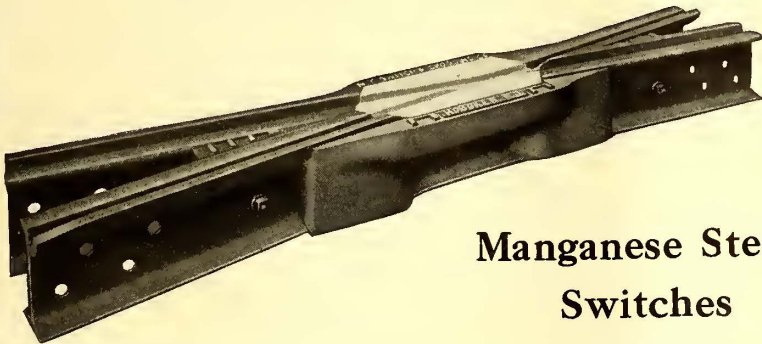
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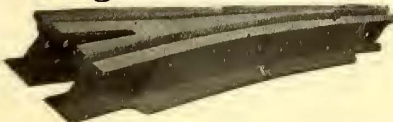
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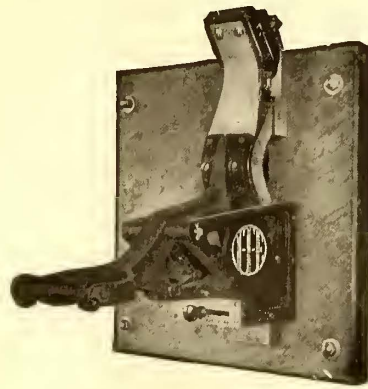


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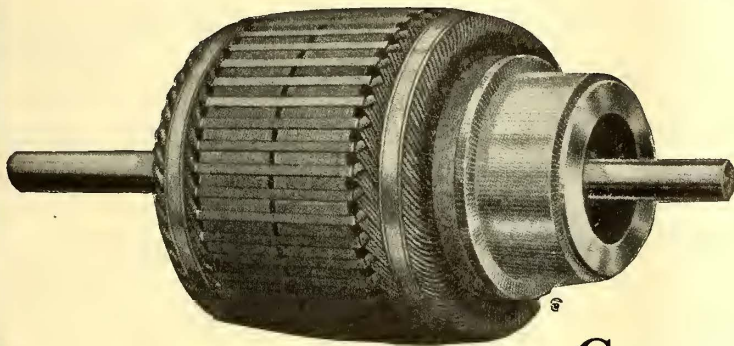
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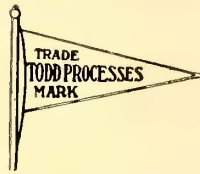
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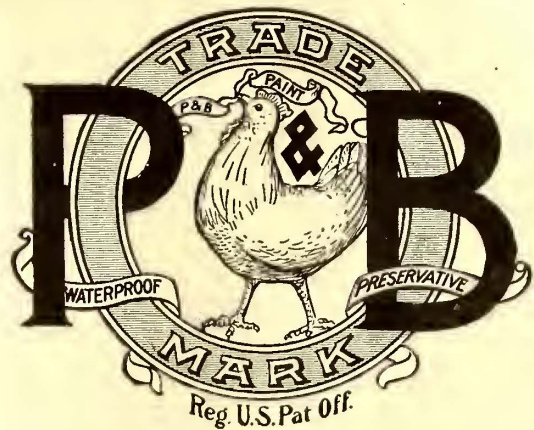


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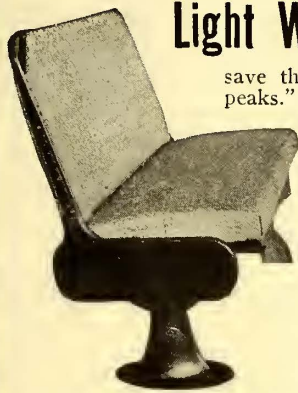
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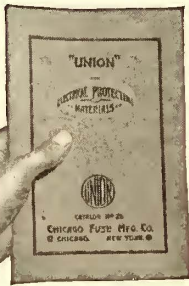
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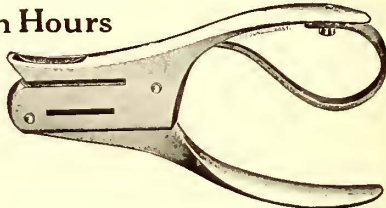
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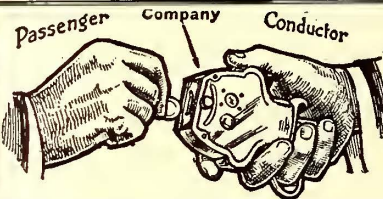
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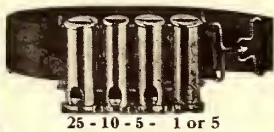
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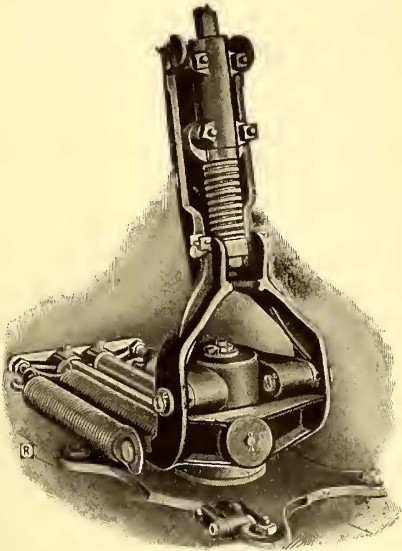
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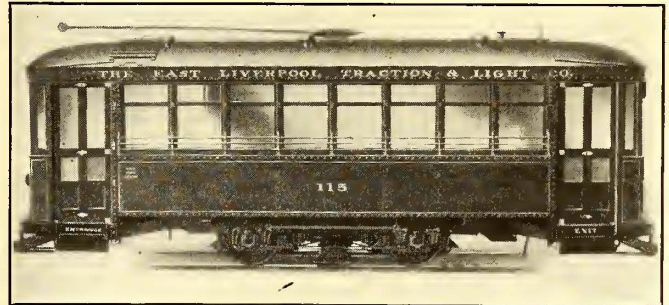
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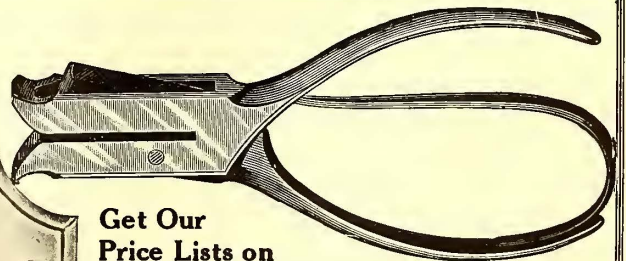


