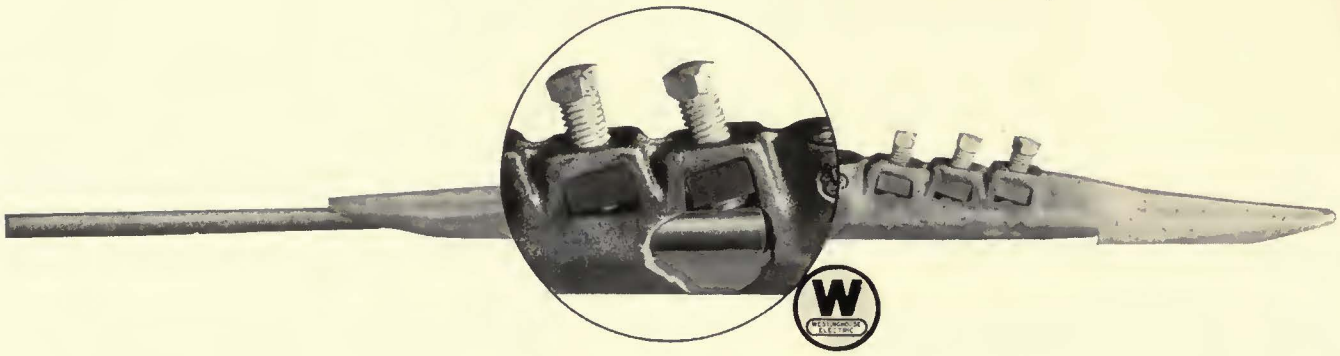
w-Hill Publishing Company, Inc. March 19, 1927 Twenty Cents per C

ELECTRIC RAILWAY JOURNAL



How Those *Rocking Nuts* Do Hold!

INCREASED pull just makes the screws dig down into the copper and take hold with a tighter grip.

Note what happens as the pull comes on the wire. The corner of the nut acts as a fulcrum, forcing the tip of the screw downward and pressing the wire against the bottom of the splicer. The wire is held in a grip that increases with the tension, increasing also the conductivity of the splicer.

The gripping power produced by rocking nuts is found only in Westinghouse line material.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries

MEMBER AERA 1922 1927

Westinghouse

X91118

Line Material With Rocking Nuts

UB Section Insulator
(Single Beam)

CL Splicer

Keeping Your
Overhead *Down*
by
Keeping it UP

DB Section Insulator
(Double Beam)

RB Splicer

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CONTENTS

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MARCH 19, 1927

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

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Peak Hour Economy

During peak hours, effective operation of ordinary brake equipment on modern light weight cars is diminished with the loading of commuting crowds—just when adherence to schedules is of the utmost importance. This condition is remedied by the

WESTINGHOUSE VARIABLE LOAD BRAKE!

During peak hours, schedules must be fast and consistent, especially through congested districts, to command passenger good will and patronage. This means that maximum speed must be maintained longer between stops than is possible without the

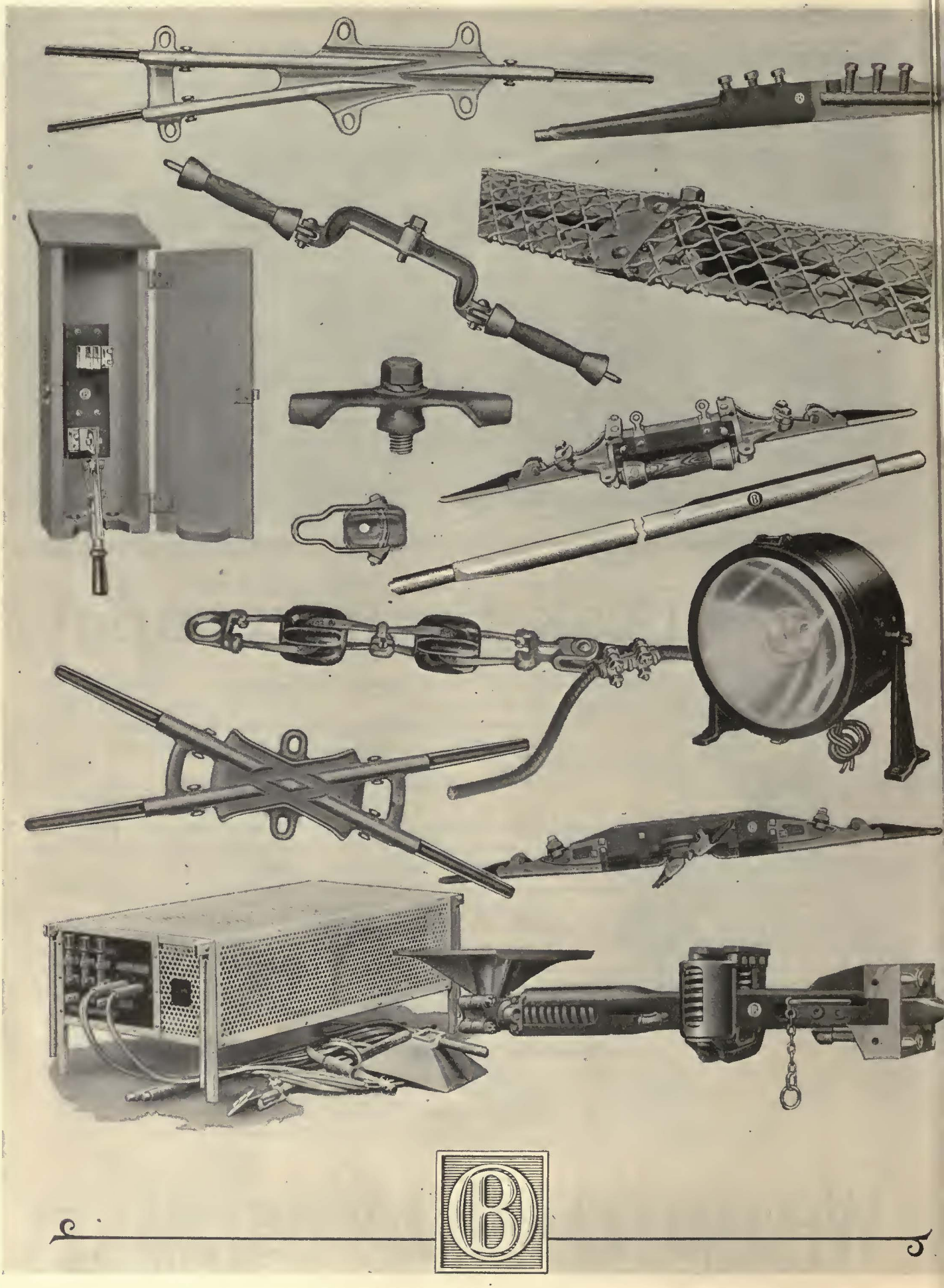
WESTINGHOUSE VARIABLE LOAD BRAKE!

During peak hours, every traction company counts its minutes saved collectively in terms of dollars. You can Save Money At Every Stop and get the utmost out of your rolling stock by using the

WESTINGHOUSE VARIABLE LOAD BRAKE!

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES



Heavy Duty Reciprocating Grinder

Saving the rail

ANY maintenance program that does not include an ample appropriation for track maintenance is neglecting to take the first step first. Whatever may be the right move to improve conditions on your road, results will be improved by good track.

If the program requires new cars, it takes good track to produce comfortable rides.

If aggressive selling and advertising are scheduled, it takes good track to make the service saleable.

Is new financing needed? Good track is the soundest investment.

Is private car competition keen? Compete with comfortable rides on good track.

Is the paving burden heavy? Good rail maintenance saves the whole track structure.

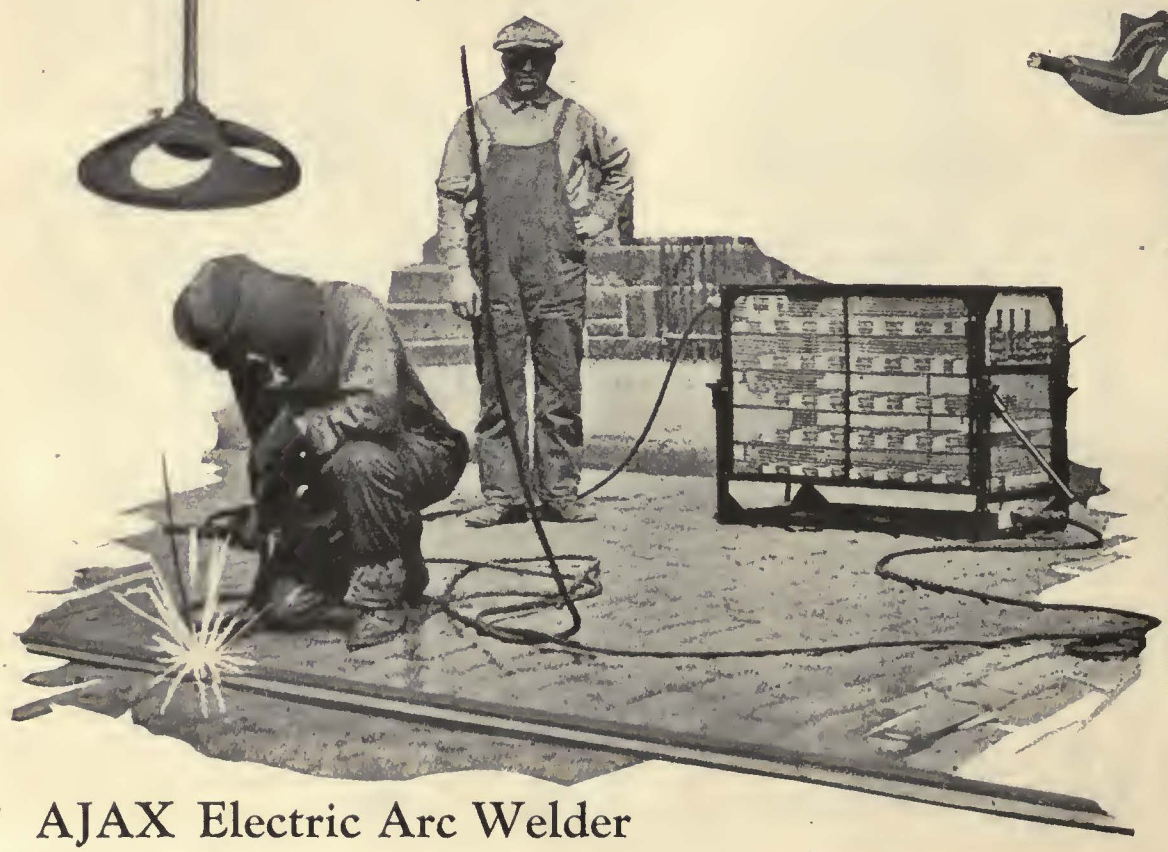
No matter what call there may be for available funds, the outstanding importance of track maintenance must be kept ever in mind.

Trim expenditure if you must, but don't neglect the rails.

Take the first step first—set aside enough to keep the rail in prime condition always.

AJAX Street Lighting Cluster

Makes Night Work Light Work



AJAX Contact Pole and Hook—

Need not be removed to let the cars pass

AJAX Electric Arc Welder

saves the railway

TRACK maintenance starts with rail maintenance. If the rails are kept always in good condition, the track structure is saved. Every corrugated rail, every cupped joint, every battered frog, switch and crossing pounds the life out of your track foundation and boosts equipment maintenance costs.

Every dollar skimped in track maintenance is paid out with usurious interest in other departments. Keeping everlastingly at it is the keynote of track maintenance economy.

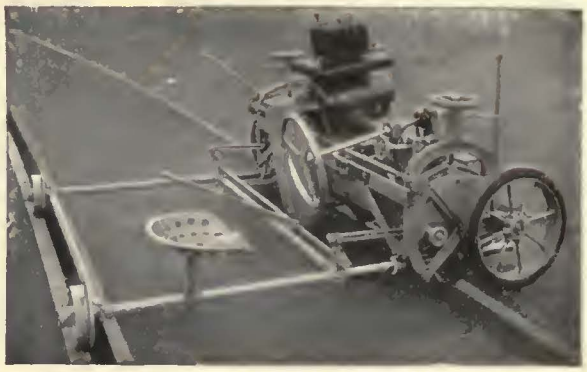
Grinding and arc welding, little and often, make good track easy to own.

By specializing on rail maintenance equipment for years, we have developed a machine for every need.

Whether you need a reciprocating grinder for removing corrugations or a rotary grinder for removing surplus weld metal or an electric arc welder, here is proven equipment.

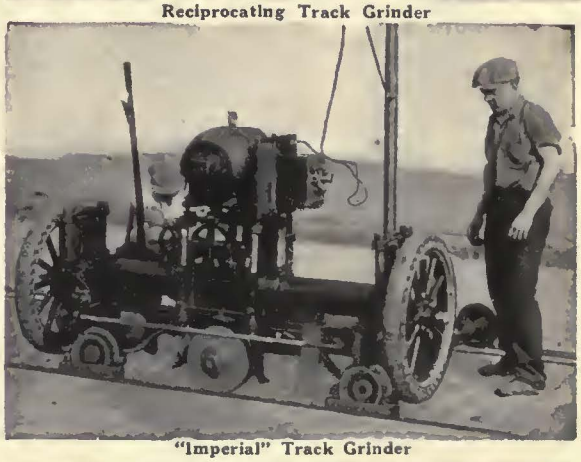
Hundreds of roads, here and abroad, are successfully using the equipment shown on these pages.

Insist on sufficient track maintenance funds to acquire the machines you need. And then keep them everlastingly busy.

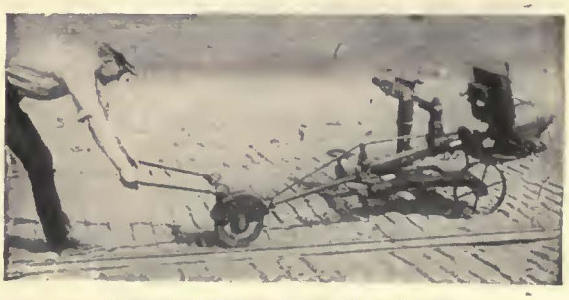


"Improved Atlas" Rail Grinder

Reciprocating Track Grinder



"Imperial" Track Grinder



"Hercules" Swing Frame Rail Grinder

"Vulcan" Rail Grinder

"Midget" Rail Grinder

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:
Chester F. Gailor, 30 Church St., New York
Chas. N. Wood Co., Boston
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H. F. McDermott, 208 S. La Salle St., Chicago
P. W. Wood Railway Supply Co., New Orleans, La.
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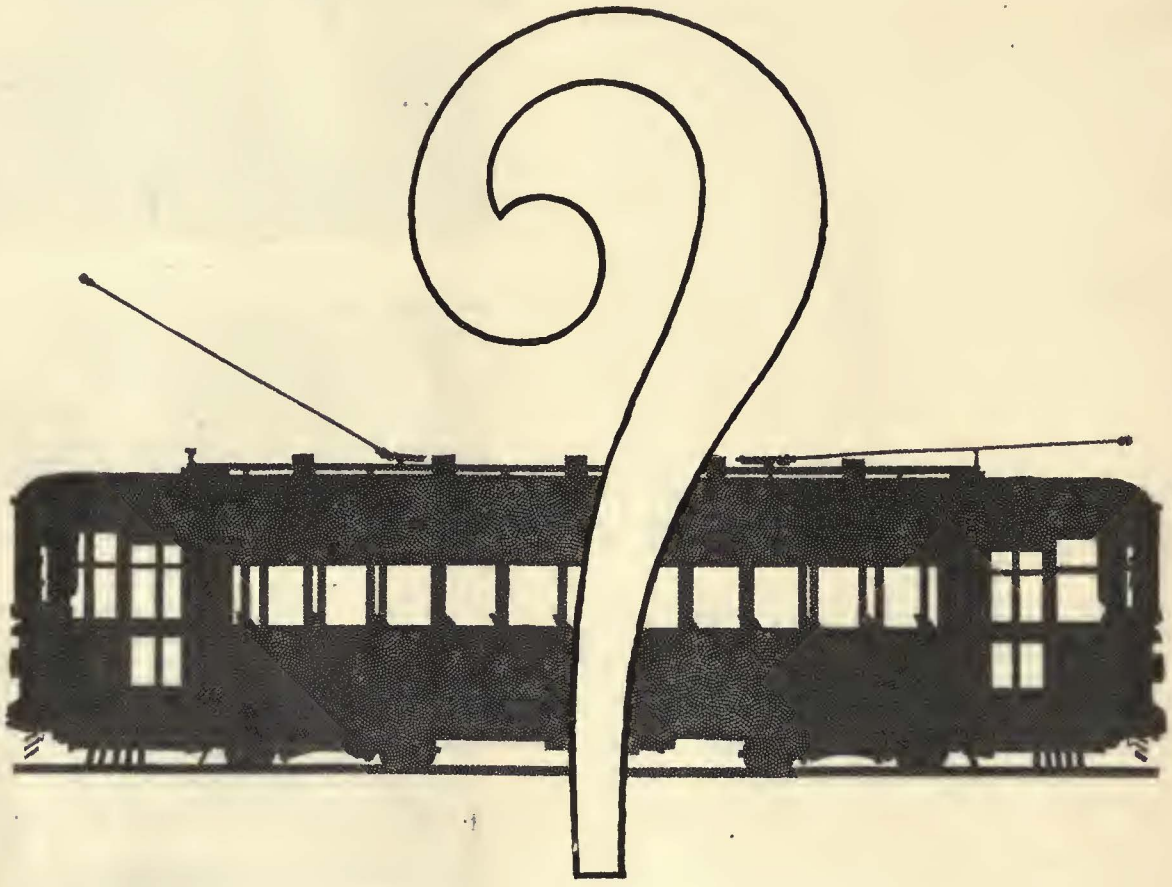
O.S.T. 1663

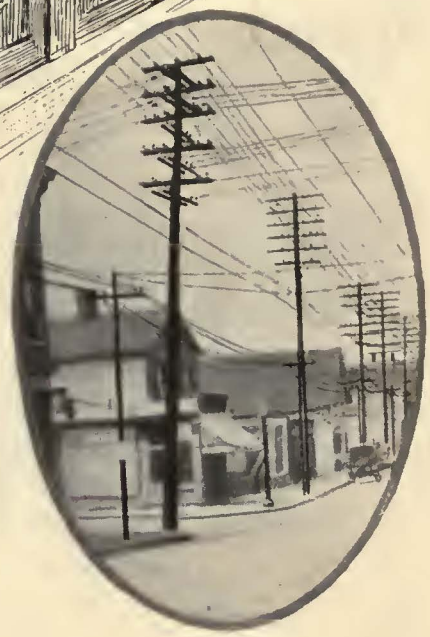
WHAT MAKES A CAR MODERN

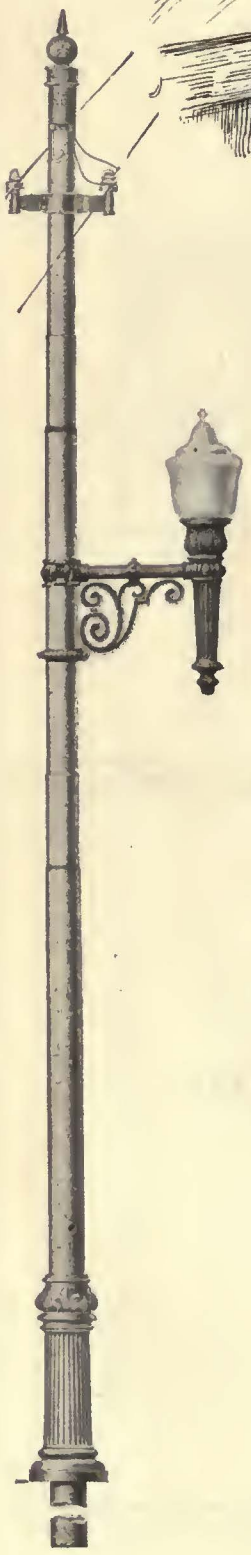


NP

MODERN brakes contribute to safety but they are only part of the ultimate safety requirements. Modern motors contribute to running speed but fail to reduce standing time. Cushioned seats contribute to comfort but cannot relieve uncomfortable congestion at the entrances and exists. To be modern, therefore, a car must be equipped to meet all possible requirements in—

SAFETY
SPEED
COMFORT





Secretary to the Secretary's Secretary

REMEMBER the old story of the business so highly organized that everybody had a secretary? Every secretary had a secretary and every secretary's secretary had a secretary.

Ridiculous! Of course. One could do all the work. But what more foolish than cluttering up the streets with three or four useless poles when one will do the job?

Clean up your streets-overhead, with Elreco Tubular Steel Poles!