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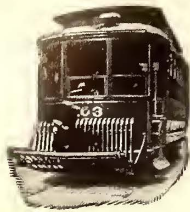
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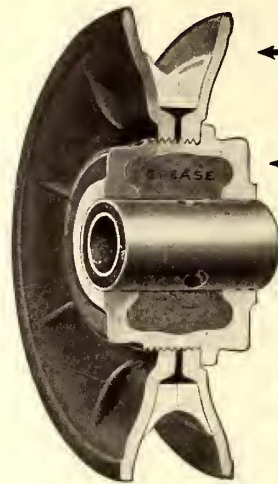
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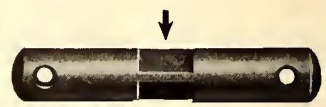
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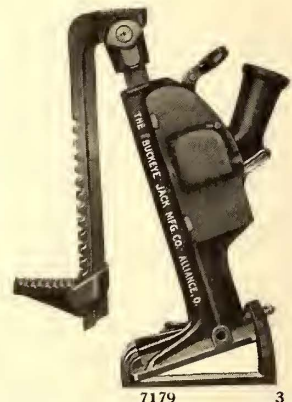
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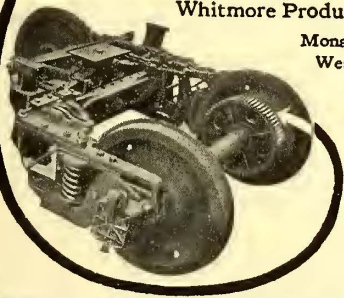
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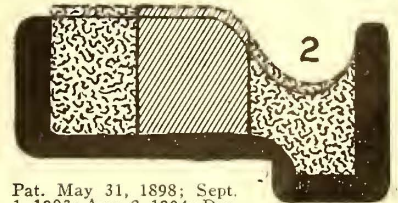
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Eighteen One-Mile Reels

**No. 0000 Hard Drawn Grooved
Copper Trolley Wire**

On Original Reels

Bought by Mistake
Low Price to Move Quick
Wire or Telephone Us

ZELNICKER
WALTER W. ZELNICKER & COMPANY
St. Louis

RAILS, EQUIPMENT, ETC.



SEARCHLIGHT SECTION

60 Cycle, Rotary Converters

- 2—General Electric 1000 K.W., 600 v., 360 R.P.M., type "H.C." comp. wound, 6 phase. Complete with air cooled 2300 v. trans., reactances and panels.
- 2—General Electric 500 K.W., 575 volt, 600 R.P.M., type "H.C." comp. wound, 6 phase. Complete with air cooled trans., 2300 v. reactances and panels.
- 1—300 K.W. Westinghouse, 600 volt D.C., 370 volt A.C., 600 R.P.M. with oil cooled G.E. trans. 11,000 v. primary.
- 1—200 K.W. Westinghouse, 600 volt D.C., 370 volt A.C., 720 R.P.M. Also following transformers:
- 3—125 K.W. G.E. 2400 volts prim., 370 volts sec.
- 6—75 K.W. Ft. Wayne, 10,000-9000-135-370 v.
- 3—175 K.W. Stanley, 10,000-2300 volts.

25 Cycle, Rotary Converters

- 1—500 K.W. General Electric, 3 phase, 25 cycle, 600 volt D.C., 370 volt A.C., 375 R.P.M.

ARCHER & BALDWIN, 114 Liberty Street

SEND FOR CATALOG—JUST OUT
ENGINES—BOILERS—MOTORS—CONDENSERS—ETC.

- 2—300 K.W. Genl. Elect., 3 ph., 25 cycle, 750 R.P.M., 600 volts.
- 1—250 K.W., Genl. Elect., 3 ph., 25 cycle, 500 R.P.M., 600 volts. Can also furnish transformers—all voltages.