Handsome in themselves, they permit lighting wires to be strung unobtrusively at the top. With any type of Novalux Lighting Unit mounted, Elreco poles present a clean, trim appearance. A contribution to any thoroughfare. Nor is this all—

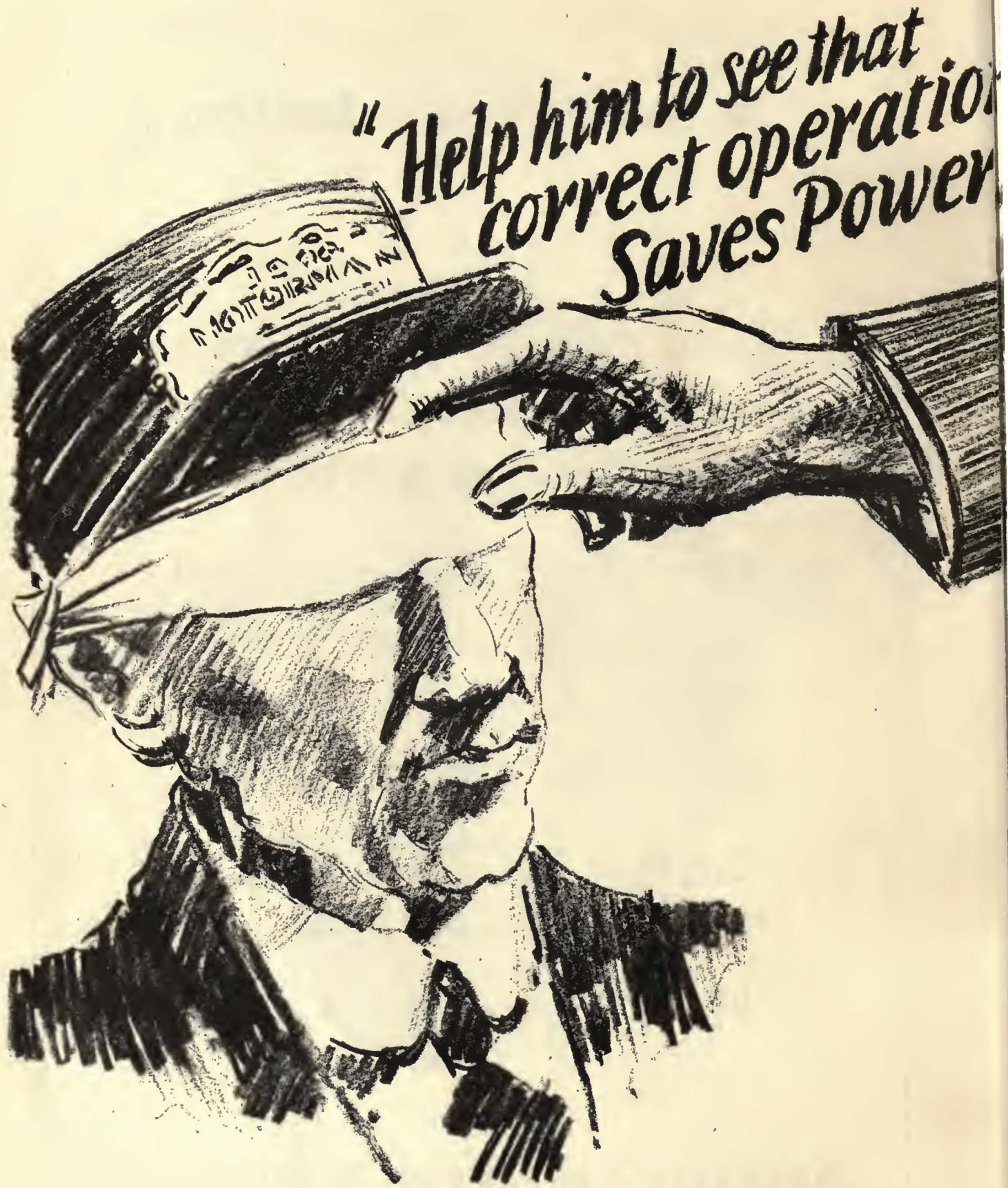
Elreco poles are stronger, lighter in weight, *more adaptable more economical to install and maintain.* Three or four companies using one pole, instead of each buying its own, naturally reduces the cost.

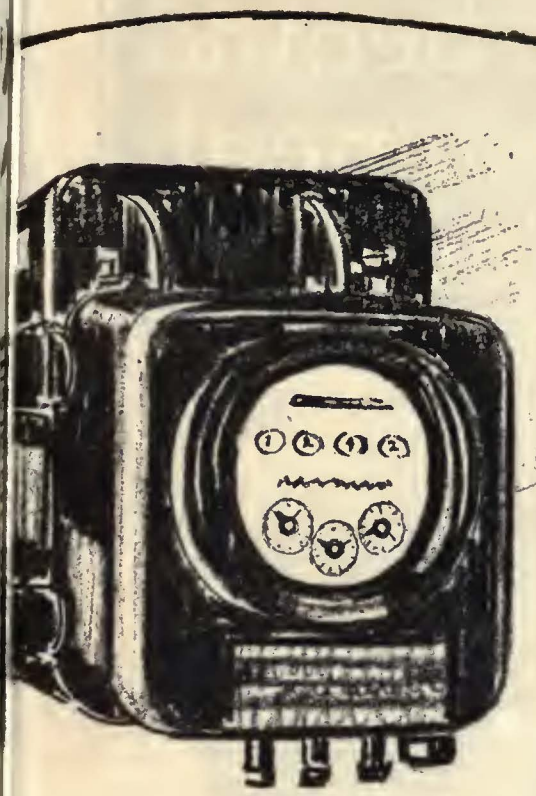
If you would add to your prestige and profit, and it's poles you want, we can help you. Ask us.

The Electric Railway Equipment Co.

Cincinnati, Ohio

New York City: 30 Church Street


"Help him to see that
correct operatio
Saves Power



"Your motormen can save over 11% of your power!"

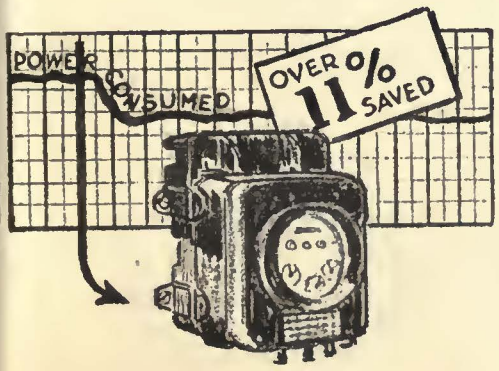
ARE your motormen *continually* trained and stimulated toward correct car operation? The ECONOMY Meter is a welcome tool which assists each man to improve by giving him a measure of his operating efficiency.

It also shows each motorman just how much energy his car uses. Saving energy saves money—and few men are willfully wasteful.

Because the ECONOMY Meter measures what he is trying to save, the motorman can satisfy himself as to the most economical methods of operation. His interest is held and he *does save.*

ECONOMY METERS

To your Mechanical Department the Car Inspection Dial automatically announces the inspections due directly in accordance with the actual work that the equipment has done. No clerical work is necessary.



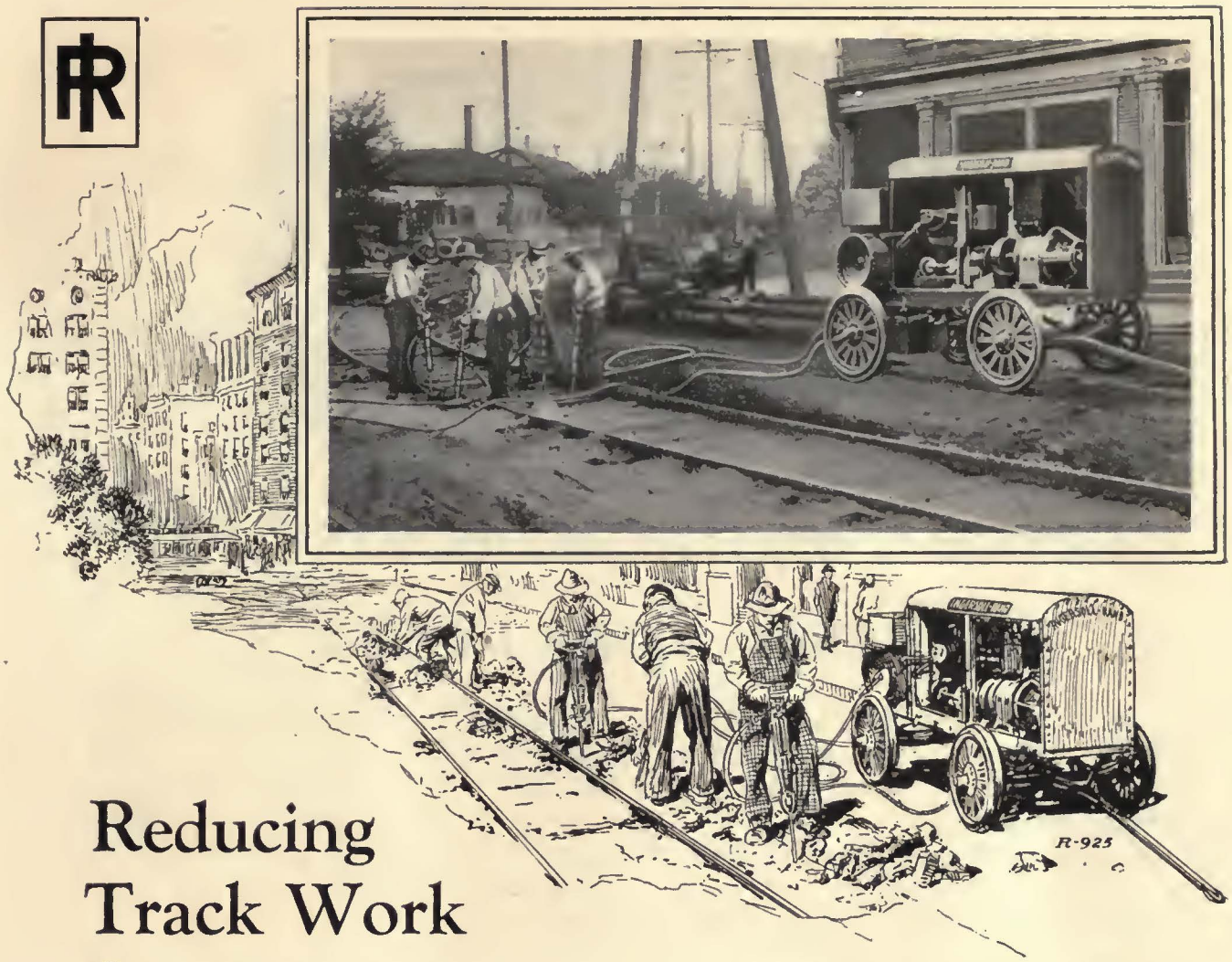
Whether you generate or purchase power, the savings effected through the use of ECONOMY Meters are real savings for the Transportation, Electrical and Mechanical departments.

Install ECONOMY Meters now. You can have two years to pay. Meanwhile the meters will earn over twice their cost. May we tell you more?

ECONOMY ELECTRIC DEVICES COMPANY

37 W. Van Buren St., Chicago

Sangamo Economy Meters — Woods Fare Boxes
Peter Smith Heaters — Bemis Boyerized Truck Specialties
Haskelite and Plymetl



Reducing Track Work Costs

Figure on a basis of I-R cost-reducing machines when making your plans for 1927 track work. There are six different sizes of Ingersoll-Rand Portable Compressors, and a complete range of air tools for electric railway service. Experienced engineers at I-R service stations will help you make your choice and will teach your men the latest time-saving methods of operation.

Cost data received from railway properties all over the country show that where ten men were necessary in the past, two men with I-R Pneumatic Tools can now do the same job in considerably less time—and can do it a great deal better. Ask for complete information.

A new edition of "100 and 1 Ways to Save Money With Portable Compressors" is now available. Write for a free copy. This 140-page book will show you many ways in which I-R Pneumatic Machines will save time and money in your track work.

I-R Labor Aiding Track Tools and Machines include:

Portable Compressors
Gasoline or Electric
Six Sizes
Paving Breakers
Tie Tampers
Rail Drills
Grinders
Riveters
Spike Drivers
Pneumatic Saws
Rock Drills

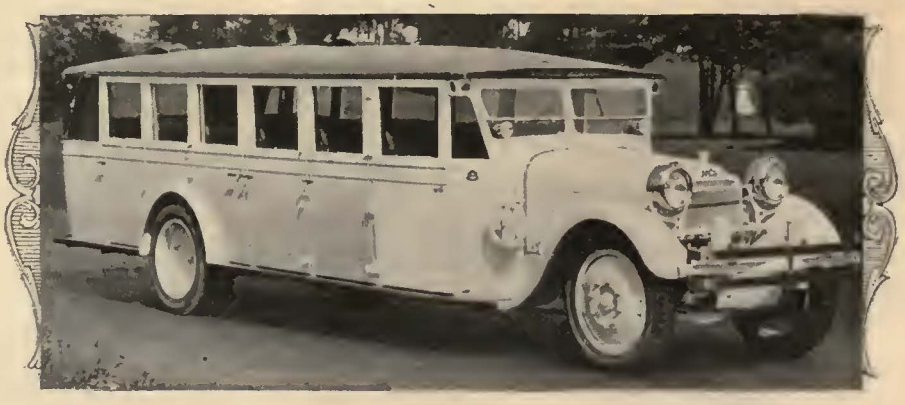
INGERSOLL-RAND COMPANY, 11 Broadway, New York City

Offices in principal cities the world over

For Canada Refer Canadian Ingersoll-Rand Co., Limited,
260 St. James Street, Montreal, Quebec.

238-PT

Ingersoll-Rand



Leece-Neville Rounds Out White Excellence

The White Motor Co. was the first maker of motor coaches to adopt Leece-Neville Patented Voltage Regulation as standard equipment.

Their desire to give customers only the best, and to build a motor coach which will give the buyer the greatest possible number of profitable revenue miles, led them to an early recognition of the almost indispensability of this equipment.

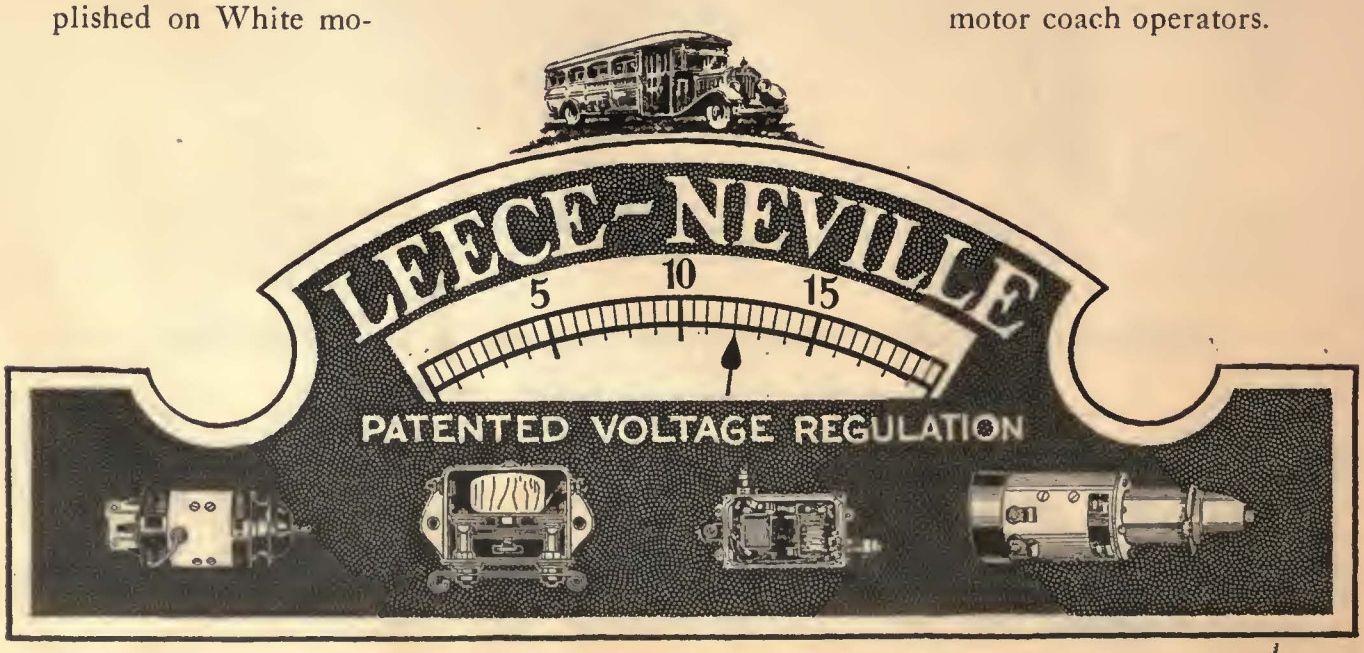
What it has accomplished on White motor coaches is history—history written in countless stories of battery mileages multiplied.

Leece-Neville Patented Voltage Regulation makes overcharge impossible, insures correct charging rate, and keeps lights steady.

You will find it standard on any good Motor Coach.

There is a constantly increasing demand for Leece-Neville electrical equipment from motor coach operators.

The Leece-Neville Co.
5353 Hamilton Ave.,
Cleveland, Ohio



Add years—

of maintenance-free life to old track!

Before—

THERMIT

...o the Vanishing Point

JOINTS

REPAIRING

emporizing Program of Patching Over and Over Cause

AS THE chain is no stronger than its weakest link, so also the railway track is no better than its poorest joint. Its life is limited by the life of the joints.

There are many methods used for repairing joints. Most of them are at best but temporary expedients to extend the life of the track a few years longer.

In many cases the method is to open up the track around the joint, take off the plates, turn them upside down, then weld them on again. But these plates were never designed for this. Furthermore there is always a gap left between rail ends and the receiving rail cannot be raised without expensive blacksmithing of the bars.

No matter how you do the job, the cost of opening up the track will be the same. When you have gone to this expense, why not do the right thing, the permanent thing, the most economical thing in the long run, namely—Thermit weld those old joints.

A Consistent Program of Thermit Welding Brings

ELIMINA

JOINTS

nstantly Increasing Track Maintenance Costs

REMEMBER—proper repair of old joints will postpone rebuilding miles of track for many years.

Wherever the rail itself has substantial life left in it, the joints can be eliminated and the track made good for years to come.

Isn't it worth a little more per mile to put existing track in A-1 condition for the smooth and quiet operation of cars? This is just as important as building new track.

Thermit welding does away with plates and bolts. It ends the need for rail bonds. In short, it makes a smooth, solid, unbroken connection where rail ends come together—a continuous piece of rail for miles and miles. It does not work loose. There's no more unsightly paving trouble around the spots where Thermit welds have taken the place of joints. There's no gap or break for wheels to jump, and therefore no further cupping or pounding to worry over.

Maintenance Costs Almost to the Vanishing Poi

NG JOINTS

After

These roads have done it!

Above we show a typical result of Thermit Welding an old joint. It happens to be in Fort Wayne, Ind., where hundreds of cupped joints like that shown on the first page have been eliminated by Thermit Welding.

At Park Row, New York City, the joints were Thermit Welded where the condition of the track under the heaviest kind of traffic had become apparently hopeless. Yet after Thermit-welding they got *eight more years of satisfactory service.*

In Pittsburgh, Milwaukee, San Antonio and many other cities the life of old track has been extended many years beyond what anyone dared hope for, by eliminating the joints with Thermit welds.

Ask to have our engineers inspect your track. Their report and estimate will interest you.

METAL & THERMIT CORPORATION

120 Broadway, New York, N. Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

"I think Cincinn

ati cars are fine"

"They stand up just as well as heavier cars. We operate 100% one-man service in the City of Dayton and we know that we can handle just as many people with Cincinnati one-man cars. . . . as with any car operated by two men. Our accident record is improving every year.

T. E. Howell, *General Manager*,
The City Railway Company, Dayton, O."

Enthusiastic approval has been voiced both by the operators and the riding public, wherever Cincinnati Lightweight NEW Cars have been placed in service.

The expressions quoted above are especially significant because they indicate two things.

First that BALANCED DESIGN *does* produce cars which are accurately fitted to the particular needs of the community they will serve.

Second that modern lightweight rolling stock, when built the way Cincinnati builds it, can easily handle the same or a greater volume of traffic, thus preserving *to the full* savings which it effects through lower power costs and one-man operation.

We will gladly discuss the details of this important subject with any interested electric railway executive.

CINCINNATI CAR COMPANY
CINCINNATI, OHIO

CINCINNATI *New* CARS

A step ahead of the modern trend

HASKELITE and help make

Facts and figures compiled by Charles Gordon, Editor of the "Electric Railway Journal" demonstrate conclusively the increase in revenue and the decrease in operating costs actually experienced by electric railway companies as a result of adopting modern light weight cars.

Increases in revenue running up to 30% and more are found on individual properties and there is ample evidence of the ability of modernized rail equipment to meet the competition of buses and private automobiles.

An average saving of 22.5% in operating costs was made on 20 roads with approximately 50% of their equipment modernized. A saving of 40.2% was made on 5 roads with 100% modern equipment.

PLYWOOD
HASKELITE
PLYMETL

Car modernization produced a saving in every one of the five main subdivisions of operating costs. And in every one of these subdivisions the saving is greater for the roads with 100% new equipment than for those averaging 50% modern cars.

These figures are so convincing that every electric railway operator can well afford to give them careful study.

Type of HASKELITE and PLYMETL and its Application in the Car.	Replaces	No. Sq. Ft.	Lbs. Wt. Saved.	Annual Saving in Oper. Cost at 6c. per Lb.
½" HASKELITE Sub-Floor	½" Fir	240	200	$12.00
⅛" HASKELITE Vestibule Facing	⅛" Cherry	50	36	2.16
¼" HASKELITE Truss Plank	¼" Poplar	50	18	.90
⅛" HASKELITE Side Lining	⅛" Cherry	60	23	1.08
⅛" HASKELITE Corner Panel	⅛" Cherry	17	37	1.38
⅛" HASKELITE Bulkhead Finish	⅛" Cherry	27	113	2.22
⅛" HASKELITE Roofing	¾" Poplar Boards T&G	270	65	6.78
⅛" HASKELITE Headlining	¾" Composition Board	270	20	3.90
⅛" HASKELITE Hood	¾" Poplar Boards	96	...	1.20
⅛" HASKELITE Seat Back		3		.....
⅛" HASKELITE		...	527	$31.62
Total saving through use of HASKELITE				
¼" PLYMETL Letter Bd. (1 Face Metal)	No. 16 B&S Sheet Steel	50	60	3.60
PLYMETL Girder Plate	No. 12 B&S Steel Plate	150	300	18.00
PLYMETL Dash (1 Face Metal)	No. 16 B&S Sheet Steel	34	40	2.40
PLYMETL Inside Vestibule Lining		36	8	.48
Total saving through use of PLYMETL	No. 20 B&S Sheet Steel	...	408	$24.48
Total saving through use of HASKELITE and PLYMETL		...	935	$56.10

The most conservative estimate of the savings resulting from lightening the car bodies is the accepted figure of 6 cents annually per pound of weight. The total saving on the HASKELITE-PLYMETL car is 935 pounds.

935 lbs. at $0.06 totals $56.10 annually

Are You Saving— or Losing—this much?

PLYMETL modern cars Pay

HASKELITE and PLYMETL, when used in the car body, help make modern equipment pay both because they attract riders and because they offer minimum weight combined with maximum strength, rigidity and resistance to impact.

The noteworthy features of attractiveness in a HASKELITE-PLYMETL car are (1) the beautiful exterior made possible by the smooth-as-glass surface of the PLYMETL side panels, (2) the low step height resulting from the thin HASKELITE floor, (3) the de-luxe interior effect obtainable with HASKELITE natural wood linings and headlinings and (4) the ample head room made possible by HASKELITE roofs.

The saving in weight may run as high as 20 lbs. per unit of seating capacity. That's a big advantage in reducing power consumption wear and tear on the track, and wear on the car itself. HASKELITE roofs and PLYMETL side panels withstand tremendous blows without failure and in case of emergencies, repairs are made simply and quickly.

The best evidence that an investment in HASKELITE and PLYMETL is a profitable one is the fact that leading builders and operators throughout the country are specifying these structural plywood products in increasing quantity every year.

Let us send you a list of users and a blue print booklet showing the many applications to car and bus construction.

PLYWOOD
HASKELITE
PLYMETL

One of the Grand Rapids cars utilizing HASKELITE roofs and interior linings and PLYMETL side panels.

HASKELITE MANUFACTURING CORPORATION

133 West Washington Street, Chicago

RAILWAY REPRESENTATIVES:

Economy Electric Devices Co., 37 W. Van Buren St., Chicago
Grayson Bros., 600 La Salle Bldg., St. Louis, Mo.
George E. Watts, 1523 Candler Bldg., Atlanta, Ga.
Railway & Power Engineering Corp., Toronto, Ont., Can.

ERJ3-10Gray


NEW YORK HERALD TRIBUNE, THURSDAY, JAN

Comment in Wall Street

Seminole Production Reaches New High

Comfortable Trolleys Prove Successful

Merger Opposition Becomes Customary

Cancellations to Cut Mexican Oil Output

Gasoline Price Raised

Money and Credit

Market Averages

Capital is interested in these figures

TWO MAIN FACTORS—management and the balance sheet—in the electric railway industry as in any other—determine the extent to which financial support can be expected. And progressive managements realize that modern equipment helps to win the confidence of the investing public.

Modernization programs—Replacements with new light-weight modern cars of heavy, obsolete equipment, are resulting in increased revenue which attract the attention of the financial world.

Wall Street measures success in terms of increased revenue and decreased operating expenses. Grand Rapids, with its 27 new, modern, Quality St. Louis cars has during its first six months since modernization gained 2.51% in revenue and reduced expenses $45,170. Wall Street is quick to say, "Comfortable trolleys prove successful."

Capital is interested in such figures!

And Grand Rapids is but an index finger pointing to the financial support you, too, may expect when you follow through on a program of progressive modernization.

built by

St. Louis Car Co.

Quality Cars

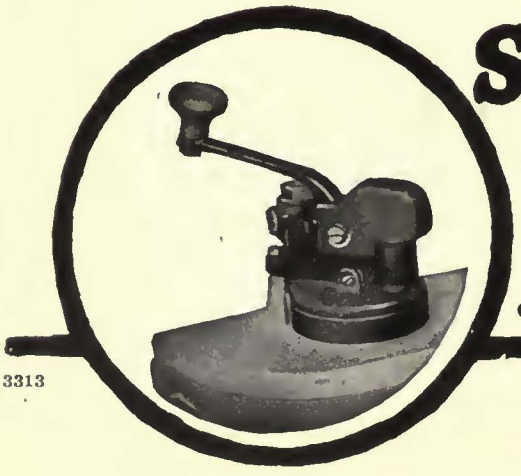
Atlanta is Modernized with Safety Cars

THE Georgia Power Company, operating within the city of Atlanta and environs, has, by its deliberate steps in Safety Car installation, taken its place among the leading traction properties of the country.

Over one hundred Safety Cars are now serving Atlanta and future prospects of an even more intensive service are brightened by the fact that a process of modernizing old equipment with Safety Car Devices is steadily being effected.

The better service, through Safety Car installation in Atlanta, has stimulated public satisfaction, which means increased patronage, and in the end a substantial economic gain.

We make the equipment which makes the Safety Car.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
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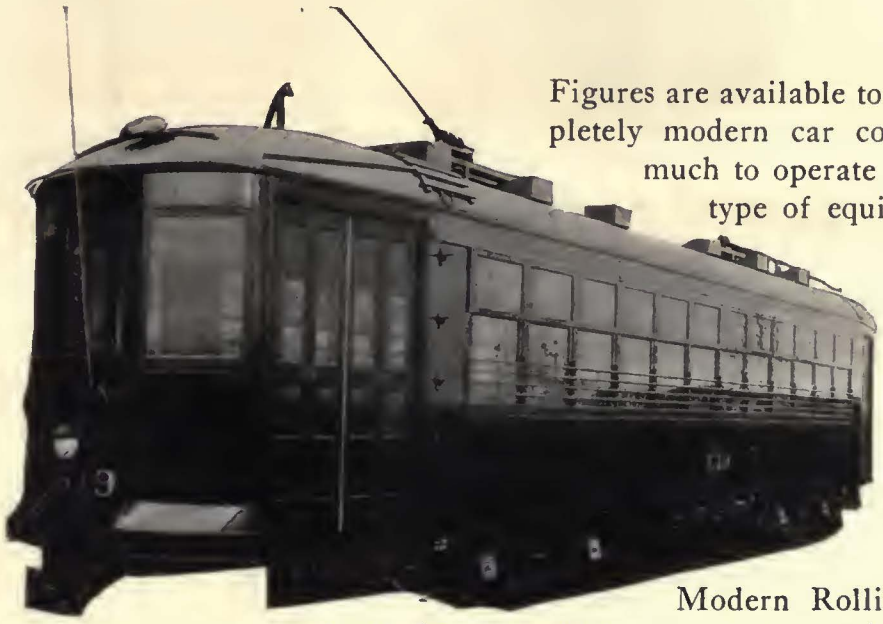
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

3313

Cheaper to Buy New *than Rebuild Old*



Figures are available to show that the completely modern car costs only 77.5% as much to operate as the older, heavy type of equipment.

Modern Rolling Stock pays for itself. Figures which cannot be ignored, have been obtained which prove it. More inviting in appearance, more comfortable to ride in, making faster trips and shorter stops; the modern car creates increased patronage and reduces the competition of the private automobile.

Lighter and faster, it operates at low cost, and entails reduced maintenance expense.

Revenues are thus increased by larger receipts and by lessened expense. The combination has been shown on properties using new cars built by this company, to be effective in wiping out the cost of the new equipment in a very few years.

Cummings Car and Coach Co.

Successors to McGuire-Cummings Mfg. Co.

Light Weight City and
Interurban Cars
Single and Double Trucks

111 W. Monroe Street
Chicago, Illinois

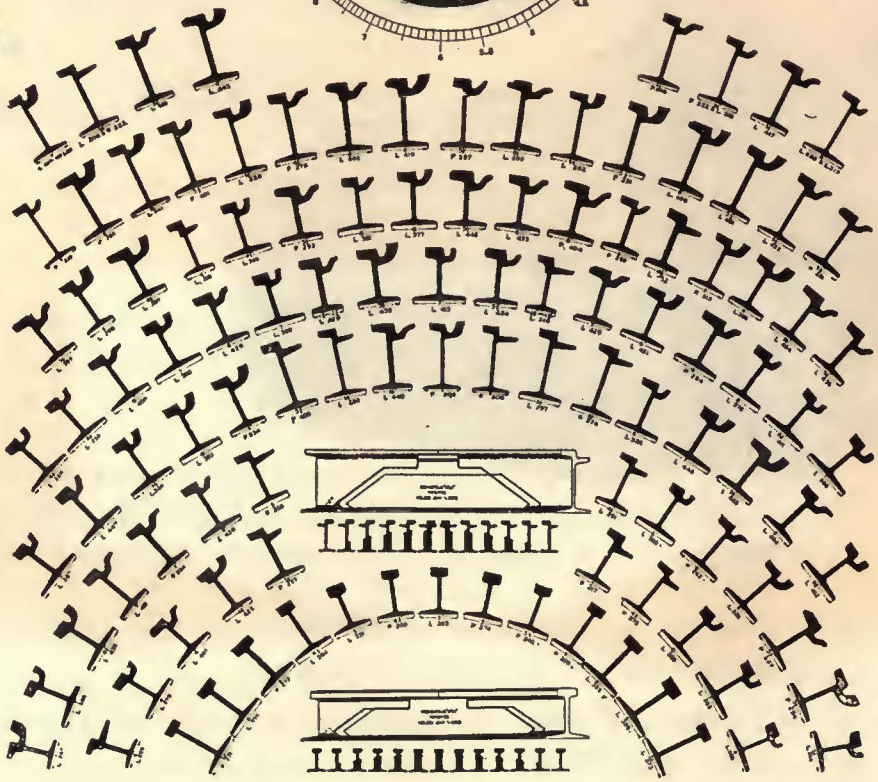
and—

the Cummings Gas-Electric Motor Coach

ROLLER-SMITH Bond Testers for ANY rail-head, EVERY rail-head

Bar in place on "T" Rail showing Saw Blade Contact

Bar in place on "Girder" Rail showing Saw Blade Contact



(Courtesy Indianapolis Switch & Frog Co.)

Practical and efficient bar contacts

Equipped with saw-tooth contacts which "bite" into any rail-head, the ROLLER-SMITH Bond Tester makes short and easy work of this important maintenance problem. The two types of contacts supplied are illustrated herewith.

ROLLER-SMITH Bond Testers are small, compact, light, and simple to operate and direct reading in units of feet of rail. One man can handle this equipment with ease.

Send for Bulletin G-200

"Over thirty years' experience is back of ROLLER-SMITH"

ROLLER-SMITH COMPANY

Electrical Measuring and Protective Apparatus

Main Office: 2140 Woolworth Bldg. NEW YORK

Works: Bethlehem, Penna.

Offices in principal cities in U. S. A. and Canada.

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ROLLER-SMITH COMPANY, 2140 BROADWAY, NEW YORK CITY

GENTLEMEN:

Please send me ROLLER-SMITH Bulletin G-200.

Name..... Position.....

Company..... Address.....

City..... State.....

Clark Street, Chicago, Between Randolph and Washington, 1887.

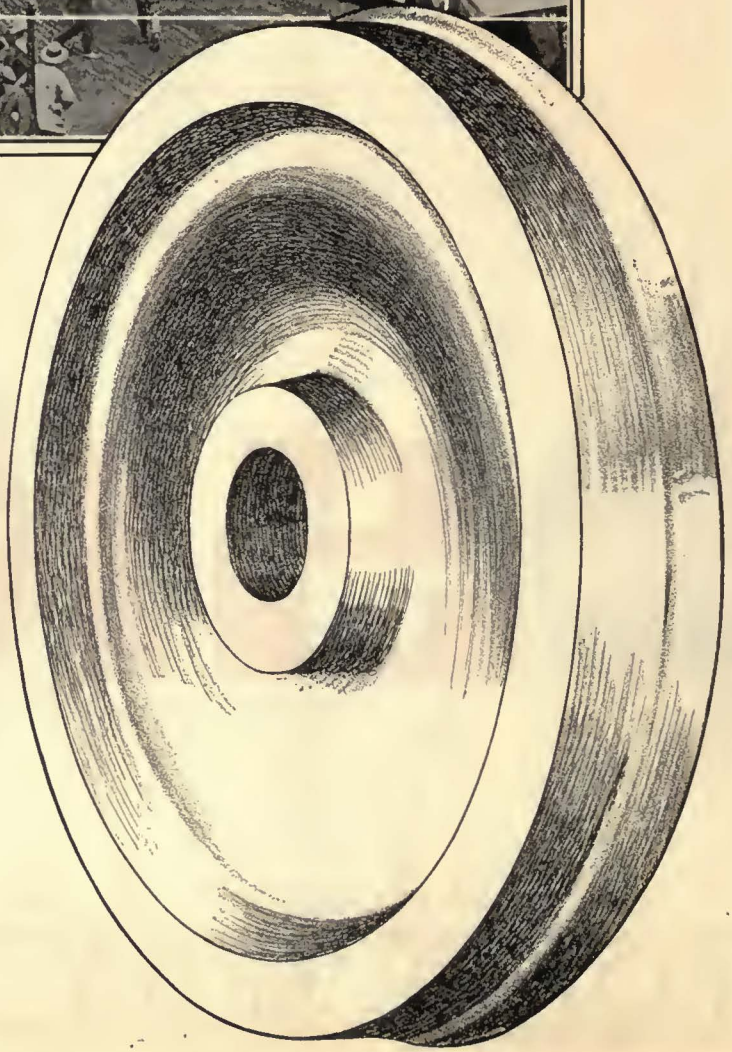
Compare This Scene With That of Today!

The calm, leisurely days of a few decades ago! ... No unbroken procession of automobiles, no thundering motor trucks, no hurrying dashing crowds.

Contrast this scene with that of today: Peak periods, rush hours, stringent schedules; quick starting, sudden stopping, frequent recurrence of emergencies.

Yes, traffic conditions have changed ... and the Gary Wrought Steel Wheel has kept pace with the change.

Our wheel engineers are at your command.



Illinois Steel Company

General Offices:
208 South La Salle Street
Chicago, Illinois

Maintaining *the* Standard

this must be the constant concern
of the successful merchant
especially when his "stock-in-trade" is transportation!

Modernization has set
it remains for progressive

General Electric has materially aided many properties to establish modern maintenance practice and so to promote public good will. The resources of the entire G-E organization are available to assist operators in setting up a consistently profitable standard of service.

WHEN the industry took its cue from the trend of the times and indorsed the idea of modernization, a new standard was established.

With its acceptance, operators have come to realize their concurrent responsibility for maintenance. Half the value of new cars, as revenue producers, lies in their very newness; the other half, in their economy of operation. Both of these must depreciate rapidly if maintenance is not as modern as the equipment itself.

The subject is of grave importance to every executive and operating man in the industry. It concerns very closely the future success of the work which has been so well begun.

GENERAL

the pace
maintenance to keep in step!

Here are examples of G-E railway devices and supply parts which are helping progressive maintenance men to keep costs down and cars running.

The new G-E Hinged-type Controller Finger is substantial and strong. It will not bend or buckle, a characteristic which cannot be over-emphasized. Its design permits alignment of the tip with the segment so as to assure full width contact.

"G-E Line Breaker Equipment with improved LB Controller Handle materially reduces controller maintenance and expedites operation." This report comes from the New Orleans Public Service, Inc.

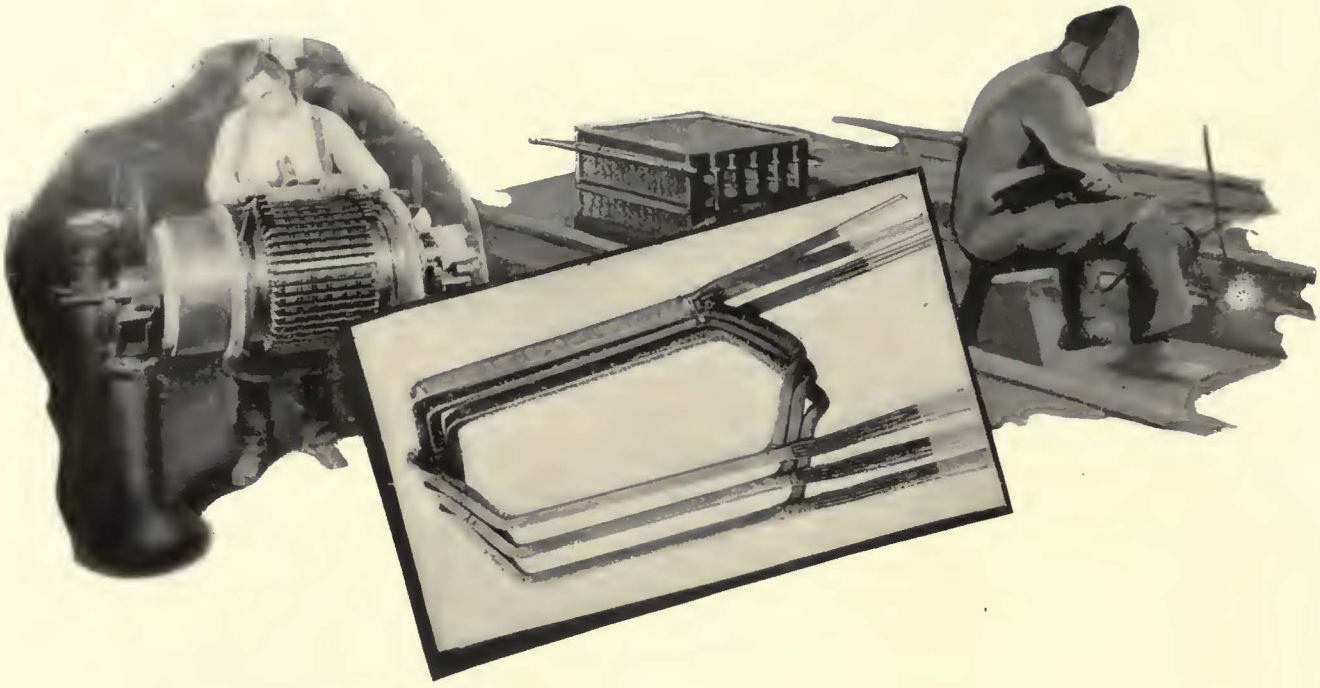
G-E Renewable Carbonway Brush Holders reduce maintenance costs 80% by making it unnecessary to replace the most costly part of the holder.

The General Electric D-C Aluminum Lightning Arrester has an established reputation for providing absolute protection. The new improved G-E arrester has three cells instead of two, yet it occupies no more space.

G-E Armature Coils have the slot portions moulded to exact dimensions. The size of the insulation assures a perfect fit, and so eliminates rubbing and wear.

G-E Automatic Sectionalizing Switches are used on scores of properties as a means of saving feeder copper and improving feeder distribution.

ELECTRIC



Repair
Replace
Rehabilitate—

always with "original quality" parts and equipment!

This is the logic of common sense, backed by long practical experience. Standard G-E products have formed the very basis of success in modernization. G-E Motors, Control and Car Equipment figure in practically all new car specifications. G-E Shop Tools, G-E Track and Line Materials, G-E Power Plant Equipment and Supplies —these are the standard wherever electric railways are operated.