Railway Car Equipment

- 8—75 H.P. Westinghouse, 112 Railway Motors, 600 volts, newly rewound armatures, full commutators, rebuilt entirely. Will be sold fully guaranteed, upon any reasonable terms of payment.
- 12—G.E. 57 Motors, 50 H.P. Each.
- 16—G.E. 67 Motors, 40 H.P. Each.
- 20—G.E. 201 Motors, 65 H.P. Each.

Booster Set

Generator—West'gh'se 70 K.W., 350 volt, 200 amp. series wound.
Motor—West'gh'se 105 H.P., 575 volt, 950 R.P.M., type "SA" shunt wound.

Complete with coupling and panel.

ROOM 302
Phone Rector 4337-4338

New York

It Would Be Almost a Miracle

if one or more of the 8,000 men who regularly receive the JOURNAL did not happen to want that used machine which you want to sell. The

Searchlight Section

brings buyers and sellers together

Copy received until Wednesday noon for publication in the issue of that week.

Manufacturing Sites for Lease with Building and Electric Power

At Boonton, New Jersey, 30 miles from Hoboken.

Twenty acres of ideal factory sites for lease in lots as desired on attractive terms. Several buildings ready for occupancy. Served by the main line of the D. L. & W. Railroad, with sidings on the property. The Rockaway River and the Morris & Essex Canal bound the property on two sides.

Electrical power available at low rates from Jersey Corporation, whose power station is located on the site. This Company already supplies power to many plants in vicinity. Labor conditions ideal. The Boonton Board of Trade will co-operate with owners to provide attractive houses for workmen and their families.

For particulars regarding these ideal manufacturing conditions, inquire of W. S. Barstow & Company, Inc., Engineers and Managers, 50 Pine Street, New York, N. Y.

Marketing Scrap

In an issue of this paper an official of a large light and railway company said :

"Some means of interchanging information about materials on hand would be desirable. One company might use a certain type of car or line equipment and have on hand a large supply of extra parts, which while perfectly good, would become useless, and if it were possible to interchange information with another company using the parts in question, many dollars which are now lost would be saved. Nearly everyone familiar with storeroom accounting can recall thousands of dollars which might have been saved if proper means had been adopted."

THE Searchlight Section of the ELECTRIC RAILWAY JOURNAL offers a market place for just such an interchange of information as mentioned above. Machinery or supplies that have outlived their usefulness, or are no longer standard with one company are often just what another company requires, and if advertised in the Searchlight Section of the JOURNAL the exchange could be made at very slight cost.

Better look over your stock and send us a list of what you have on hand but for which you have no immediate use. The Searchlight Section can help you whether you are looking for a market, a man or a job.

Get your wants into the Searchlight

READY-REFERENCE INDEX

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

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

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

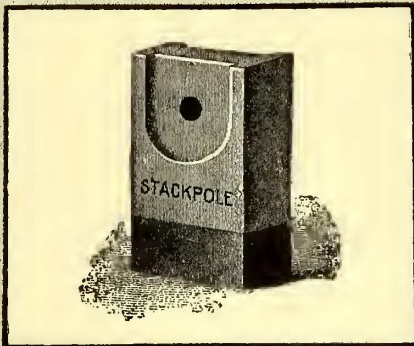
This ready-reference index is up to date, changes being made each week.

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

- Acetylene Apparatus.**
(See Cutting Apparatus, Oxy-Acetylene.)
- Acetylene Service.**
Oxweld Acetylene Co.
Prest-O-Lite Co., Inc., The.
Searchlight Co., The.
- Advertising, Street Car.**
Collier, Barron G., Inc.
- Air Cleaners.**
Lord Mfg. Co.
- Alloys and Bearing Metals.**
(See Bearings and Bearing Metals.)
- Alloys, Steel and Iron.**
American Vanadium Co.
Titanium Alloy & Mfg. Co.
- Anchors, Guy.**
Johns-Manville Co., H. W.
Ohio Brass Co.
Track Specialties Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Anti-Climbers.**
Railway Improvement Co.
- Automobiles and Buses.**
Brill Co., The J. G.
- Axle Straighteners.**
Columbia, M. W. & M. I. Co.
- Axles—Car Wheel.**
Brill Co., The J. G.
Cambria Steel Co.
Cincinnati Car Co.
Hadfield's, Ltd.
National Tube Co.
Niles Car & Mfg. Co.
Standard Steel Works Co.
Taylor Elec. Truck Co.
Westinghouse Elec. & M. Co.
- Babbiting Devices.**
American Gen'l Eng'g Co.
Columbia M. W. & M. I. Co.
- Badges and Buttons.**
American Railway Supply Co.
International Register Co.
Western Electric Co.
Woodman Mfg. & Sup. Co., R.
- Bankers and Brokers.**
Coal & Iron National Bank.
Halsey & Co., N. W.
- Batteries, Dry.**
Johns-Manville Co., H. W.
Stackpole Carbon Co.
Western Electric Co.
- Batteries, Storage.**
Electric Storage Battery Co.
Western Electric Co.
- Bearings and Bearing Metals.**
American General Engrg. Co.
Columbia, M. W. & M. I. Co.
General Electric Co.
Long Co., E. G.
More-Jones Brass & M. Co.
Post & Co., E. L.
Taylor Elec. Truck Co.
Westinghouse Elec. & M. Co.
- Bearings, Center.**
Baldwin Loco. Works.
- Bearings, Oilless, Graphite, Bronze & Wooden.**
Graphite Lubricating Co.
- Bearings, Roller and Ball.**
Railway Roller Bearing Co.
- Bells and Gongs.**
Brill Co., The J. G.
Electric Service Supplies Co.
National Tube Co.
Reiter, G. C.
Trolley Supply Co.
Western Electric Co.
- Benders, Rail.**
Niles-Bement-Pond Co.
Watson-Stillman Co.
Zelnicker Sup. Co., W. A.
- Blow Torches for Soldering and Brazing.** (See Cutting Apparatus, Oxy-Acetylene.)
- Blowers.**
General Electric Co.
Westinghouse Elec. & M. Co.
- Boilers.**
Babcock & Wilcox Co.
- Boiler Cleaning Compounds.**
Dearborn Chemical Co.
Johns-Manville Co., H. W.
- Boiler Coverings.**
Johns-Manville Co., H. W.
- Boiler Tubes.**
National Tube Co.
- Bond Testers.**
American Steel & Wire Co.
- Bonding Apparatus.**
Oxweld Acetylene Co.
Prest-O-Lite Co., Inc., The.
Searchlight Co., The.
- Bonding Tools.**
American Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Ohio Brass Co.
- Bonds, Rail.**
American Steel & Wire Co.
Elec. Ry. Improvement Co.
Electric Service Supplies Co.
Electric Ry. Equipment Co.
General Electric Co.
Johns-Manville Co., H. W.
Ohio Brass Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Boring Tools, Car Wheel.**
Niles-Bement-Pond Co.
- Braces, Rail.**
Kilby Frog & Switch Co.
- Brackets and Cross Arms.** (See also Poles, Ties, Posts, Etc.)
Bates Expanded Stl. Truss Co.
Creaghead Engineering Co.
Electric Ry. Equipment Co.
Electric Service Supplies Co.
Int'l Creosoting & Constr. Co.
Linsley Bros. Co.
Ohio Brass Co.
Western Electric Co.
- Brake Adjusters.**
Sauvage-Ward Brake Co.
- Brake Shoes.**
Amer. Brake Shoe & Fdy. Co.
Barbour-Stockwell Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Long Co., E. G.
Taylor Elec. Truck Co.
Wheel Truing Brake S. Co.
- Brakes, Brake Systems and Brake Parts.**
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
Jones' Sons Co., J. M.
Long Co., E. G.
Lord Mfg. Co.
National Brake Co.
Taylor Elec. Truck Co.
U. S. Metal & Mfg. Co.
Westinghouse Trac. B. Co.
- Brooms, Track, Steel or Rattan.**
Western Electric Co.
Zelnicker Sup. Co., W. A.
- Brushes, Carbon.**
Calebaugh Self-Lubricating Carbon Co.
Dixon Crucible Co., Jos.
- General Electric Co.**
Jeandron, W. J.
Le Carbone Co.
Morgan Crucible Co.
Speer Carbon Co.
Stackpole Carbon Co.
Western Elec. Co.
Westinghouse Elec. & M. Co.
- Bumpers, Car Seat.**
Elec. Service Supplies Co.
Imperial Rubber Co.
Massachusetts Chemical Co.
Walpole Tire & Rubber Co.
- Bunting.**
Boyle & Co., Inc., John.
- Bushings, Fibre.**
Diamond State Fibre Co.
- Bushings, Graphite and Wooden.**
Graphite Lubricating Co.
- Bushings, Rubber.**
Imperial Rubber Co.
- Buttons.** (See Badges and Buttons.)
- Cables.** (See Wires and Cables.)
- Carbon Brushes.** (See Brushes, Carbon.)
- Car Equipment.** (For Fenders, Heaters, Registers, Wheels, etc.—see those headings.)
- Car Trimmings.** (For Curtains, Registers, Doors, Seats, etc.—See those headings.)
- Cars, Passenger, Freight, Express, etc.**
American Car Co.
Brill Co., The J. G.
Cambria Steel Co.
Cincinnati Car Co.
Jewett Car Co.
Jones' Sons Co., J. M.
Kuhlman Car Co., G. C.
Niles Car & Mfg. Co.
United Electric Car Co.
Wason Mfg. Co.
- Cars, Self-Propelled.**
Electric Storage Battery Co.
General Electric Co.
- Castings, Composition of Copper.**
Anderson M. Co., A. & J. M.
- Castings, Gray Iron and Steel.**
Amer. Brake Shoe & Fdry. Co.
American Gen'l Eng'g Co.
Columbia M. W. & M. I. Co.
Falk Co., The.
Hadfield's, Ltd.
Jones' Sons Co., J. M.
Long Co., E. G.
St. Louis Steel Foundry.
Standard Steel Works Co.
Union Spring & Mfg. Co.
- Castings, Malleable and Brass.**
Amer. Brake Shoe & Fdry. Co.
American Gen'l Eng'g Co.
Hadfield's, Ltd.
Long Co., E. G.
- Catchers and Retriever, Trolley.**
Earl, C. I.
Eclipse Railway Supply Co.
Elec. Service Supplies Co.
Long Co., E. G.
Lord Mfg. Co.
New Haven Trolley Supply Co.
Ohio Brass Co.
Trolley Supply Co.
Wood Co., Chas. N.
- Ceiling, Car.**
Pantastote Co.
- Checks, Employees'.**
American Ry. Supply Co.
- Cheese Cloth.**
Boyle & Co., Inc., John.
- Chemists.**
Little, Arthur D., Inc.
- Circuit Breakers.**
Cutter Electrical & Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Clamps and Connectors for Wires and Cables.**
American Gen'l Eng'g Co.
Anderson M. Co., A. & J. M.
Dossert & Co.
Elec'l Engrs. Equipment Co.
Elec. Service Supplies Co.
Fargo Mfg. Co., Inc.
General Electric Co.
Klein & Sons, Mathias.
Ohio Brass Co.
Standard Railway Supply Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Cleaners and Scrapers, Track.** (See also Snow - Plows, Sweepers and Brooms.)
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
Van Dorn & Dutton Co.
Western Electric Co.
- Cleats, Car Wiring.**
General Electric Co.
- Clusters and Sockets.**
General Electric Co.
- Coal and Ash Handling.** (See Conveying and Hoisting Machinery.)
- Coasting Clocks.**
Railway Improvement Co.
- Coil Banding and Winding Machines.**
American Gen'l Eng'g Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
Western Electric Co.
- Coil Impregnation.**
Vacuum Impregnating Works.
- Colls, Armature & Field.**
Cleveland Armature Works.
Columbia M. W. & M. I. Co.
D & W Fuse Co.
General Electric Co.
Mica Insulator Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Colls, Choke & Kicking.**
Electric Service Supplies Co.
General Electric Co.
Westinghouse Elec. & M. Co.
- Coin Carriers.**
Etter, Chas. F.
- Coin-Counting Machines.**
International Register Co.
Johnson Fare Box Co.
- Commutator Slotters.**
American General Eng'g Co.
General Electric Co.
Westinghouse Elec. & M. Co.
Wood Co., Chas. N.
- Commutator Truing Devices.**
American General Eng'g Co.
General Electric Co.
- Commutators or Parts.**
American General Eng'g Co.
Cameron Electrical Mfg. Co.
Cleveland Armature Works.
Columbia M. W. & M. I. Co.
General Electric Co.
Long Co., E. G.
Mica Insulator Co.
Western Electric Co.
Westinghouse Elec. & M. Co.