When such vital parts of the system need repair, replacement, or rehabilitation, the logical way is to specify G-E, thus assuring "original quality," original efficiency, and economy.

GENERAL ELECTRIC

Annual Maintenance and Construction Number

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Publishing Company, Inc.

CHARLES GORDON, *Editor*

Volume 69 New York, Saturday, March 19, 1927 *Number* 12

Maintenance from the Car Rider's Viewpoint

WHAT concern of the car rider is the maintenance practice of his street car line? What does he care about the workings of the motors, the trolley, the track? Why worry whether the car that carries him is a light-weight type or a heavy one? Certainly if the rider pays any particular attention to these things he is different from the average man. But when he decides whether to ride the street cars or to buy a new flivver, he considers, even without realizing it, that perhaps the cars are habitually dirty; that there have been frequent delays because of road failures; that the flat wheels have left him tired at the end of a half-hour ride; that the lights flicker so that he cannot read the evening paper. Perhaps his wife tore a new dress because a nail protruded from the car seat, or a spot of oil from a door engine dropped on his new fedora as he left the car on the way to the theater. These are the possibilities to indicate how the car rider is affected by the maintenance of the system.

Let the maintenance man put himself in the position of the man who is to be attracted or repelled. Let him determine if he would ride the cars if he had to pay fare. Then have him go back to his job and try to put his part of the system in such good condition that the average citizen will be pleased to become a regular rider. That is maintenance from the car rider's viewpoint.

Well-maintained rolling stock reflects the company's own estimate of itself.

Smooth, Quiet Operation Results from Good Workmanship

EVERY ONE realizes that quiet running cars are needed and that a high standard of maintenance is necessary to do away with excessive noise. Campaigns for noise reduction are producing good results, and the various maintenance departments show an alertness and eagerness along this line never before manifested.

Better maintenance will permit smoother operation and make it easier to maintain schedules. An open-circuited resistor or a governor out of adjustment may cause jerky acceleration and annoying stops. The passenger usually blames the operator for this, but the real reason is poor maintenance.

The men responsible for the condition of electric railway equipment are really the foundation that must support any campaign for improved equipment. Success in attracting riders and keeping them satisfied depends on the efficiency of the maintenance departments. All other sales effort and publicity to produce increased patronage will fail if cars are dirty and ill-kept, if the track is rough and out of alignment, or if trolley wire breaks and wheels off the wire cause annoying interruptions to service.

Avoid the folly of the broken trolley—inspect the overhead before it gets under foot.

Care Is Important for the Electrical System

NO PART of an electric railway is more vital than the electrical system. Practically 100 per cent service is an absolute essential. Other parts may fail, causing local delays or inconvenience, but breakdown of the electrical system may easily affect a large territory, so that extraordinary efforts should be and are constantly made to prevent failure.

The generation of power is no longer a matter of direct concern to many railways. Its purchase, frequently from large interconnected systems of such diverse territory that failure of the primary source of power is infrequent, is supplanting generation for railway purposes alone. Increased reliability in the substation has been secured by improvements in conversion equipment, particularly for use on 60-cycle systems, while the tendency toward simplification and increased efficiency by use of the mercury arc rectifier is receiving careful consideration.

Development of automatic protective apparatus for use in the substation and on the line has not only reduced the time required for the isolation of overloaded or defective sections and decreased the probability of interruption of other than the affected circuit, but has provided for the automatic restoration of service at the instant that conditions become normal. Remote supervisory control has made it possible for the load dispatcher at a central point to keep in continuous touch with the entire system and to perform necessary switching operations in distant unattended stations with greater facility and certainty than was formerly possible with operators at each place.

The transmission, distribution and trolley contact lines have also received consideration. Insulating materials are constantly being improved, and the results of intensive research are being applied to the insulation of cables for high voltages. The trolley wire material, its manufacture and use are all being carefully studied in the desire to secure a more perfect electrical system.

Unfortunately not all electric railways have modern equipment throughout, though the electrical system may include some or all of the features previously mentioned. In all cases, however, there are two requisites for satisfactory service, namely, thorough inspection and

judicious maintenance. Good construction alone is not enough. There must be periodic and thorough inspection to eliminate possible sources of delay before a breakdown actually occurs. In many instances inspection must be supplemented by tests, to determine conditions accurately. The frequency with which inspection and tests are necessary varies for different parts of the system. Some require daily attention, others need it less frequently; but regularity is essential.

Incoming material should be closely watched so that its acceptability and quality are known before installation. The scrap pile cannot be overlooked for ideas, as an inspection of worn-out parts often points the way to improvements.

The importance of thorough inspection combined with judicious maintenance cannot be overestimated. Worn materials must be replaced before failure, but economy dictates the necessity of getting all possible wear before replacement. To secure a proper balance between these two conflicting requirements makes necessary the use of good judgment all along the line, by the superintendent, by the inspector and by the foreman and workmen directly responsible for the maintenance of the system.

The repair job that is "cheap" is not the least expensive in the long run.

Preventive Maintenance Is Better than Repairs After Failure

MAINTENANCE of the highest type includes cars well painted, which are kept immaculately clean, with no loose parts to cause disagreeable noises, and lubricated so that smooth running results. For a short period such maintenance will cost more per car-mile than slipshod work, but in the long run, considering both maintenance and depreciation of the equipment, it will be the cheaper. From the revenue viewpoint the better maintained car certainly will attract more riders and the increased earning power will more than pay for the high standard of maintenance.

Most car maintenance work can be classified under five general headings. These are (1) work needed to keep the car clean, attractive and noiseless; (2) inspection and adjustment; (3) repairs and replacements of worn parts to anticipate and forestall failure; (4) repair of failures; (5) repairs to equipment damaged in operation.

The far-reaching influence of the first class of maintenance, that necessary to keep the equipment attractive, is often overlooked. Many master mechanics know that when it appears advisable to reduce maintenance expense, this class of work is the first one in the budget to be cut, as officials consider that the cars will still operate satisfactorily even though their appearance is not of the high class desired.

The items of car cleaning, painting and lubrication represent a relatively small part of maintenance costs and the savings from neglecting any of these will be comparatively small. It certainly does not pay to cut down expenditures for these three items. In analyzing average figures for several large railway systems, it was found that car cleaning constitutes approximately 15 per cent of the total maintenance cost. Car painting, done on a yearly basis, was approximately 12 per cent of the total and the cost of both labor and material for lubrication was less than 3 per cent of the total. The systems included in the analysis pride themselves particularly on having attractive cars, but still the total expenditure for the three items enumerated is less than one-third of total maintenance cost.

Why give the passenger a soft seat and trust him to a rough motorman?

Cutting Costs at the Source

NO PROGRAM of maintenance-cost reduction can be fully or even largely successful unless the co-operation of the working force can be secured. This co-operation is necessary for conservation of materials, and even more for conservation of time. It involves two elements; desire to keep down maintenance costs, and knowledge of the equipment and its use far beyond the range of the particular job. It appears therefore that here is a problem of management which for its solution involves education. First comes education in loyalty and co-operation; on this a superstructure of information can be reared.

Maintenance costs can be most effectively minimized by careful, that is, intelligent, handling of equipment. This is especially needed, for example, with the modern, light-weight, ventilated motor. A manufacturer's expert, called in for consultation in connection with an epidemic of motor failures, soon correctly diagnosed the trouble as due to frequent and unnecessary reversal of motors in braking. A campaign of education stopped the trouble. Similarly, motormen sometimes "fan" the control so as to "inch the car along" when following another car or other vehicle.

These illustrations suggest but one of many ways in which maintenance can be made to approach the irreducible minimum, that is the amount which is involved in unpreventable wear-and-tear. Then in the actual maintenance work there are other opportunities. First, because most obvious, is elimination of waste in the use of materials. Reclamation of worn equipment and other parts is responsible for large economies and has still further possibilities; always, however, understanding that repair work can be carried too far. To a limited extent also there is actual loss or misuse of material; this can be obviated with a little care.

Important as materials conservation is, however, time conservation is still more important. Labor loss is the more subtle, more difficult to discern and measure—and yet labor is the largest part of maintenance cost. Good supervision will control this loss to some extent, but without the will to save and knowledge of how to do it the worker will waste time, inadvertently or otherwise.

No magic formula can be invoked. But an overwhelming majority of electric railway workers want to help the management cut maintenance costs. They positively will welcome information and suggestions. They want to be taken into partnership in performing this task of management. Much can be done along the line of education through departmental conferences, and where a railway has a comprehensive educational and training program in operation, cutting maintenance costs may well be one objective in laying out the courses. Competition is also an incentive; such, for example, as is furnished by the increasingly popular interchange of maintenance cost data among properties. The first requisite in all of this, however, is a conviction on the

part of somebody that the worker is the ultimate source of considerable maintenance cost, hence offers an opportunity for stopping certain leaks at their source.

Paint your rolling stock or you won't need any rolling stock to paint.

Paint Artistically If Possible, but Paint Anyway!

SIR JOSHUA REYNOLDS' famous remark to one of his questioners that he mixed his paint with brains is one that the electric railways may well ponder. Many of them are doing this very thing, but some of them are not. Ordinary pigments include, among others, umbers, siennas, ochres, chromes, Venetian red, Indian red, Prussian blue, and Vandyke brown, but it is the combination of colors that counts. Thus it may seem a long jump from Pliny explaining the term "catagrapha" and Epictetus decorating a vase to the modern car painter, but to both of them the vehicle is still the liquid in which the particles of the base are held in suspension. Age may stale only slightly the infinite variety of the subject of the master, but age and abrasions do detract from the work of the master car painter. The true artist may wince at a combination of yellow and bright red, but these colors make for visibility.

The slatternly-looking vehicle certainly has no place in the present scheme of things. And in eradicating it, paint can be made to play an important part. This is so because the modern methods of painting have made it possible. Isn't it significant that on one railway system the cost of repainting a double-truck car at the present time is $69 with labor at 58 cents an hour —a cost considerably lower than that of 1913, although labor and materials doubled in cost meanwhile? Isn't it also significant that on another system, by improved methods, the number of revenue cars painted annually has been increased from 34 per cent of the total operated in 1920 to 82 per cent in 1925, while the man-hours required for painting a 40-ft. double-truck car have been cut from 340 in 1920, with hand labor, to 90.9 in 1925 with spray and hand labor?

The answer, it seems, is not in the economy itself, but in the opportunity which that economy affords for more work of the same kind to be done at the same gross expenditure. But no matter what the cost, it is the color combination that counts. And there again the advice of Sir Joshua holds good. The tangerine that would do in one place might not do at all in another. Of course, the taste of the public cannot be trusted implicitly, but the railways in Atlanta and Kansas City appear to have fared well by permitting their public to express its ideas about the matter. The members of an art institute might not approve of looking upon traffic, made up for a goodly part of street cars, when they are bright red. This would seem to be just as well. The flaming interurban that can be heard a mile away, to put the matter in the vernacular, may be all right when isolated, as it usually is, but a multitude of such cars on a city system would be more than sensitive souls could endure. A maroon that is permitted to become a screaming scarlet would probably not receive acclaim at the hands of the art critics. It is all a matter of taste, durability and cost, and not the least important of these is the esthetic side of the matter. Of that it might be said *fiat lux.*

Interurban Stations Often a Poor Advertisement

WHAT a dismal picture some interurban stations present! A two-by-four shack, open on one side; a dirt floor and rotting sills that struggle to keep the cinder ballast from washing away. Look at the walls. They are the victims of every pocket-knife owner, and what is far worse, those traveling Michelangelos with a flair for the obscene and lewd. Often they are the last resting place for the dodger of a Fourth of July excursion which raises the ire of the commuter when snow is a foot or two deep outside.

Turn the mental film and view a terminal station of the average interurban. Often it is a reconstructed building. It is poorly lighted, furnished with hard benches, its toilets are unsanitary, cuspidors of the iron age adorn its smoking rooms, it is cleaned with a lick and a promise. It is cold in winter and hot in summer. It is a sardonic joke on the company's publicity claims.

Yet the wayside station and the terminal building are the gateways to the utility—the portals to service, that no matter how well advertised or maintained, suffers immeasurably by their unkempt appearance. Poorly maintained way stations are often the point of the wedge for community antagonism. They are monuments of indifference to what the public considers essential to its comfort. Ten minutes in a leaky, unkempt way station has bred many a bitter enemy.

There is a certain likeness between an attractive street car running on bad track and a Rolls-Royce running on a flat.

Many Station Improvements Can Be Made at Little Cost

ON THE other hand, let's square off and look at the whole problem of the possibilities available for interurban station improvement in the light of a few simple maintenance kinks. That the way structure be adequately protected and habitable in all kinds of weather is the first consideration. This and cleanliness can be easily effected by rigid inspection by the track foremen. Next comes a neatly ballasted platform, a little whitewash on the sills, renewal of old sills with ties or bridge timber that ordinarily would be burned or piled in the storage yard. Add a few buckets of paint. Then offer a small prize and half the problem has been solved.

Next it may be observed that flower seeds are cheap and vine seeds are cheaper. A flower box with a few hardy plants or a vine is living publicity of the best sort. Or better still, a small flower plot arranged in an emblematic fashion with a slogan of the road, spelled with flowers. Fix to the wall a neat publicity board, the messages on which are frequently changed, and then by reason of the new ensemble sit back and watch how the wind shifts. No station is so isolated but some adaptation of this scheme is not practical. More often the rule than the exception, the community that is served will furnish the protective measures and, more than likely, some of the maintenance effort necessary to make the portal a show place. With such a decorative setting the station becomes not only the portal to the company's service but a gateway to the community of which every citizen will be proud. Make these silent sentinels monuments to the progressive principles of the industry. Silence is golden if the gold is there.

Daily Cleaning Keeps Cars Bright

No. 1. Ventilator sides and sign windows are wiped carefully with cheesecloth.

No. 2. Applying soap suds and scrubbing cleans all parts.

No. 3. After scrubbing, the cars are rinsed carefully with a special brush and are then squeegeed to remove all streaks.

No. 4. Two types of scrubbing brushes are commonly used. A small furniture brush reaches corners and inaccessible places.

No. 5. Wetting down the exterior of a car is the first operation in the general cleaning.

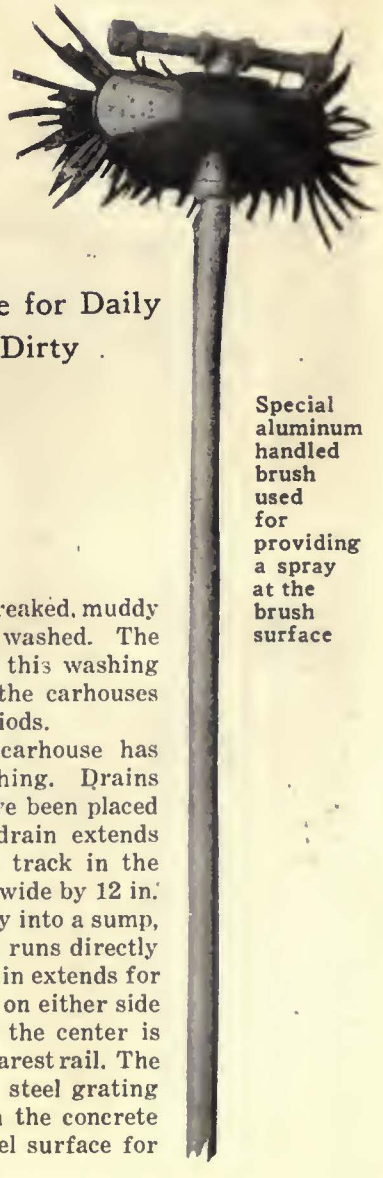
Giving a car its daily washing as it is brought into the carhouse

Clean Cars

Hold Patronage

Methods of the Third Avenue Railway, New York City, Provide for Daily Washing of Car Exteriors When These Become Spotted or Dirty from Traffic or Weather Conditions

By J. S. McWhirter
Superintendent of Equipment Third Avenue Railway System, New York, N. Y.

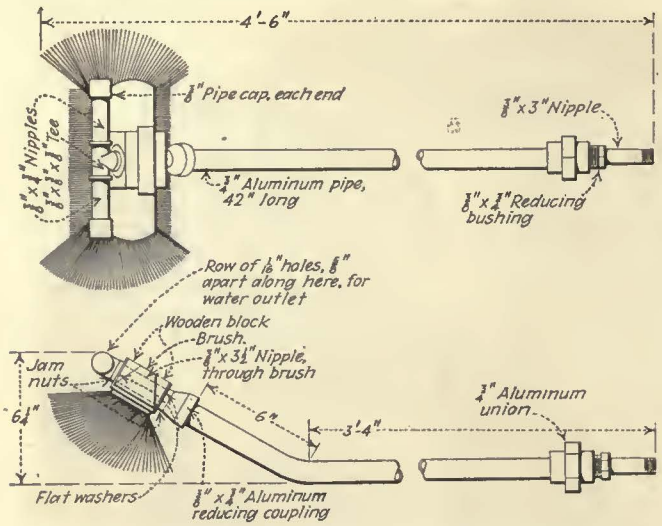


Special aluminum handled brush used for providing a spray at the brush surface

SPECIAL provision has been made so that cars can be cleaned frequently on the lines of the Third Avenue Railway System, New York City, in order to keep the company's rolling stock in the most attractive condition possible and also to prevent deterioration. Much of the track of this company is under elevated railway structures, where, during rainstorms or in the winter, there is dripping from the structure onto the cars. Even when there is no actual rain the windows and sides of the cars get a muddy appearance which is most undesirable. Also, during the summer considerable dirt and iron rust from the structure fall to the roofs of passing cars. Whenever there is a rainstorm, this washes from the roof down on the sides and the windows and produces a streaked appearance.

In order to provide for frequent cleaning, each carhouse has been equipped with a washing system. Cars are washed daily if conditions warrant. When there is a rainstorm or when cars begin returning to the carhouse dirty or with a streaked, muddy appearance all cars are washed. The usual practice is to do this washing as the cars return to the carhouses after the peak-load periods.

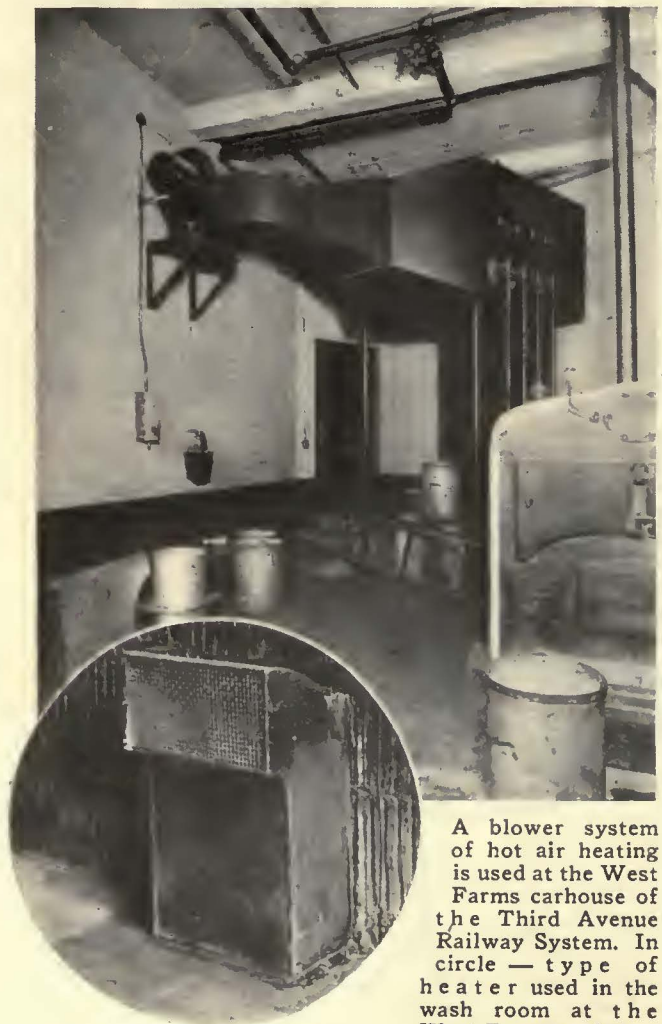
One track at each carhouse has been equipped for washing. Drains and a concrete floor have been placed in this section. The drain extends along each side of the track in the form of a trough 10 in. wide by 12 in. deep and sloped to empty into a sump, from which a 3-in. pipe runs directly into the sewer. The drain extends for a length of about 50 ft. on either side of the wash track and the center is about 2 ft. outside the nearest rail. The drain is covered with a steel grating whose top is flush with the concrete floor, thus giving a level surface for



Construction used for special aluminum handled brush

the men who do the washing as well as making the floor look neat.