Stackpole Carbon Co.

**Manufacturers of
Motor and Generator
Brushes**



**Metallic and Graphite Brushes
Carbon Specialties**

St. Marys, Pa.

**The Highest Grade
Portable Instruments
Ever Produced!**

Weston

Model 45 D. C. Portable Ammeters and Voltmeters



Designed to meet the demand for a medium-priced Ammeter and Voltmeter. They are guaranteed to be of sufficient accuracy (one per cent) for general testing in electric power plants, or for outdoor work.

They are shielded from the influence of external magnetic fields, the movement and magnetic system being enclosed in an iron case permanently mounted in a handsome wooden carrying box with hinged cover.

The scale has a mirror over which the knife-edge pointer travels. Readings can be made within 1/10 of a division at any part of the scale.

In mechanical and electrical workmanship the Weston Model 45 Portable Ammeters and Voltmeters practically attain perfection.

A full description will be found in Bulletin 501, which will be mailed to you on request.

Weston Electrical Instrument Co.

21 Weston Ave., Newark, N. J.

New York	St. Louis	Cleveland	Toronto	Berlin
Chicago	Denver	Buffalo	Montreal	Paris
Philadelphia	San Francisco	Cincinnati	Winnipeg	London
Boston	Detroit	Richmond	Vancouver	Petrograd

MORGANITE Brushes

TRADE

MARK

Prescribed—not merely sold.

The Morgan Crucible Co., Ltd.
120 Liberty St., New York
Factory Brooklyn

Speer
G

—the economical railway motor brush

There's always a limit to carbon brush economy—Speer's G has reached that limit.

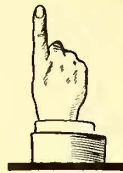
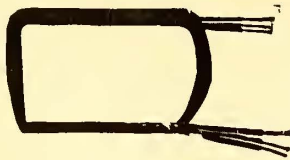
Get a set for trial.

Speer Carbon Co., St. Marys, Pa.