At each location are four hose connections to the city water system so that four men can work at the same time. In an accompanying illustration, which shows the washing track at the West Farms carhouse, two of the water connections are alongside the shop wall, since the wash track is the first from the wall. The other two water connections, which come between tracks, are in the floor. These have removable covers for making the hose connection which can be replaced with the hose passing through a hole in the cover. Each hose has a length of 50 ft. so that all parts of the outside of the car can be reached readily. Ordinarily with four men a 43-ft. city car can be washed in 1¼ minutes. Where cars do not come in at such a rapid rate two men can do the washing in about 2½ minutes per car.



A blower system of hot air heating is used at the West Farms carhouse of the Third Avenue Railway System. In circle — type of heater used in the wash room at the West Farms carhouse

A convenient brush for the washing is used which has a special construction with a pipe connection over the top to provide a spray of water at city pressure. The brush handle is made of ¾-in. aluminum pipe and is 42 in. long. The lower end is provided with an aluminum union and a nipple for attachment of the hose. The upper end passes through the brush and then has a T-shaped connection of ⅜-in. aluminum pipe 10 in. long just at the upper face of the brush, with a row of 1/16-in. holes spaced ⅝ in. apart along the side next to the brush. The water is forced out of these holes with considerable pressure and passes along the front side and into the brush. The spray of water itself is very effective for removing dirt and the rubbing of the brush, which also keeps filled with water, will remove any hard particles. The brush used is a No. H-701, manufactured by the Whiting Adams Company, New York, N. Y. An accompanying drawing shows the method of fastening the brush to the handle and the provisions for spraying the water and attaching the hose. The aluminum pipe is very light and lessens the fatigue of the workmen.

With four men washing a car, two start at one vestibule corner and work in opposite directions. The other two start at the diagonally opposite corner and work toward the first two. Each man wears a rubber coat, boots, hat and gloves.

All parts of cars in service are cleaned thoroughly and are scrubbed once each month. The wash room at the West Farms carhouse, which is typical, is provided with three tracks and is 30 ft. wide by about 60 ft. long. The floors are of concrete and are sloped to sumps for drainage, so that the water runs directly into the sewer.

To provide for efficient washing of cars during cold weather, the wash room is heated by a blower system. Air is heated over steam pipes in the boiler room and then blown through ducts. A 16-in. diameter pipe runs from the blower underground and from this risers are provided, each 10 in. x 20 in. The washing room has four outlets. The equipment and methods used are shown in accompanying illustrations.

For the general monthly cleaning the five men assigned to the work at the West Farms carhouse average thirteen or fourteen cars daily. One works inside rubbing off moldings, etc., with cheesecloth, one cleans the vestibules, two scrub and wash the outsides and one uses a squeegee, after rinsing. The brushes with the special aluminum handle and attachment for spraying the water are used advantageously in this general cleaning.

In cleaning the outside of the car all parts are first wet down by means of the aluminum handled brush. Little rubbing is done, as the water is simply sprayed on, the pressure as it comes out of the small openings being sufficient so that all parts of the car can be reached readily. After the exterior has been wet down a soap solution is applied. This solution is made up in advance and is kept in a barrel in one corner of the

General view of the wash room at the West Farms carhouse of the Third Avenue System

wash room. A 14-qt. pail of Amberzo vegetable soap, made by the Hildreth Varnish Company, New York City, is dissolved in a barrel of water. A pint of this solution is used to each 14-qt. pail of water for use on the car bodies. The soap solution is applied to the car body by round car washing brushes with handles of different lengths for reaching various parts conveniently. All of the brushes used are purchased from Whiting Adams, New York City.

Following the application of the soap suds, the exterior is scrubbed thoroughly with a flat floor scrubbing brush for large surfaces and a furniture rubbing brush to fit into the various corners and around moldings, window openings, etc. After the scrubbing, the rinsing is done with the aluminum handled brush, with considerable rubbing to make certain that all soap is removed. An ordinary type of squeegee, such as is commonly used for window washing, completes the outside washing program and prevents streaks while drying. After this the ventilator sash and side windows are wiped carefully with cheesecloth.

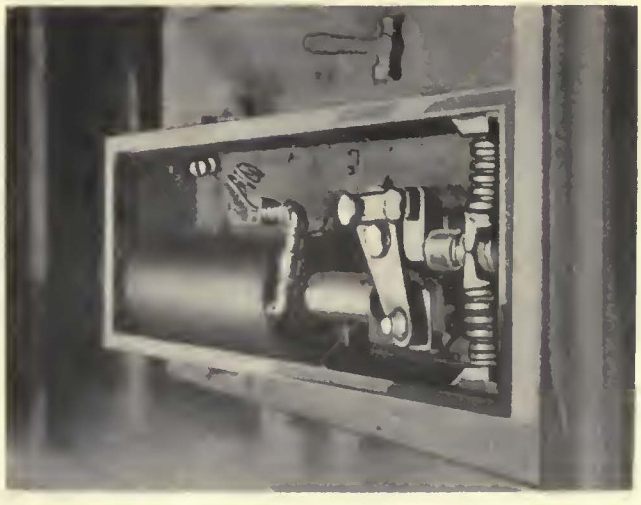
While the exterior of the car is being washed, men are busy inside. Platforms, vestibules, stanchions and similar parts are given the same scrubbing and washing as the exterior. Roofs are also given the same regular scrubbing. For washing the insides of windows of the car body a counter brush is used with plain water. No soap is used inside the car. Moldings, lamps, seats and other interior fittings are wiped with dry cheesecloth. It should be mentioned that cane seats are removed and scrubbed at the time the car goes through the shop on its regular painting schedule, and so the only attention given them during the monthly cleaning is to wipe off carefully and make certain that there is no oil or other material on them which might damage the passengers' clothing and so result in damage suits afterward. The flooring inside the car is flushed out with a hose. In all the interior washing particular care is exercised to make certain that water is not slopped or directed so as to reach any of the electrical apparatus.

This same general plan of washing is carried out at the ten carhouses of the Third Avenue system. The number of men at each varies, due to the differing numbers of cars maintained.

Knoxville Installs Electric Switch of New Type

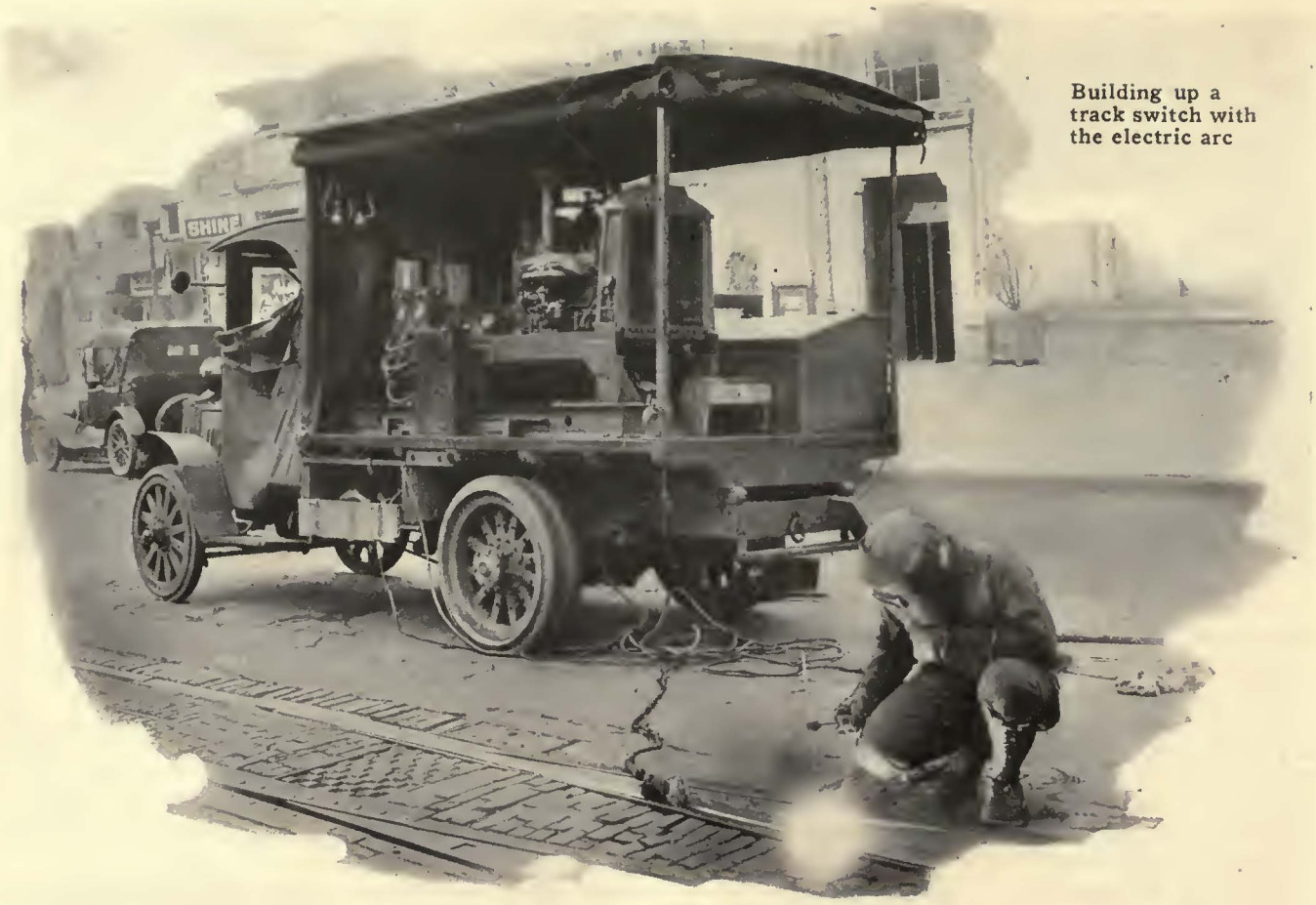
RECENTLY a new electrically operated track switch designed and patented by Charles A. Walker, electrical superintendent, Knoxville Power & Light Company, Knoxville, Tenn., was placed in service in that city. The first unit was constructed in the shops of the company.

As outlined in the patent application, the points of superiority claimed are that the electrical mechanism is contained within the non-magnetic casing, which can be filled with oil. The equipment thus inclosed is placed below the street surface in the usual manner, and the operating levers are connected directly with the switch point.



Mechanism of a new type of electric track switch developed in Nashville, Tenn.

It is claimed that the non-magnetic casing will be non-corrosive as well and the oil filling will prevent trouble due to moisture, either from leakage or from sweating. Suitable connections are made by which the wires are taken from the underground box by conduit to the side of the street, where connection is made with the trolley contacts in a conventional manner.



Building up a track switch with the electric arc

Welding Track Without Car Delays

Tracks May Be Kept in First-Class Condition by Welding with a Moderate Expenditure of Maintenance Funds — This Also Permits Effective Emergency Repairs to Be Made Speedily and Obviates Delays

By Edwin P. Goucher

Engineer of Way and Structures Capital Traction Company, Washington, D. C.

MAINTENANCE and construction work on the lines of the Capital Traction Company, Washington, D. C., is not allowed to interfere with the operation of the cars. Of course at times a delay of two or three minutes cannot be avoided, but a delay of four or five minutes means an investigation and possibly a reprimand to the guilty party. Cars are never rerouted in order to carry on construction work. Rerouting causes annoyance to passengers and perhaps requires a longer time for them to reach their destination. The installation of new track is done at night, after the last scheduled car has passed, and the track must be ready for the first regular car in the morning. If owl service is operated on the line in question the owl car is run in both directions on the adjacent track.

In this age of efficiency and economy it would be difficult to visualize what would result from a complete cessation of all practices and means of welding. This art as applied with present-day methods undoubtedly is saving millions of dollars annually in the maintenance costs for the electric railway industry alone. Not many years ago when a frog became badly worn, or a rail head broke, there was nothing else to do but buy a new frog or cut in a new piece of rail. Present-day welding methods have changed all this. On most properties a frog or switch, before being scrapped and replaced, has been built up with the arc at least once and possibly two or three times.

The Capital Traction Company is a firm believer in the value of welding as a means of reducing operating costs and making emergency repairs to obviate service delays. Three welders are kept busy practically the entire year building up worn frogs, cupped joints, worn guard rails and other miscellaneous work. Practically all of the tracks in the city of Washington are of the underground conduit type. Special work costs from six to ten times as much as similar layouts for the regular surface construction, so any one familiar with the savings effected by making welding repairs on surface track special work may readily understand that

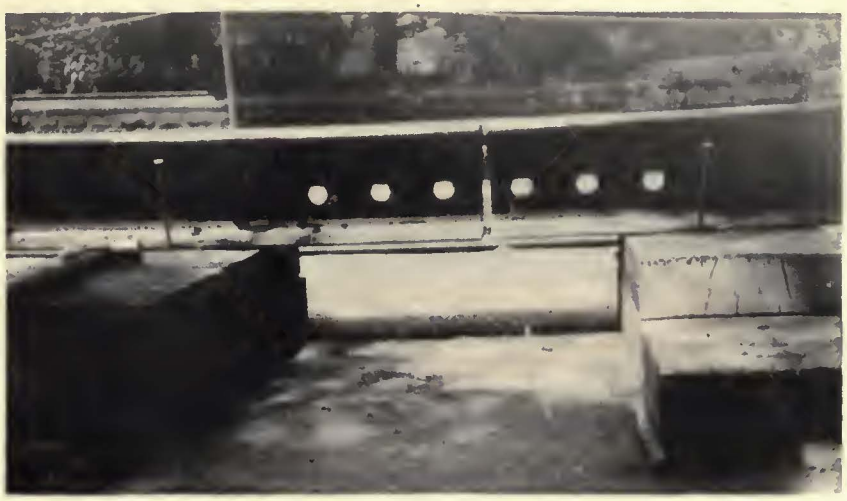
this amount must be very much greater when the repairs are made on the conduit type of track. The saving alone in interest on investments probably more than carries all the costs of the welding equipment and labor expended in making these repairs.

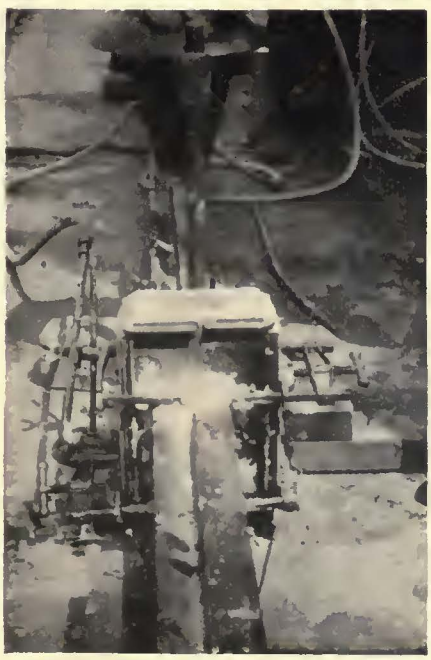
As an example, there is a double-track crossing on the lines of the Capital Traction Company that will be renewed complete this year. This crossing was scheduled for renewal in 1925, but by means of electric arc welding it was possible to hold it over until 1927. This job will cost installed about $21,000 and the interest for that amount for two years at 6 per cent is about $2,500.

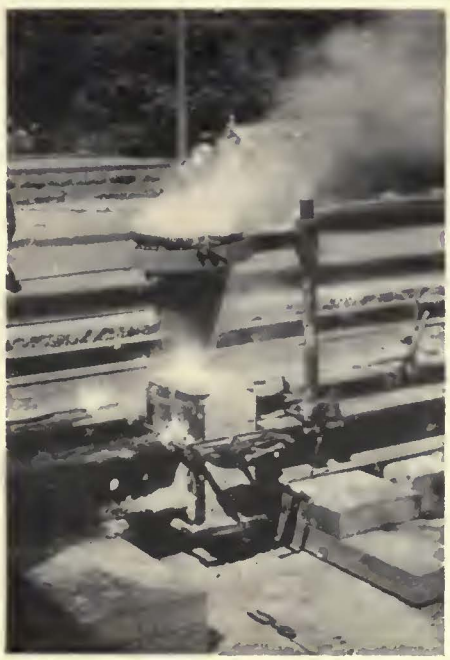
The ever-increasing need for labor and time-saving equipment has resulted in the development of many new machines for various classes of work, and in my opinion one of the most important is the welding outfit mounted on an automobile truck. The old way of towing or hauling the welding machine to the job and back again, leaving the operator and his helper to shift for themselves during the day, is fast becoming a thing of the past. The time wasted while the machine is moved from place to place by the men is too costly, not to say anything about the lost time occasioned while waiting for a truck to move the outfit a mile or two to another job.

Broken rail heads, frogs, etc., are discovered usually by some one in the construction or maintenance forces, but quite often a trainman will report this condition before any one else has noticed it, possibly shortly after the break occurred. Repairs are made immediately if the nature of the break is at all apt to cause a delay to the cars. If of a minor nature, a welder is usually allowed to finish the job on which he is working before leaving for the other location.

Metallic arc welding is used for this class of work on our lines. For ordinary cupped rails, worn guards and manganese plates a high carbon rod is used. Where the break requires a large deposit of metal, such as a broken rail head, a low carbon rod is used to build up the metal to within about $\frac{3}{8}$ in. of the running surface and the harder rod is used to complete the weld. We find this method superior to the use of the high carbon rod throughout the weld, and of course the low carbon rod is not suitable for use where it will be subjected to wear.







Several rail lengths are thermit welded at the side of the track and then are installed as one piece

At top—Rails set up ready for mold boxes.
At left—Mold boxes in position ready for welding 122-lb. A.E.R.E.A. 7-in. trilby rail.
In center—Thermit reaction taking place.
At right—Weld after removal of mold boxes and before it is cleaned up.

The Capital Traction Company has now standardized on thermit joints for new construction. While this method of welding presents no serious difficulty on the average property, to those of us operating the conduit system it is quite a problem. We cannot install portable crossovers wherever we wish and divert traffic to one track, nor can we lay temporary track on which to operate cars.

First and foremost in the minds of all Capital Traction employees is the understanding that the cars must not be delayed. Our livelihood depends on the cars and avoidable delays are inexcusable. We have effectually solved the thermit welding problem by welding four to six rails together outside the track, installing them as one piece and welding the intermediate joints at night between 1 a.m. and 5 a.m. This adds materially to the cost per joint as compared to other methods, but we feel that the increased value of the thermit joint is worth the difference. Thermit is also used in the construction of frogs, crossings, repairing broken switch and frog arms and in making compromise joints.

Cutting, brazing and welding with the oxyacetylene torch is now another large factor in track maintenance. This is probably more true of conduit track maintenance than of surface track, due to the increased use of iron and steel in the conduit type of construction. Each of the Capital Traction welders has a complete gas cutting and welding outfit in addition to the regular arc welding equipment. Frequently the combined use of these two methods results in a considerable saving in time.

When present-day traffic conditions are taken into consideration, the wonder is that any trackwork can be repaired or reconstructed without great expense for labor. This would undoubtedly be the case were the hand methods of past years still in use. But labor-saving tools have been developed and are being used to such an extent that instead of an increase, there actually has been a reduction of about 40 per cent in labor hours expended per foot of track on reconstruction work. The decrease of 40 per cent has been the experience of this company, and when this percentage is applied to present labor rates, we can see an actual saving in labor alone of more than $20,000 per mile of conduit track reconstruction, as compared with similar work before we had labor-saving equipment.

While welding equipment cannot be credited with a substantial part of this saving, it nevertheless plays a very important part in the upkeep and maintenance of the road, and in my opinion is probably responsible for as great a saving in that particular field as are our air compressors, derricks, etc., when used on construction work.

Dynamometers Regulate Tension of Trolley Wire

ON THE Boston Elevated System about 50 per cent of the trolley-wire breaks are due to fatigue, or crystallization. These are caused by the moving up and down of the wire at points of attachment and by vibrations set up in the wire by passing trolley wheels.

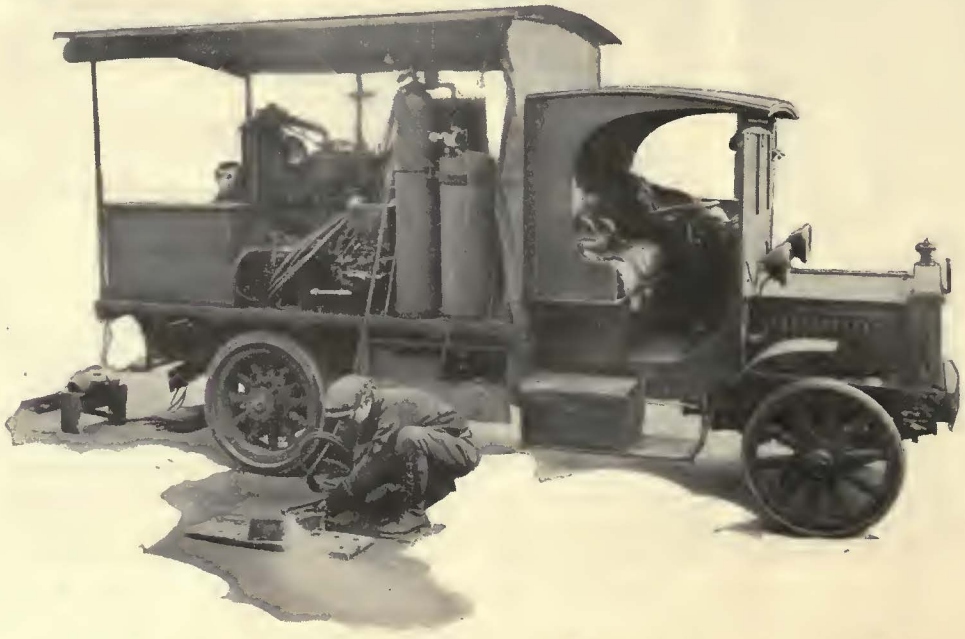
Many more of this class of breaks occur during the months of high temperature than during the low temperature months. For example, in June, July and August, 1926, there were 38 breaks of this nature, and in January, February and December there were nineteen breaks. In winter the wire is tight, due to contraction, and in the summer it is slack, due to expansion. This indicates that the tightness of the trolley wire has much to do with the development of crystallization.

Last September dynamometers were furnished each line maintenance crew, and the trolley wires are now pulled to tensions according to temperature, as follows:

At 0 deg.	2,100 lb.
At 30 deg.	1,800 lb.
At 60 deg.	1,500 lb.
At 90 deg.	1,200 lb.
At 120 deg.	900 lb.

Wire pulled to these tensions will have at zero temperature approximately 3 in. of sag in a 100-ft. section and 7¾ in. sag at 120 deg.

Previous to the use of these instruments the trolley wire was pulled until the men considered it tight, the wire being pulled to the same degree of tightness in winter as in summer, hence wire installed during cold weather was very slack in summer.

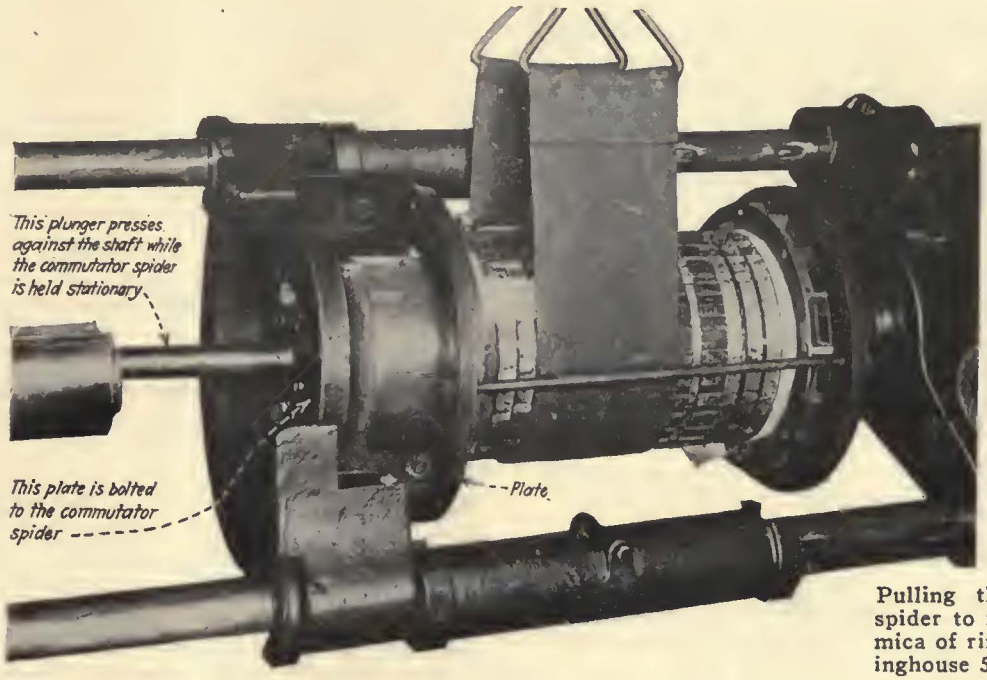


Cutting with the oxyacetylene torch produces savings in track maintenance

Preventing Flashovers

Is an Important Part of

Commutator Maintenance*



Pulling the commutator spider to repair the front mica of ring of the Westinghouse 557-R1 armature

Shellacking Mica V-Rings at Frequent Intervals Produces a Hard, Glossy Coating to Which Dirt and Carbon Dust Will Not Adhere Readily—Creepage Currents Are Decreased with Reduction in Flashovers

By Jesse M. Zimmerman

Renewal Parts Engineer Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

FLASHING over of the current from the commutator bars of railway motor armatures to the front metal V-ring is due largely to the presence of oil and moisture on the insulation. This tends to collect dirt and carbon dust, which mixture acts as a good conductor for creepage currents. Each flashover consumes part of the bond in the insulation as well as carbonizing the oil which may exist in or on the mica V-ring. This will permit an increase in flow of creepage current between the bars which eventually will become a small arc. When this occurs it soon will decrease the dielectric strength of the ring and at some future time ground the commutator.

As "an ounce of prevention is worth a pound of cure," the prevention of grounded commutators and the flow of creepage current on the front mica V-ring is quite as important as methods of repairing grounds. It is good practice to make the surface of the mica V-ring as smooth as possible, so that the dirt and carbon dust will not adhere readily to it.

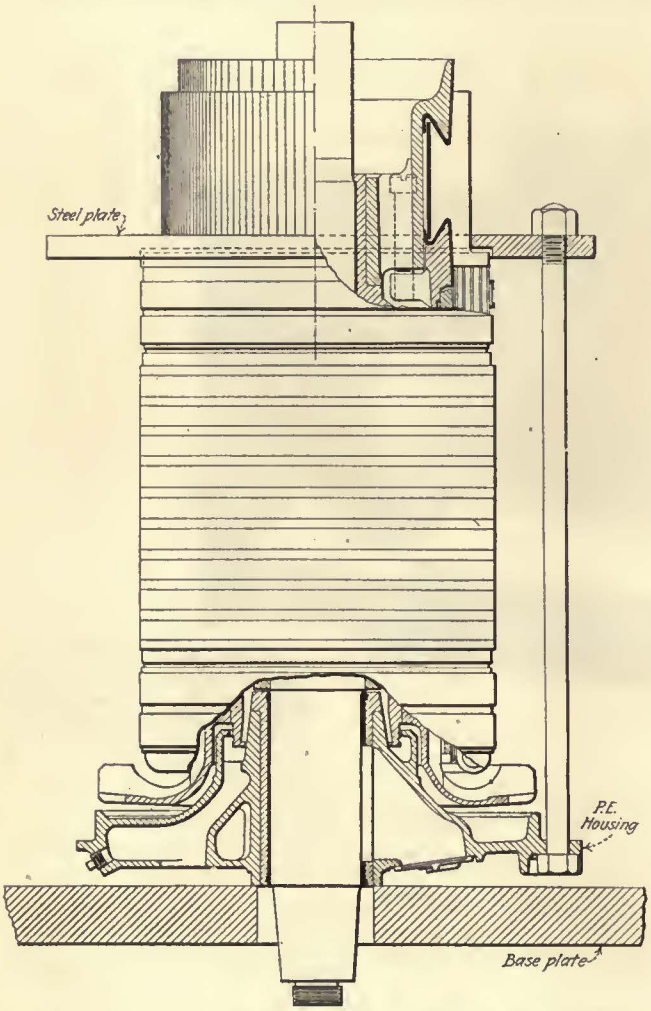
Repairing Pitted Bars

If the front ends of the copper bars are badly pitted they should be machined so that the mica is flush with the copper. It will do no harm to take $\frac{1}{32}$ in. from the bars. The front edge of the commutator face should not come to a sharp corner, but should be rounded off so that it will have a radius of at least $\frac{1}{32}$ in. to $\frac{1}{4}$ in. A sharp corner increases the number of flashovers be-

*This is the seventh of a series of articles on commutators for railway motors. The others were: Choosing Materials for Railway Motor Commutators, published Aug. 21, 1926; Important Considerations in Replacing Commutator Bars, published Oct. 23, 1926; Accurate Machining of the V's of Assembled Commutators Is Essential, published Nov. 20, 1926; Mica V-Rings and Bushings Have Important Functions in Commutators, published Dec. 18, 1926; Methods and Equipment for Efficient Assembling of Commutators, published Jan. 15, 1927, and Soldering of Railway Motor Commutators, published Feb. 19, 1927.

cause the electrical potential tends to build up on sharp edges. When an unbalanced voltage condition occurs in the operation of the motor a flashover from the sharp edge of the commutator face to some metal part of the motor will result. This flashover always leaves a pitted place on this part of the commutator.

The mica V-ring should be cleaned carefully with sandpaper, making sure that no dirt remains on the mica in the corner next to the commutator bars. Dirt



Fixture for holding bars in position when removing the commutator spider. This is for use with armatures similar to Westinghouse 557-R1 and 587-D5

should also be removed from the groove between the front end of the mica V-ring and the metal V-ring.

The front mica V-ring should be brushed, also, with a coat of heavy pure orange shellac and a smooth layer of soft four-ply twine wound on closely, pulling the ends through with a loop to fasten. It is best to place the mica V-ring protection on the commutator before the armature has been dipped and is ready to be placed in the baking oven. This will permit the protection to be baked at the same time. The essential feature is that the V-ring protection be thoroughly hardened before the armature is placed in operation.

This twine should be covered with three coats of shellac, ironing each coat in thoroughly with a hot iron. The first coat should be very thin so that it will penetrate the twine thoroughly. After the shellac has become hard it should be covered with a coat of black glossy baking varnish and baked thoroughly. This will leave a hard, glossy surface which can easily be kept free from dirt, moisture, oil and carbon dust. After hardening of the third coat of shellac some operators use one or more coats of commutator compound. This should cover the front ends of the bars, making a fillet of large radius between them and the mica V-ring and filling the groove between the front end of the mica V-ring and the metal V-ring. A commutator compound should resist oil and moisture as well as withstand flashovers. Some operators have found a satisfactory composition to be plaster of paris, dextrine and shellac, applied directly on the mica V-ring. However, a compound made of an iron oxide preparation gives better results.

In some shops it may not be convenient to bake the armature when applying mica V-ring protection. A good grade of air drying varnish should then be used instead of a baking varnish. The average commutator compound on the market will harden in four or five hours without being baked.

At every regular motor inspection period the mica V-ring protection should be cleaned. This can be done by wiping with a cloth dampened with gasoline. If this is carried out grounded commutators will be decreased.

Methods of Removing Grounds

Commutator grounds are more frequent in the front V than in the rear V. Sometimes it may be necessary only to remove the front mica V-ring, while at other times the commutator may be burned so badly that one or more bars will have to be replaced and the front metal V-ring repaired. Any holes burned in the metal V-ring should be built up by welding and finishing so that the mica ring will have a uniform seat.

Where the front metal is detachable the work of repairing the ground without disturbing the armature winding is very simple. Repair of commutators having the detachable metal V-ring in the rear is slightly more complicated. To replace the front mica V-ring in this type of commutator the commutator spider must be removed. At a glance one would think it necessary to remove the armature leads from the commutator to remove the complete commutator. With an inexpensive fixture this can be done without disturbing the commutator bars or the armature winding, as shown in an accompanying illustration.

A steel plate is made which fits against the front end of the assembled segments. It should have an offset so that the brush face of the commutator segments will hold it in a central position. The plate should have holes the same in number and size and on the same bolt circle as the pinion end housing.

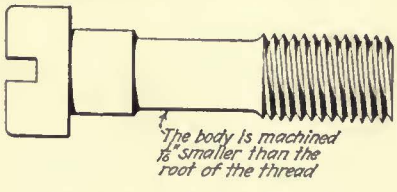
To hold the commutator bars several turns of steel banding wire should be wrapped on a paper in the groove in front of the neck and be soldered in one spot. The pinion end housing can then be assembled on the armature shaft and the armature placed in an upright position. With the steel plate on the front end of the assembled segments bolted to the pinion end housings by means of long bolts, the commutator bolts can be removed and the commutator spider pressed out in a suitable press.

With this fixture it is possible to hold the commutator bars against the rear V-ring, thereby keeping them in position, while taking out the commutator spider. If several commutator bars are to be renewed the armature should be placed in an upright position after the commutator spider has been pulled before the banding wire is cut and the fixture removed. Should it be

necessary only to replace the mica V-ring the fixture and banding wire should not be removed.

When several of the bars are burned badly they should be replaced. A simple method of preparing new bars is to remove the damaged bars, together with an undamaged adjacent bar for a pattern. By clamping the unfinished bar in a vise with the pattern bar it can be trimmed to approximately the outline of the pattern. If the V's have been rough sawed or punched, the amount of filing may be reduced by taking an extra cut with a hacksaw. A new mica strip should be cut to the same size as the unfinished bar and fastened to the copper with a thin coat of heavy pure orange shellac. By clamping the unfinished bar and the pattern in a vise with a mica strip between them, the V's of the new bar can be filed to the same size as the pattern bar. The radius in the V's can be finished with a small rat-tail file and the bars are ready.

After assembling the new bars in the commutator the fixture should be put back on so as to hold the bars in position while the spider is being replaced. The armature leads should not be put in the slots of the new bars until the commutator has been tightened. Long headless stud bolts with a finished body should be screwed into the rear detachable V-ring before pressing the commutator spider onto the armature spider. These studs will serve as guides, accurately locating the bolt holes. After the commutator spider has been pressed on the armature shaft the studs should be replaced by the regular commutator bolts. Next the alignment of the bars should be checked in order to insure good commutation. It is also essential that the commutator be heated to at least 100 deg. C. before the bolts are drawn tight. This will soften the bond in the mica, permitting it to adjust itself to the irregularities of the metal parts and making it possible to obtain a tight commutator. A higher temperature should not be permitted as the armature coil insulation will deteriorate.



Commutator bolt designed to eliminate breakage

Bolt failures often are due to excessive length. The bolt strikes the bottom of the hole before the commutator is tight. The man tightening the commutator, not knowing of this, subjects the bolt to an excessive strain. To make sure that this does not happen, it is advisable to place the detachable steel V-ring in its final position and draw the commutator bolts tight before the commutator is assembled. This will show whether they are too long.

Breakage of commutator bolts can be decreased by machining the body approximately 1/64 in. smaller than the root diameter of the threads. If the body of the bolt is larger than the thread root any twisting effect or expansion will occur at the end of the thread, causing a break at this point. If the body of the bolt is smaller the expansion and twisting effect will be distributed over the entire length of the bolt. The seat of the bolt near the head should be sufficiently large to insure a good contact in the detachable steel V-ring.

Electrically Heated Pots in Babbitt Department

SOME months ago the Pittsburgh Railways reorganized its Homewood shop and concentrated all of the maintenance work there, including all the rebabbitting of bearings. After some study it was decided to install four Westinghouse automatic electrically heated babbitt melting pots of 750 lb. capacity each. These pots were grouped as shown in the accompanying illustration.

Relining an armature bearing in the new babbitting department of the Pittsburgh Railways

The two in the foreground contain armature bearing metal, the two in the rear metal for the journal babbitt. These pots have sufficient capacity to take care of all the bearings needed daily for the Pittsburgh Railways system, which operates approximately 1,250 passenger cars in addition to its miscellaneous equipment.

The automatic feature is convenient, as the danger of under or over heating metal is eliminated. At 6 o'clock in the morning the shop watchman turns on the current and by the time the men arrive for work at 7:30 the babbitt is at correct temperature for use. The automatic feature keeps it at this temperature until quitting time at night.

Under the system previously used two babbitt rooms were maintained. Gas heating was used and six men were employed solely on bearing work. At present two men take care of this department and have made it what the gentleman in the illustration calls "the show place of the shop," as well as a very efficient section.

Route Numbers for Public Service Cars

ALL cars operating in the Essex Division of Public Service Railway, Newark, N. J., henceforth will carry route numbers in addition to other signs indicating destinations. Cars of the Central line are already equipped and those of other lines will follow.

A sign with numbers in white on a blue background will be placed on the right-hand front corner of the roof of each car, one number facing the front and another the side.

Public Service bus lines have carried route numbers for some time, routes being designated by even numbers. Street car lines will be designated by odd numbers and bus lines and car lines operating in the same territory will as far as possible carry contiguous numbers.

Air reservoir being given a hydrostatic test. The workman in the rear is placing a canvas liner in a reservoir hanger

Inspection Methods that Made Possible

100 Per Cent Operation

On Dec. 20, Last Year, the Chicago Surface Lines Operated All of Its Passenger Cars and for Three Days Following This 99.97 Per Cent Were Operated

By T. H. Shaughnessy
Assistant Superintendent of Shops and Equipment Chicago Surface Lines, Chicago, Ill.

OPERATION of 100 per cent of all passenger cars owned by an electric street railway company is considered remarkable, but when this record is established by one of the largest street railway systems it is an achievement—something that did not "just happen," but the result of plans carefully worked out and details followed to the end. Therefore, the task imposed upon the shops and equipment department of the Chicago Surface Lines was by no means a light one. This was referred to briefly in an article in ELECTRIC RAILWAY JOURNAL for Jan. 1, 1927, page 10.

During the late summer and fall months special inspection and attention were given to all parts of the electrical equipment. All main fuse boxes were overhauled and inspected carefully. The terminals were tightened and renewed where necessary, insulating partitions and barriers were cleaned and boxes were given a coat of good insulating paint, inside and out.

Motor junction boxes and terminal boards were cleaned out thoroughly. All terminals, terminal screws and sleeves on the end of motor leads were checked and put in first-class condition. Also the motor leads themselves were thoroughly inspected, broken insulation was repaired and leads were renewed where necessary and repainted.

The rheostats were tested for weak insulation and cleaned. The rods tightened, all leads were examined closely and the terminals were tightened. The wooden supporting sticks were cleaned thoroughly and then repainted. Any that were found charred near the bolts, due to current leakage from defective rheostats, were renewed.

Electric heaters were blown out with air, the supports were tightened, the heater coils checked, terminals tightened and coils or heaters renewed where necessary. Thermostats and thermostat switches were inspected, contacts renewed where necessary and all parts tightened. Heater fuse boxes received a special inspection and all weak or burned fuse clips were renewed.

All air tanks were given a hydrostatic pressure test equal to 1½ times the working pressure. Then they were thoroughly painted and a new strip of canvas, soaked in

paint previously, was installed between the tanks and their supporting bands and hangers. The safety valves were tested and governor settings were checked. At the same time all air gages were checked by the method of installing a master air gage in the air line.

All car wiring and motors were tested carefully with instruments. This is the regular practice in our shops at general inspection periods.

Truck and car body inspection and repairs were also given closer attention than usual. Material and supplies were prepared in sufficient quantities to meet all requirements. Corner posts, vestibule posts and other parts were painted and kept in stock, ready for installation when required.

Terminals as well as fuses were given careful attention

At the carhouse foremen's semi-monthly conferences the importance of putting all cars and equipment in the best possible condition was stressed and time and again it was pointed out that it was the duty of every one concerned to believe in himself and in the value and necessity of his work.

With the work in the shops reduced as cars were not taken in for general overhauling, workmen were transferred to the carhouses, to assist in making repairs to cars having damage done to the body, vestibule, etc., with the result that a total of 182 cars were repaired and placed in rush-hour service during the four days preceding Christmas Eve, as shown in the accompanying table.

When it is considered that more than 20 per cent of the cars in use have two-motor equipments and a failure of any kind would put a car out of service the standard of maintenance is self-evident.