READY-REFERENCE INDEX

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

- Compressors, Air.**
Curtis & Co. Mfg. Co.
General Electric Co.
Westinghouse Trac. B. Co.
- Condensers.**
General Electric Co.
Westinghouse Machine Co.
- Conduits.**
Fibre Conduit Co.
Johns-Manville Co., H. W.
Standard Underground Cable Co.
Western Electric Co.
- Conduits, Flexible.**
Tubular Woven Fabric Co.
- Controller Regulators.**
Electric Service Supplies Co.
- Controllers or Parts.**
American General Eng'g Co.
Columbia M. W. & M. I. Co.
Electric Service Supplies Co.
General Electric Co.
Johns-Manville Co., H. W.
Kerschner Co., Inc., W. R.
Westinghouse Elec. & M. Co.
- Controlling Systems.**
General Electric Co.
Westinghouse Elec. & M. Co.
- Converters, Rotary.**
General Electric Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Conveying and Hoisting Machinery.**
Green Engrg. Co.
Hadfield's, Ltd.
- Cord, Bell, Trolley, Register, etc.**
Brill Co., The J. G.
Electric Service Supplies Co.
Imperial Rubber Co.
International Register Co.
Long Co., E. G.
Roebbling's Sons Co., John A.
Samson Cordage Works.
- Cord Connectors & Couplers.**
Electric Service Supplies Co.
Samson Cordage Works.
Wood Co., Chas. N.
- Cotton Duck.**
Boyle & Co., Inc., John.
- Couplers, Car.**
Brill Co., The J. G.
Cincinnati Car Co.
Long Co., E. G.
Ohio Brass Co.
Westinghouse Trac. B. Co.
- Cranes. (See also Hoists.)**
Niles-Bement-Pond Co.
Thew Automatic Shovel Co.
Van Dorn & Dutton Co.
- Creosoting. (See Wood Preservatives.)**
- Cross Arms. (See Brackets.)**
- Crossing Foundations.**
International Steel Tie Co.
- Crossing Signals. (See Signals, Crossing.)**
- Crossings, Track. See Track Special Work.)**
- Culverts.**
Canton Culvert & Silo 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.
Railway Supply & Curtain Co.
- Cushions, Field Coll.**
Massachusetts Chemical Co.
Walpole Tire & Rubber Co.
- Cutting Apparatus, Oxy-Acetylene.**
Oxweld Acetylene Co.
Frest-O-Lite Co., Inc., The.
Searchlight Co., The.
- Derailing Devices. (See also Track Work.)**
Cleveland Frog & Cross. Co.
U. S. Metal & Mfg. Co.
- Despatching Systems.**
Northey-Simmen Sig. Co.
Simmen Automatic Ry. Sig. Co.
Western Electric Co.
- Detective Service.**
Wisch Service, P. Edward.
- Door Operating Devices.**
Electric Service Supplies Co.
- Doors and Door Fixtures.**
Brill Co., The J. G.
Edwards Co., Inc., The O. M.
Electric Service Supplies Co.
General Electric Co.
Hale & Kilburn Co.
- Doors, Asbestos.**
Johns-Manville Co., H. W.
- Doors, Folding Vestibule.**
Electric Service Supplies Co.
- Doors, Steel Rolling.**
Kinnear Mfg. Co.
- Doors, Trap.**
Edwards Co., Inc., The O. M.
- Draft, Rigging. (See Couplers.)**
- Drills, Track.**
American Steel & Wire Co.
Elec. Service Supplies Co.
Long Co., E. G.
Niles-Bement-Pond Co.
Ohio Brass Co.
- Dryers and Purifiers, Oil. (See Purifiers and Dryers, Oil.)**
- Dryers, Sand.**
Zelnicker Sup. Co., W. A.
- Engineers, Consulting, Contracting and Operating.**
Archbold-Brady Co.
Arnold Co.
Bemis, Anthony J.
Burch, Edw. P.
Byllesby & Co., H. M.
Darlington, F. W.
Ford, Bacon & Davis.
Greims Corporation, H. E.
Gulick-Henderson Co.
Hovey, M. H.
Hunt & Co., Robert W.
Jackson, D. C. & Wm. B.
Little, Arthur D., Inc.
Neiler, Rich & Co.
Richey, A. S.
Roosevelt & Thompson.
Sanderson & Porter.
Sargent & Lundy.
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Stone & Webster Eng. Corp.
White & Co., J. G.
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Westinghouse Machine Co.
- Engines, Steam.**
Westinghouse Machine Co.
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Brill Co., The J. G.
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.
- Fences and Fence Posts.**
American Steel & Wire Co.
- Fencing Wire.**
American Steel & Wire Co.
- Fenders and Wheel Guards.**
Brill Co., The J. G.
Cincinnati Car Co.
Cleveland Fare Box Co.
Consolidated Car Fender Co.
Eclipse Railway Supply Co.
Electric Service Supplies Co.
Parmenter F. & W. G. Co.
Star Brass Works.
Western Electric Co.
- Fibre.**
Diamond State Fibre Co.
Westinghouse Elec. & M. Co.
- Fibre Tubing.**
Diamond State Fibre Co.
Fibre Conduit Co.
Johns-Manville Co., H. W.
Westinghouse Elec. & M. Co.
- Field Coils. (See Coils.)**
- Filters, Water**
Scaife & Sons Co., Wm. B.
- Fire Extinguishing Apparatus.**
Imperial Rubber Co.
Johns-Manville Co., H. W.
Pyrene Mfg. Co.
- Fireproofing Materials.**
Johns-Manville Co., H. W.
- Flooring Composition.**
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Western Electric Co.
- Forgings.**
Standard Steel Works Co.
- Frogs, Track. (See Track Work.)**
- Furnaces. (See Stokers.)**
- Furniture, Metal Office.**
Edwards Co., Inc., The O. M.
- Fuses and Fuse Boxes.**
American General Eng'g Co.
Chicago Fuse Mfg. Co.
Columbia M. W. & M. I. Co.
D & W Fuse Co.
General Electric Co.
Johns-Manville Co., H. W.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Fuses, Refillable.**
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Johns-Manville Co., H. W.
- Gaskets.**
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Johns-Manville Co., H. W.
Power Specialty Co.
- Gas Producers.**
Westinghouse Machine Co.
- Gates, Car.**
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Jewett Car Co.
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Standard Steel Works Co.
- Gear Cases.**
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Thayer & Co., Inc.
Westinghouse Elec. & M. Co.
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American Gen'l Eng'g Co.
Columbia M. W. & M. I. Co.
Diamond State Fibre Co.
Elec. Service Supplies Co.
General Electric Co.
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Long Co., E. G.
Nuttall Co., R. D.
Van Dorn & Dutton Co.
- Generators, Alternating Current.**
General Electric Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Generators, Direct Current.**
Dick, Kerr & Co.
General Electric Co.
Western Electric Co.
Westinghouse Elec. & M. Co.
- Gongs. (See Bells and Gongs.)**
- Gongs, Rotary Foot.**
Reiter, G. C.
- Graphite.**
Dixon Crucible Co., Joseph.
Morgan Crucible Co.
- Greases. (See Lubricants.)**
- Grinders and Grinding Wheels.**
Goldschmidt-Thermit Co.
Hadfield's, Ltd.
Railway Track-work Co.
U. S. Metal & Mfg. Co.
Western Electric Co.
- Grinders, Portable, Electric.**
Goldschmidt-Thermit Co.
Railway Track-work Co.
U. S. Metal & Mfg. Co.
Western Elec. Co.
- Guards, Trolley.**
Electric Service Supplies Co.
Ohio Brass Co.
- Harps, Trolley.**
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Anderson M. Co., A. & J. M.
Bayonet Trolley Harp Co.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works.
Universal Trolley Wheel Co.
Western Electric Co.
- Headlights.**
Electric Service Supplies Co.
General Electric Co.
Jones' Sons Co., J. M.
Long Co., E. G.
Ohio Brass Co.
Trolley Supply Co.
Westinghouse Elec. & M. Co.
- Headlining.**
Pantasote Co.
- Heaters, Car (Electric).**
Johns-Manville Co., H. W.
- Heaters, Car, Hot Air.**
Cooper Heater Co.
Smith Heater Co., Peter.
- Heaters, Car, Hot Water.**
Cooper Heater Co.
Smith Heater Co., Peter.
- Heaters, Car, Stove.**
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- Holists and Lifts.**
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Duff Mfg. Co.
Ford Chain Block & Mfg. Co.
Niles-Bement-Pond Co.
Van Dorn & Dutton Co.
Yale & Towne Mfg. Co.
- Hose Bridges.**
Ohio Brass Co.
- Hose, Pneumatic & Fire.**
Imperial Rubber Co.
Johns-Manville Co., H. W.
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Well, it's about the most rugged combination of insulation and wire ever created for standing up against motor temperature conditions. It's