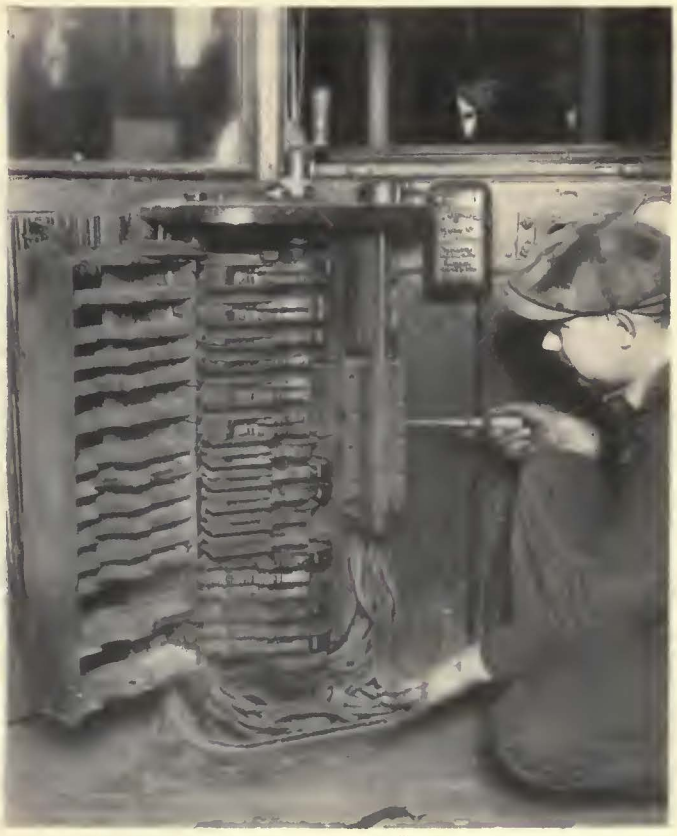
With the 100 new cars delivered during the year and available, the work in connection with overhauling cars was kept up until Dec. 7. No cars were taken into the shops for overhauling after that date. There were in the two shops on Dec. 1 67 cars for overhauling and 54 cars for damages and other repairs, or a total of 121.

On Dec. 7, the last day that cars were taken in for overhauling, there were 55 cars undergoing overhauling and 35 in for damage repairs, a total of 90 cars in

CARS REPAIRED AT CAR STATIONS AND SHOPS AND PLACED IN RUSH-HOUR SERVICE, DEC. 20 TO 23, INCLUSIVE

12–20	12–21	12–22	12–23	Total
47	39	46	50	182

Motor lead junction boxes were inspected carefully and all connectors tightened



All parts of controllers received special attention on inspection

the two shops. This total was reduced to zero on Dec. 20 and increased again to one car on Dec. 21, 22 and 23, due to one car being sent in each day with heavy damages, which could not be completed before the rush-hour period.

During the month of November at the sixteen carhouses approximately 25 cars per day were held in for repairs during the rush-hour period, or about 1.5 cars per carhouse. This number was reduced, so that from Dec. 1 to 19 the number of cars held in daily for repairs at carhouses during the rush hour was approximately eleven, or practically 0.7 car per carhouse per day. An accompanying table shows the number of cars available, number of cars operated and number of cars in carhouses and shops from Dec. 1 to 23 inclusive.

Heaters were blown out with compressed air and all supports, terminals and coils were tightened

CARS AVAILABLE AND OPERATED BY CHICAGO SURFACE LINES DEC. 1 TO DEC. 23, 1926, INCLUSIVE

Date	No. Cars Available	Per Cent	No. Cars Operated	Per Cent	No. of Cars in Carhouses	Per Cent	No. of Cars in Shops	Per Cent
12- 1	3,490	95.9	3,384	93.0	28	0.8	121	3.3
12- 8	3,557	97.7	3,497	96.1	6	0.2	76	2.1
12-15	3,621	99.5	3,589	98.6	2	0.06	16	0.44
12-16	3,619	99.45	3,597	98.8	5	0.14	15	0.41
12-17	3,625	99.61	3,597	98.8	5	0.14	9	0.25
12-20	3,639	100.0	3,639	100.0	0	0	0	0.00
12-21	3,638	99.97	3,638	99.97	0	0	1	0.03
12-22	3,638	99.97	3,638	99.97	0	0	1	0.03
12-23	3,638	99.97	3,638	99.97	0	0	1	0.03

It will be noted from the table that on the four days immediately preceding Christmas Eve there were no cars held in for repairs at any of the carhouses during the rush-hour period. This means that 100 per cent of the cars at the sixteen operating carhouses were available and operated during the rush-hour period on four consecutive days. As far as is known by the writer, this record has never been equaled.

The co-operation of the transportation department with the shops and equipment department in the careful handling and operation of the equipment was of course essential, and it was through a complete understanding and co-ordinating of interests that the exceptional results were accomplished. All operators entered into the work with enthusiasm and by careful handling of mechanical and electrical apparatus failures due to service abuses were reduced materially. The primary objective of the entire organization was to keep cars in service and to avoid delays that would inconvenience passengers.

The high class of maintenance work that formed an essential part of the continuous program for putting car equipment in first class condition through regular overhauling and careful attention to maintenance details provided a substantial foundation for such an undertaking. Many defects were discovered before they actually produced trouble and so the real work of repairs was reduced. Also by providing a supply of spare parts and equipment ahead of time, defective parts could be replaced quickly and the actual work of repairs made during periods when more attention could be given to the work. By providing a maintenance program so as to make all cars available for service during the periods of maximum load an investment in extra equipment to take care of proper service was avoided.

Car resistors were given a thorough test with instruments

Many small tools such as concrete breakers and tampers are used in track maintenance by the Pittsburgh Railways

Pittsburgh's Track Repair Organization Permits No Delay to Service

The Construction and Maintenance Sections of the Way and Structures Division Work with the Municipalities Through Which the Company Operates and Meet the Various Schedules of Improvements that Are Undertaken

By O. Williams

Superintendent of Way and Structures Pittsburgh Railways, Pittsburgh, Pa.

UNDER the new organization of the Pittsburgh Railways all maintenance and construction of track is handled by the maintenance of way and structures division of the operating department. This department is headed by a superintendent reporting directly to the general manager. In order to meet the heavy demands for new track and also to keep the present tracks in good, safe operating condition the work is divided between the maintenance and construction sections, each of which is headed by a superintendent reporting to the department head. The maintenance section deals chiefly with the repairs of track and paving and the installation of small jobs of special work needed for renewals. The construction section does the larger renewal and construction jobs, as this department is especially equipped for the purpose with modern labor-saving devices. The personnel of the construction section is made up of a superintendent, three general foremen and ten construction foremen. The number of men employed throughout the season will vary between 150 and 250, depending upon the quantity of work on hand.

The equipment of this department consists of four Thew shovels mounted on standard car wheels, three one-bag concrete mixers, two large 10-in. x 10-in. air compressors, three 6-ton steam rollers, two complete thermit welding outfits, six steel Differential dump cars and many smaller tools, such as pneumatic concrete breakers and tampers. All of this equipment except the steam rollers is operated with direct current taken from the trolley wire. In moving the shovels and concrete mixers from place to place the motive power is supplied by one of the dump cars. The air compressors and welding outfits are mounted on single-truck motor cars and so can move readily from place to place under their own power. The steam rollers are transported on flat cars, generally pulled by a dump car. Supplementing all this equipment is a Universal crane

Preparing new track foundations in West Liberty near Pioneer Street

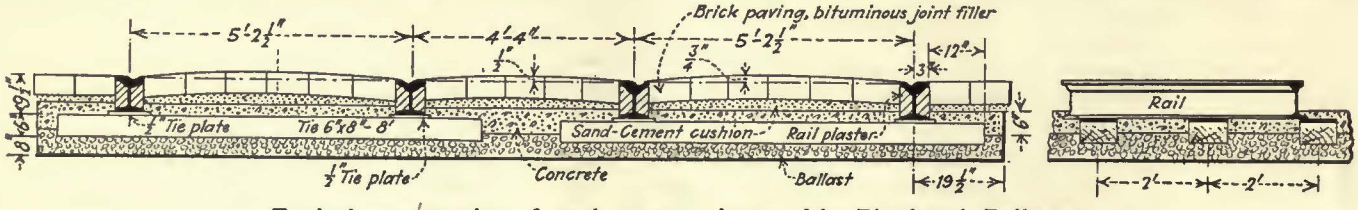
mounted on a 5-ton Mack motor truck and also an electrically operated crane mounted on a double-truck car body. These two cranes are also used whenever needed by the maintenance department in the installation of special work jobs.

In 1924, when the Pittsburgh Railways was removed from the receivership, the agreement entered into with the city of Pittsburgh provided a blanket annual payment of $300,000 in lieu of paving charges, taxes, etc. It states that the work of repaving brought about by track removal or replacement, maintenance of track or car operation shall be done by the railway under the plans and specifications submitted to and approved by the director of public works. In case the mileage of track operated in the city is increased or decreased, either by annexation of contiguous territory or by construction or removal of tracks by the company, then the yearly payments as provided shall be increased or decreased proportionately.

After the signing of this agreement by the city of Pittsburgh the railway immediately presented the same proposition to the various boroughs and townships in which it had tracks upon paved streets. As a result there are now, including the city of Pittsburgh and Allegheny County, 38 municipalities operating under this agreement. Also several agreements are in effect in which the railway company has agreed to install the concrete base and the municipalities to furnish the surface paving. Under the agreements the new track constructed by the railways is determined almost entirely by these municipalities in preparing their repaving schedule.

The main problem confronting the construction section was how best to meet these various schedules and improvements of the municipalities, working with them and their contractors in making these changes, and still work efficiently. Due to the wide range of territory served by the Pittsburgh Railways it was determined that the track to be built in the farthest outlying districts would be done by contractors, while the company's forces would operate within the city, or at least within a reasonable radius, in order to facilitate the transporting of equipment from one job to another. The railway next proceeded to prepare a schedule of the starting and finishing dates for certain sections of track on each job, arranged so as to conform with the starting dates used by the municipalities for the paving of the flank. In this way the railway was generally able to build one track and move to the next location while the municipalities' contractor finished the street flank on the first job, after which the railway would return and build the other track, which in turn would be followed by the street flank.

Since the various municipalities had several jobs scheduled to start at approximately the same date, the construction gang was divided into six units of approximately 25 men each. Thus all jobs could be under construction at the same time. In this case two jobs were handled by one general construction foreman, who moved his equipment from one job to another in the order in which they were needed. After certain experiments and slight rearranging of the schedule it was possible to place a shovel on a job, finish a stretch of grading, move to the next job and start grading again with but little lost time. The same procedure was used with the tamping and roller outfits, so that in all there was an almost continuous rotation of equipment. The welding gang necessarily followed closely with the final



Typical cross-section of track construction used by Pittsburgh Railways

Concrete used in track construction on East Street

Ballast in place on section of track on McClure Avenue

tamping operation on each job, pouring and grinding the necessary thermit welds.

This method created a tendency to improve the efficiency of each of these units by putting them on a competitive basis, as each had to keep up in order to permit moving upon scheduled time to the next job. Doing the work in this manner resulted in an almost uniform speed of about 650 ft. of finished track per week by each gang throughout the construction season. In attaining these results the assistance and co-operation given by the municipalities and contractors was of the greatest importance. Also contributing to the success was the excellent condition of the construction equipment, which had been overhauled thoroughly by the individual operators in the railway shops during the previous winter shutdown.

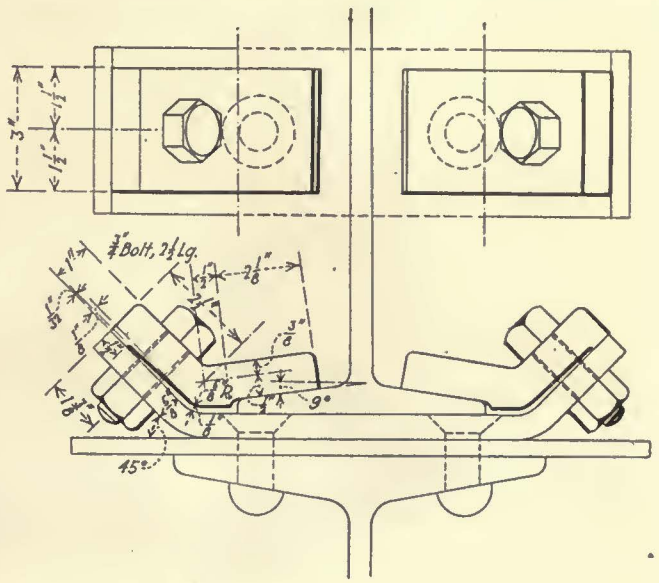
As is usual with all schedules, many things arose which had not been anticipated. There developed, as the season progressed, certain improvements which were deemed necessary and which necessitated the construction or rebuilding of some track. These were fitted into the schedule as well as possible, and whenever the construction gangs were too busily engaged to take care of the work it was allotted to the maintenance section and carried through in that way.

There were also quite a few jobs which required a little extra attention and in which more than ordinary conditions covering track reconstruction had to be met. A few examples of this will give some idea of this:

In placing the rail across the Ninth Street bridge it was determined to use thermit-welded joints. As this bridge has a steel deck upon which had been fastened clips to receive the rail it was necessary that the rail first be laid on ties, the entire length welded, then dropped into place on the clips and bolted into position. The design of these clips is shown in an accompanying sketch.

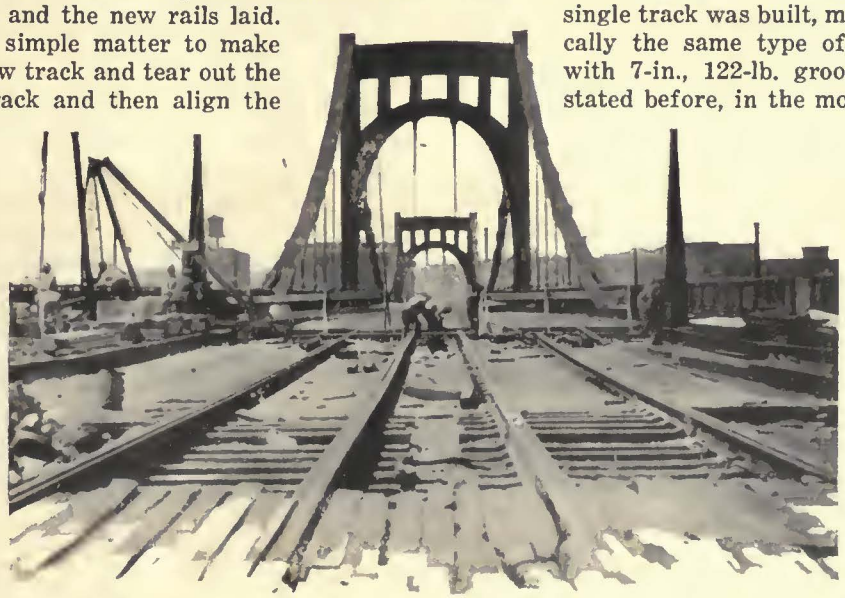
In another instance it was decided to reconstruct only one track in the center of a street where previously there had been two, and also that this should be done without any interference to traffic. This was accomplished by placing temporary crossovers, removing one track, taking out as much of the sub-grade for the new track as possible with a shovel and completing the grade by hand. This, of course, extended somewhat into the second track. The ties were then placed between the ties of the old track and the new rails laid. After this it was a simple matter to make connections to the new track and tear out the section of the old track and then align the new track in its proper location.

In another instance it was necessary, due to county road improvement and the necessary installation of a large special work job at an important intersection, to unite both the maintenance and construction sections. These worked day and night to speed up the installation. With the closing of the Sixth Street bridge it was decided to install an additional loop to assist in rerouting the cars formerly crossing the bridge. Here again the construction section found it necessary to build a track in a heavily congested district on a street where there already was one track which could not be disturbed until the new one and its connections had been completed. This situation was met by first constructing as much of the new track as possible and then during a night in which the cars were rerouted making the necessary connection at each end. At this time also the maintenance section was called in to assist, as extreme speed was necessary.



Type of clip used to hold rails on Ninth Street bridge

In summing up the results accomplished by this department it was found that in 1926 approximately 16 miles of single track was built in the city limits of Pittsburgh. The straight track in this total was built of 9-in., 134-lb. grooved girder rail laid on 8 in. of gravel ballast and 6-in. x 8-in. x 8-ft. oak ties. The joints were all made by the thermit-welding process. The special work in most cases consisted of 9-in., 152-lb. grooved rail placed on the same type of construction. Outside of the city of Pittsburgh some 14 miles of single track was built, most of it using practically the same type of construction except with 7-in., 122-lb. grooved girder rail. As stated before, in the more outlying localities the track was built under contract. Of this there was a total of approximately 6½ miles, about 3½ miles of which was built in Glassport Borough, some 2 miles in the city of Washington, Pa., and 1 mile in the city of McKeesport. Thus a total of approximately 30 miles of single track was reconstructed last year on the system.



Reconstructing tracks on the Seventh Street bridge, Pittsburgh

After removal of grease and dirt with pumice stone, the surface is rinsed with warm water applied with a sponge

Frequent Painting Required

for Modern Rolling Stock

Improved Methods Will Reduce Painting Costs so that Railways Can Afford to Paint Oftener—Cars Should Be Painted Once a Year

By A. T. Clark
Superintendent of Rolling Stock and Shops
United Railways & Electric Company, Baltimore, Md.

KEEPING cars attractive requires a carefully worked out system for cleaning and frequent painting. Old-time methods produce a beautiful finish and long life for the paint, but with the present congested city traffic, which soon scratches and mars the surface, frequent painting is most essential. The older systems of painting were expensive and the piano finish which was secured is not needed for a street car. The most essential feature is an attractive appearance of the car as it is viewed from the sidewalk. By adapting methods that will reduce cost and keep the time of painting at a minimum, more frequent painting can be done economically.

Old-time car painting methods followed closely the practices used in fine carriage and coach building and the workmen were, for the most part, recruited from shops that built vehicles of that type. Such a workman had served for many years under an arduous apprenticeship, and only when able to take a carriage or coach and paint, varnish and stripe it completely, doing all the work alone and unaided, was he considered a "coach" painter.

On the United Railways & Electric Company of Baltimore some years ago such a method was standard, and cars as turned out were indeed attractive. An accompanying illustration shows a car painted in that manner. The lower panel was in cream with an orange-yellow broad and fine stripe. The upper panel was painted in dark Tuscan red with an aluminum broad and fine stripe. The broad aluminum stripe was edged in black. The belt rail, corner posts and intermediate posts were in cream color and the letterboard in Tuscan red. The doors and sash were all natural cherry, filled and varnished. The numbering and necessary lettering were aluminum stripe with black edging.

Higher wages increased the cost, and combined with the great length of time the vehicle was in the shop, it was felt necessary to study some means to reduce time and cost. The older method required after the priming coat, which was usually a lead and oil mixture, with the oil percentage large, three or four coats of "rough stuff" or surfacers. Each required about 24 hours for drying. After the last of these coats had stood for 24 hours, a carefully trained painter with a rubbing block and water brought the car surface to a high degree of smoothness. Great skill was required to prevent rubbing more at some points than others, which would produce low places that would show up when the final varnish coats were applied. After this one or two coats of body color were put on, and then the successive coats of varnish, which

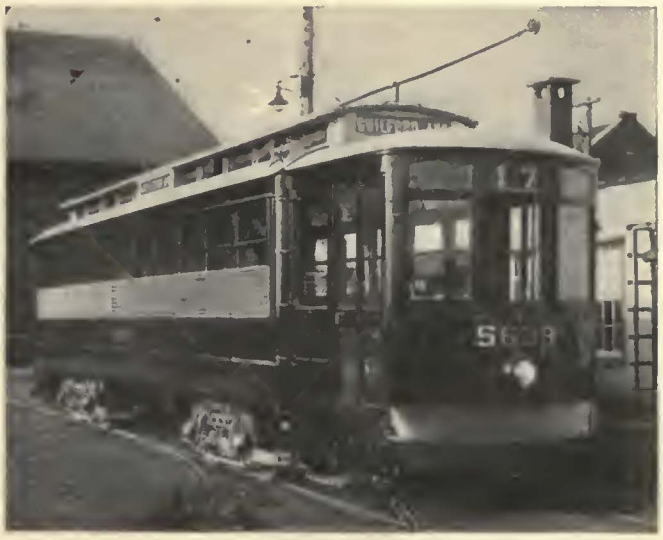
were also rubbed down, until the final coat, usually of finishing varnish, was applied. The numbers, lettering and decorations were put on after the first coat of rubbing varnish.

Considerable study and experiment showed that a great reduction could be made in the cost of painting cars by substituting the glazing coat of oil and white lead, made of such consistency that it would dry hard and sand smoothly. It was also found that enamel could be substituted for flat color and varnish coats. Exterior surfaces in natural woods, varnished only, while very attractive when new were difficult to keep that way and as a rule soon perished. Today almost universally such surfaces are painted, then varnished, as is the rest of the exterior of the car. Lettering and striping have been eliminated generally, and such as remain are applied in the decalcomania form. As might be expected, with the former high cost of painting, together with a painting period of approximately fourteen days, it was not possible to pass many cars per year through the paint shop. Hence the periods for successive shopping for paint were two to three years. As an average this was too long for best results, and instead of cars being improved in condition, every so often the undercoats were so defective as to require burning off. This added still more cost and time to the car painting. As a result of experience with the practices that we are now pursuing, it has been found that it is quite possible, at a fairly small cost per car, to send the cars to the paint shop every twelve months. Such fairly frequent attention keeps the exterior painted surfaces in an excellent state of preservation.