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Just a word will do about the wire itself. It's a pure lake copper, drawn accurately to gauge.

But it's the insulation we want to call your attention to. It's made of pure asbestos and a high temperature filler. The asbestos meets the demands of all over-load temperatures. The filler is a special impregnating compound which gives it the electrical insulating "back-bone."

Your motor can't burn out with Deltabeston. Up-hill or sudden starts don't make any difference.

Suppose you get the facts—today. It definitely means dollars and cents to you.

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1

Overloads are Sure to Come but
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by the Use of

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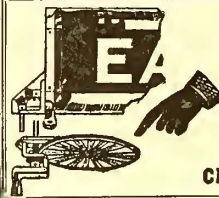
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By means of it, conductor or motorman can change sign without leaving platform. All that has to be done is to turn the crank. Better investigate.

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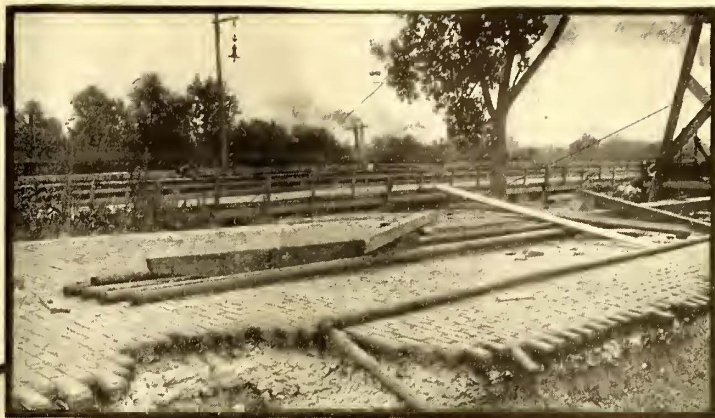
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Showing destruction of Levee Road caused by flood.



Upper illustration shows another section of same road after the flood.



Levee Road at Middletown, O. Brick pavement filled with Barrett's Paving Pitch in 1892.

**Barrett's
PAVING
PITCH**

An Extraordinary Test

Twenty-three years ago this road at Middletown, O., was paved with brick and filled with Barrett's Paving Pitch.

Recently a section of the road was damaged by flood and this gave an opportunity to observe carefully the condition of the Paving Pitch.

It still clung tightly to the bricks that were washed away. Samples of it were taken and found to be in exactly as good condition chemically as when new. In fact, if it were practicable to scrape or melt it off the bricks it could be used over again today in a new

pavement and would undoubtedly give perfect satisfaction for another twenty-three years.

Pitch is wonderful in its absolute immunity to the action of water. It ranks with gold and copper in its resisting power against the elements.

Service considered, it is the least expensive filler known and the easiest to apply. It maintains a perfect seal against the intrusion of water and frost. It eliminates the ancient expansion problem, for it makes every joint an expansion joint.

Booklets free on request. Address our nearest office.

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(See pages 86-87.)
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Printing begins on Tuesday of each week.
 Changes of copy received up to 10 A. M. Monday will appear in the issue of the following week, but no proofs can be submitted for OK before publication.
 New Advertisements (not changes of copy) received up to Wednesday noon can appear in the issue of that week, but no proofs can be shown.
 If proofs before printing are required, changes of copy and copy for new advertisements must be in our hands 10 days in advance of the date of publication.
 (An asterisk * indicates advertisements appearing in the International Edition only.)

to Wednesday noon can appear in the issue of that week, but no proofs can be shown.
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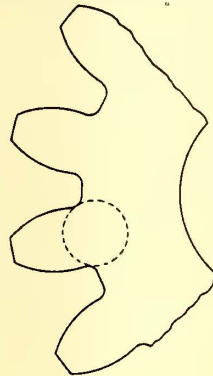
BP Process Heat Treated Gears

**Guaranteed to Give Three and One-Half
Times the Mileage of Untreated
Cast Steel Gearing**

Comparative Physical Properties

Untreated Material	
Tensile Strength	85000 lbs.
Elastic Limit	45000 lbs.
Elongation in 2"	22 %
Reduction of Area	45 %

Surface Hardness	
Brinell Test	196



After BP Treatment	
Tensile Strength	130000 lbs.
Elastic Limit	90000 lbs.
Elongation in 2"	12 %
Reduction of Area	35 %

Surface Hardness	
Brinell Test	555

Test pieces taken from roots of teeth as shown in cut, before and after gear is treated

These are the results of scientifically treating ordinary medium carbon steel.

What is your cost per thousand miles for Cast Steel Gears ?

Write for a definite guarantee on BP Gears.

Nuttall - - Pittsburgh



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leaves an impress on the lubrication cost sheet. If it's improperly packed the best of lubricants can never right the wrong.

By working with the car house men Galena experts get them into the habit of properly packing journals.

Then by using Galena oils the cost goes down to bed-rock.

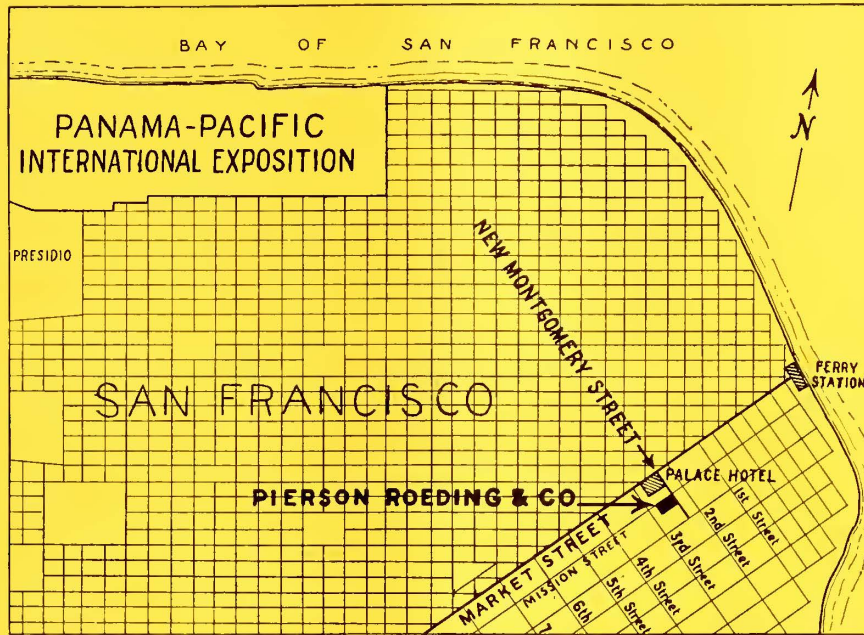
We guarantee the saving.



GALENA SIGNAL OIL COMPANY

Franklin, Pa.

INVITATION



THIS map of the northeastern section of San Francisco shows the location of the Exposition Grounds in relation to the business district along Market Street. The well-known and conspicuous Market Street landmark, the Palace Hotel, is in the heart of the busiest part of the city and is at the corner of New Montgomery Street, where but a block east will be found the main offices of our Pacific Coast Agents, Messrs. Pierson, Roeding & Company. The offices are on the ground floor of the Rialto Building, 118-130 New Montgomery Street—corner of Mission Street. All Railway Officials from abroad and from all parts of this country who will attend the Exposition during the year, are cordially invited to visit the offices and are requested to ask for Mr. H. R. Noack, President, Mr. Thomas Finigan, Vice-President, and Mr. F. A. Richards, Manager Car Dept.

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Philadelphia, Pa.
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St. Louis, Mo.
G. C. KUHLMAN CAR CO.
Cleveland, Ohio
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63 G-E Locomotives on the New York Central

Eight years ago thirty-five 115-ton G-E Locomotives, designed to haul 535-ton trains at 60 miles per hour, were placed in service.

Today, 63 G-E Locomotives are used in this electrification. The illustration shows the latest type placed in passenger service. The total weight of 125 tons is on the driving-wheels and the locomotive can haul 1200-ton trains at 60 miles an hour.

One phase of G-E electrification progress is indicated in the above figures—an increase of 124 per cent in train weight successfully operated by locomotives weighing only 9 per cent more than the original type.

Latest type G-E Locomotive
hauling "Twentieth Century"
on New York Central lines.



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