Of course, there occurs today, as a result of the congestion of vehicles in the crowded streets of our large cities, an unusual amount of damage to exteriors of cars, so that, no matter what care or cost has entered into the preparation of a painting job, the vehicle is liable to damage that will decidedly mar its appearance. It is evident that the least expensive method of painting, giving good appearance, is preferable to a more expensive method giving results of the old-time carriage work.

The following methods are now pursued in the painting of cars of the United Railways & Electric Company:

The foreman painter keeps a card index record of each car by number, filed according to the months in which they were painted. Thus, by looking through a group of cards, he knows almost instantly those cars which should be sent to the shop for painting. He prepares a list which is turned over to the foreman of the motor and truck shop, who has charge of the transferring crews, and is thus provided with cars to work upon.



Simplified color schemes are the standard practice in Baltimore

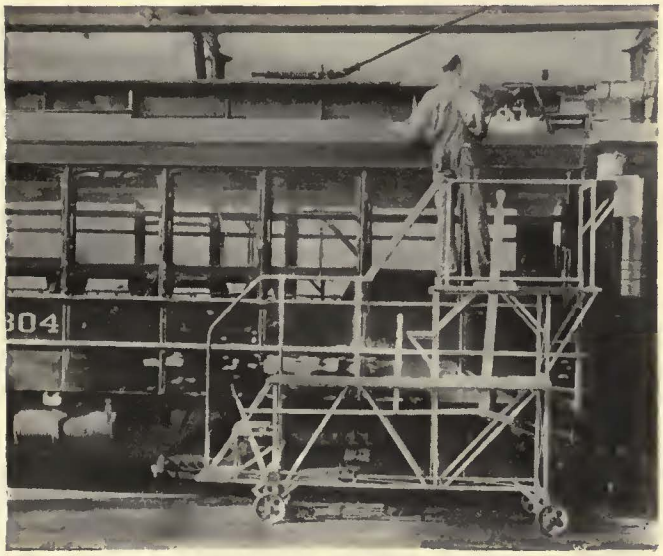
Method Used for Painting a New Car

As the cars are brought to the paint shop they are examined by the carpenter shop representative, who fixes any loose or damaged panels or moldings, and does any other work of this nature required prior to painting. While this is going on the car trimmers remove seats, side-window screens and Hunter signs. In the meantime the roof painters have given the roof a coat of paint. A special type of portable scaffold has been found efficient for the painting of monitor sashes and side roofs. The car is cleaned on the outside, from top to bottom. In order that the car will clean more rapidly a coat of weak acid is placed on as much of the surface as is possible at one time with a 4 or 5-in. wall brush. Then follows a washing with liquid soap made of linseed oil and potash, put on with a brush. The cleaners next rub the surface with No. 1 steel wool to remove the dirt and grease. Around the heads of nuts and bolts it has been found that a little fine pumice stone will assist the removal of accumulated grease or dirt. With a sponge and lukewarm water, the surface is rinsed thoroughly. An accompanying illustration

Old-time painting methods gave much attention to striping and lettering

shows a portable scaffold, which has been designed specially so that two can work at the same time. When the upper portion of the side of the car has been finished, the remaining lower half is similarly finished by working from the floor.

As soon as the car has dried thoroughly, all the surfaces which exhibit cracks, nail holes, scars or other imperfections are coated with a lead and oil primer. This is also done on the first day. Any new moldings or panels inserted have been previously painted, so that only in rare instances is new wood encountered. Under a separate heading will be found a description of the painting from the raw wood up. On the second day, the car is given a coat of red enamel, cutting around numbering, lettering, and other decorations. Following the coat of enamel the car is given one coat of finishing varnish on the third day. In some instances, where cars are in good condition, with the surfaces not scratched or marred, it is possible to varnish the car without a coat of red enamel, and this saves one day. After standing for 24 hours the car is ready to receive



A portable scaffold has been found particularly efficient when painting monitor sashes and side roofs

seats, window screens, Hunter sign curtains, and other trimmings. On the fifth day the car is ready to be returned to service.

As soon as the exterior has been cleaned (usually the second day) the cleaners begin work on the interior of the car. Here great care is required. The use of acid is eliminated entirely and only upon exceptionally dirty spots is soap used. The work is begun on the ceiling, working down the sides of the car to the floor. The interior cleaning includes underside of hoods and vestibule ends. Accumulations of dirt, paper, etc., under longitudinal seats and such places are removed. After the interior cleaning has been finished, the paint shop foreman or his assistant examines the car and decides whether the interior condition warrants renovation or revarnishing. Should the varnished surfaces appear in good condition a special renovating oil is employed. If, on the other hand, the surfaces appear dull and unattractive, the car is varnished. The interior of the vestibule ends, however, usually receives such hard service that it is found desirable in nearly all cases to repaint the woodwork, using a solid color, imitation mahogany or natural cherry finish. Seat pedestals are bronzed; stanchions, hand brake supports, etc., are then painted or enameled, and finally, on the same day that the car is given a coat of clear varnish, the floors are painted, so that both are drying simultaneously. Before the car is put back into service, all the windows are cleaned carefully and the excess paint is removed with the use of an old razor blade.

Painting from the Raw Wood Up Requires Special Treatment

The practices followed on a car from the raw wood up differ from those already described. To the raw wood is first applied a primer made of two-thirds raw linseed oil and one-third pure whitelead. This is colored pink by the addition of a small amount of Tuscan red. After this has been allowed to stand 48 hours it is sanded with No. 1 sandpaper. Then the second coat of primer made of half linseed oil and half whitelead, which has also been colored, is put on. This second coat is allowed to stand 24 hours and is then sanded with No. 1 sandpaper. The third coat of surfacer consists of one-third linseed oil and two-thirds whitelead, colored as previously described. This third coat, after being allowed to stand, is likewise sanded.

Generally speaking, there has now been provided a good, smooth surface. If, however, a still better surface is desired, a knifing coat of lead with a small amount of oil and turpentine is then used, which, after standing 24 hours, is smoothed down very carefully with No. ½ sandpaper. There is then applied a red undercoating, which is a quick drying, non-sanding surfacer. The next coat is the red body enamel. This is allowed to stand 24 hours and then the numbers, lettering, and other decorations are applied. Following this, the car is given two coats of finishing varnish with 24 hours between for drying.

The result of sending cars to the paint shop every twelve months is that very few cars require such treatment. The burning off of old paint under these conditions is also very rare.

The present paint-shop force includes one foreman, one assistant foreman, one inspector, twenty-two first-class painters, sixteen second-class painters, six third-class painters, three fourth-class painters, one first-class helper, five second-class helpers and twenty women.

One Hundred Cars a Month Painted in Baltimore

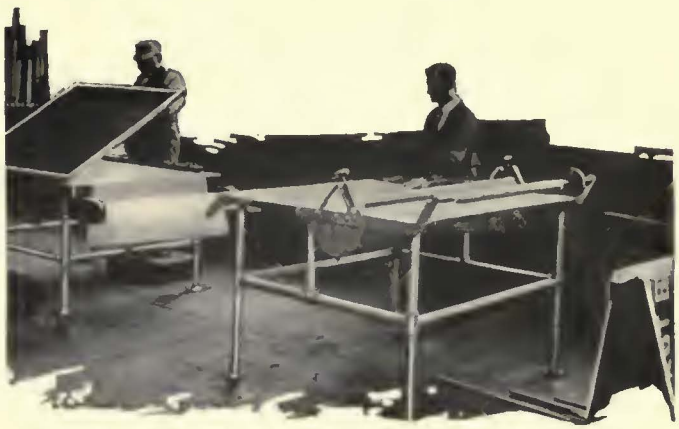
The total number of passenger cars on the system is approximately 1,200 and with an average output of 100 cars per month it is possible to send every car through the paint shop each twelve months. The paint-shop force also does a great amount of work in painting automobiles, trucks and bus bodies. During 1926 a total of 49 were painted in addition to the cars. Considerable painting is also done by this force of all kinds of signs, also waiting stations and office sections of buildings. A quite extensive rerouting of cars resulted in making changes of more than 1,000 Hunter sign curtains.

Painting records show that the following are fair estimates of cost: To paint the exterior and varnish the interior according to the old methods, including numbering, lettering and striping in vogue at that time, would cost on today's rate of wages and price of materials between $250 and $275 per car. To bring up a car from the raw wood following present-day practice

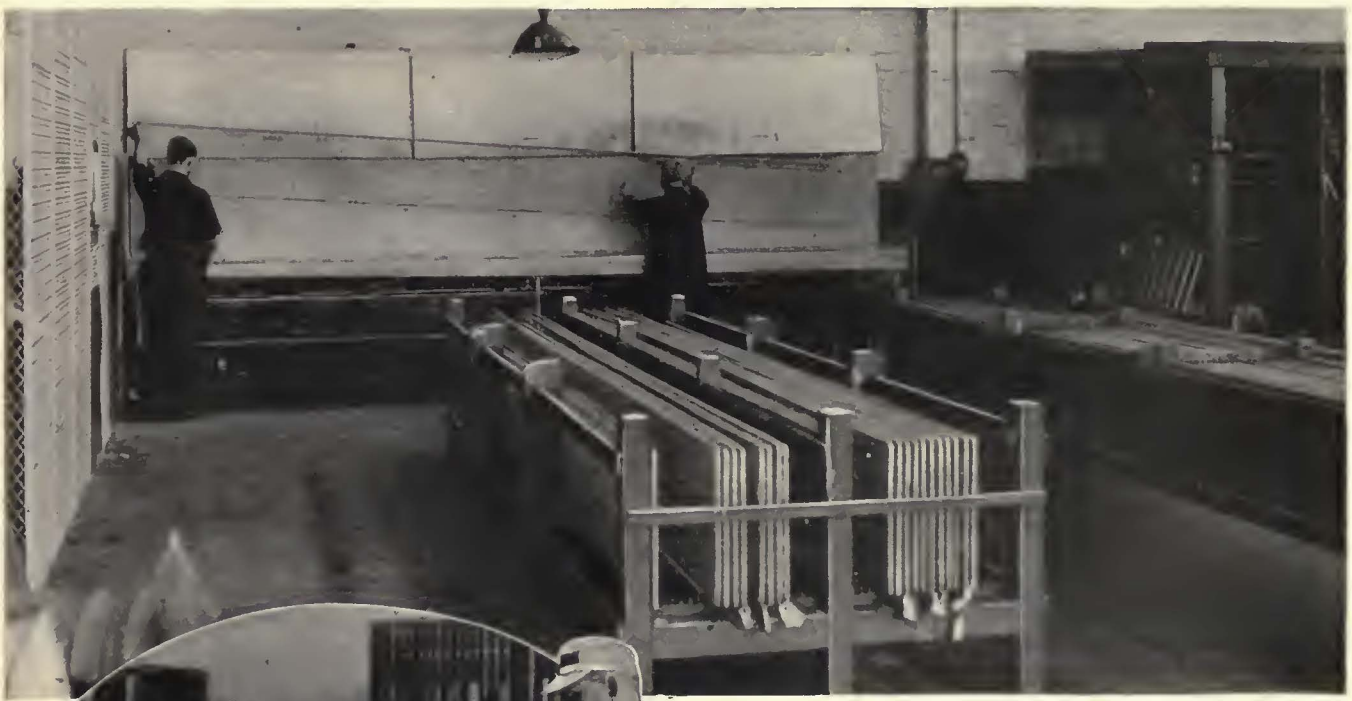
would cost about $125. To clean down, touch up and revarnish, including one coat of enamel and one coat of varnish, costs on the average of $60 per car. The present standard practice eliminates the two colors and striping.

Formerly the side window screens were given one coat of aluminum bronze. Investigation of this detail indicated the need for some quicker method, such as dipping the screen in a shallow pan of paint. As aluminum bronze separated in a very few minutes, it was difficult to keep the material in a homogeneous condition. Finally a scheme was devised to use a gray-colored paint generally similar in appearance to aluminum. Screens can now be dipped in a few minutes. By doing a large number at one time still further economy is possible.

The frequent repair, replacement and making of new Hunter sign curtains indicated the need for a change



Printing arrangement and device for impregnating Hunter sign cloth with oil to make it impervious to water. This is necessary to prevent buckling and wrinkling



Two men dipping side window screens

The screen has just been placed in the gray paint and has been lifted out and is about to be hung on the rack above the dipping table so that the surplus may drain off. After several screens have been dipped and allowed to drain for a few minutes, a dry brush removes the surplus paint. The screen is then placed in the rack seen in the forefront of the picture. Hanging from the corner of the screens is a tag which shows the number of the car to which the individual screen belongs.

Silk stencil method of making Hunter signs

One section of a Hunter sign has just been printed and the workman is lifting the silk stencil off the freshly-painted sign. This section is then cut loose from the roll of cloth and the fresh strip of cloth is drawn under the frame. The frame is then clamped down and another sign painted.

from the slow hand method. A careful study of the use of silk stencils has shown that this work can be done at small cost with great speed. A recent example was occasioned by the need of signs for trolley poles indicating the proper stopping point for cars. as the result of eliminating stops during rush hours. Approximately 1,500 signs were required to be delivered in approximately ten days. By the use of a silk stencil and the dipping of the sheet metal on which the working was applied, it was possible to turn out these signs with lettering on both sides within one week.

In the foregoing, the work that has been covered has been done by the brush method. Nevertheless, numerous experiments have been made to accomplish this by use of spray methods. Owing to the excessive amount of vapor the results have not been satisfactory. Complaints arose from the workmen in the vicinity. With the use of lacquers this is even more pronounced. It has also been found that lacquers do not work out satisfactorily on woodwork, and as the greater portion of the cars have wood surfaces lacquer has not been considered seriously. It is believed that there is need for

considerable investigation of this problem, especially along the line of producing a spray gun which will atomize the paint, varnish or lacquer, but will control the spread of the finely-divided particles. So far, the use of spray painting has been confined to the painting of large surfaces, such as walls, partitions of buildings, car body trucks and generally where the fumes would not be of extreme annoyance.

Experiments and tests have also been made with the use of long oil enamels. Generally speaking, these results have not been at all satisfactory because of two conditions. First, there is a longer and uncertain period required for the drying. Instances have occurred where as long a time as five days was needed for a single coat to dry. Secondly, without a coat of varnish over the coat of enamel, great care must be exercised in the kind of cleaners used at terminals. It has been found that such enamels are injured by any acid cleaners.

The company has for its heavy service lines quite a number of front-entrance cars of the Birney safety type and articulated cars arranged for front entrance especially designed by the railway. In order to acquaint the riding public with cars that load at the front, all front-entrance cars are painted in cadmium yellow, the rear-entrance cars using the standard red color.

Records of Paints Used Kept by Glass Samples

The need for records on paints of different kinds is met by providing a small cabinet holding a large number of pieces of glass approximately 3 in. x 5 in. in size on which samples of any new paints are placed, together with an identifying number and a record of who furnished and when. This makes it very easy to check up on the delivery of paint materials as to body and color. Samples are also kept in a similar manner of paints made in the paint shop, with the formula, so that at all times such materials can be reproduced exactly as to color and general consistency.

The liberal use of paint in the paint shop is encouraged with the view of keeping a clean, fresh and attractive appearance. It is believed that such expenditures, although small, have a beneficial effect upon the morale of those working in such surroundings. It also produces an inviting atmosphere to those who, upon occasion, visit this part of the railway system.

Since the war, the greater portion of the car cleaning preparatory to painting on our system is being done by women. This was brought about by the shortage of man-power. Women are also employed in the paint shop to clean windows preparatory to sending the car out for services.

Constant tests of paints, oil and varnishes are being made under supervision of the foreman of the paint shop, usually in the form of test panels. These test panels are prepared carefully under his supervision and a record of the materials and their method of use carefully noted. The test panel is then numbered, dated and placed out for exposure. Removal of test panels is not permitted without instructions from the superintendent and a record is made of the conditions upon removal. Generally speaking, paints are exposed for twelve months, and varnish and similar materials for eighteen months. Color combinations are under constant consideration, with the view of obtaining an attractive color scheme with a cost equal to or less than that existing at present.

Poor Tools May Cause Injury

POOR quality tools, good tools impaired and the improper use of tools account for about 11,000 casualties yearly among railroaders of the United States. A study of "tool accidents" on a single representative railroad has disclosed that 89 per cent of injuries are chargeable to tools. They come under four leading causes: Struck by tools in hands of self or others, 33 per cent; bars slipping, 25 per cent; jacks slipping or falling, 16 per cent; wrenches slipping, 15 per cent; various other causes, 11 per cent.

In one year there were 3,868 compensated accidents recorded in New York State, each caused by the misuse of hand tools, or defects in such tools—proof that safety is of vital importance to the user of tools.

Slight yearly reductions in the annual toll from tools used carelessly indicate a lessening of the general hazards, but the fact that tool accidents are mostly confined to shops, stores, tracks, bridges, and buildings where men work in groups under the close surveillance of their foremen and where safety supervision is easy to provide, makes it evident that a greater improvement is possible with better co-operation between workmen and foremen. Tool accidents will decrease to the extent that supervision and co-operation become effective.

Burred and feathered chisels and sledges, hammers and shovels that are loose on their handles, wrenches with spread or worn jaws and jacks with defective ratchets are an index to the efficiency of those who use them as well as to those who supervise the work in which they are being used.

Improper use of tools, even though dangerous, will be discontinued only when foreman and workmen have a mutual understanding that such practices will not be tolerated. To be effective it must be understood by all that the foreman's instructions are to be enforced, and that if necessary the workman who refuses to abide by them will be disciplined.

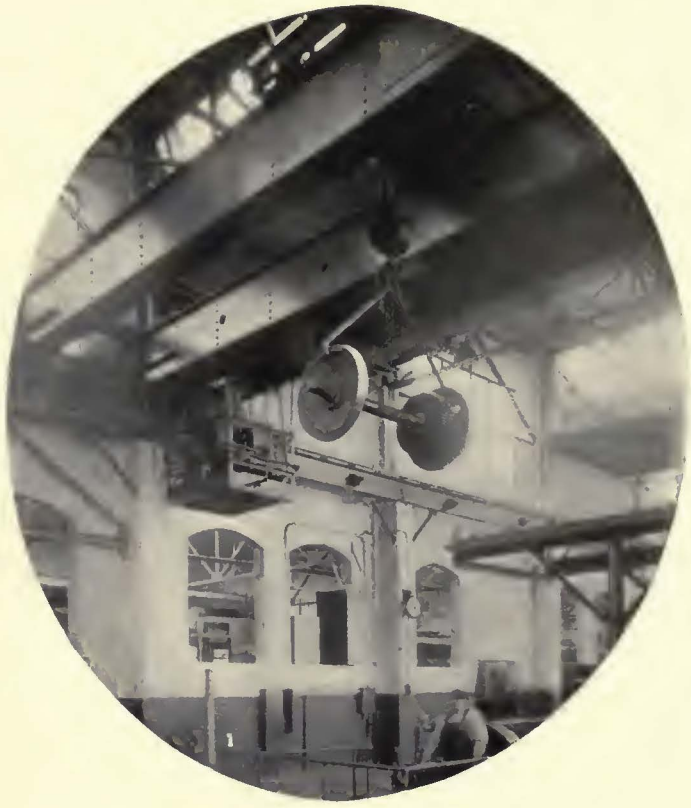
New Shops of Chicago Rapid Transit Company Will Occupy 15 Acres

TEN separate shop units are planned by the Chicago Rapid Transit Company to be located at Niles Center. They will cover upward of 15 acres and are laid out and connected with each other so as to afford the utmost efficiency in handling cars. When the elevated railroads were operated as four separate companies each road had its own shop and there was no provision for an interchange of equipment. That condition had to be continued as a matter of necessity after the companies were consolidated. When the new shops now under construction are completed they will have a capacity sufficient to care for all the present equipment, and provision is being made for adequate expansion. The present shops will be used for purposes of inspection and minor repairs.

Work on the first unit of the shops is progressing rapidly and it is expected that it will be completed in May. This unit is the paint shop. It will be followed by other units from time to time until all of the shops are completed. The building now under way is 200 ft. by 224 ft. in outside dimensions. The walls are of Old English mission brick with cast stone trimmings. All of the buildings to follow will be of the same design. This will give them an attractive appearance, in keeping with the neighborhood.

Glimpses into the new

B.-M. T. Repair Shop



AN ELECTRIC RAILWAY SHOP equipped completely with the latest machine tools and other modern equipment is an inspiration to men responsible for electric car maintenance. Such an example is furnished by the new DeKalb Avenue repair shop of the Brooklyn-Manhattan Transit Corporation.

Prior to June, 1926, all maintenance work on surface cars for both the above corporation and the Brooklyn City Railroad was consolidated under one head. The separation of this work for the two companies made it necessary for the Brooklyn-Manhattan Transit Corporation to have increased facilities. The DeKalb Avenue shop was rebuilt and enlarged and the very latest shop equipment that could be obtained was installed.

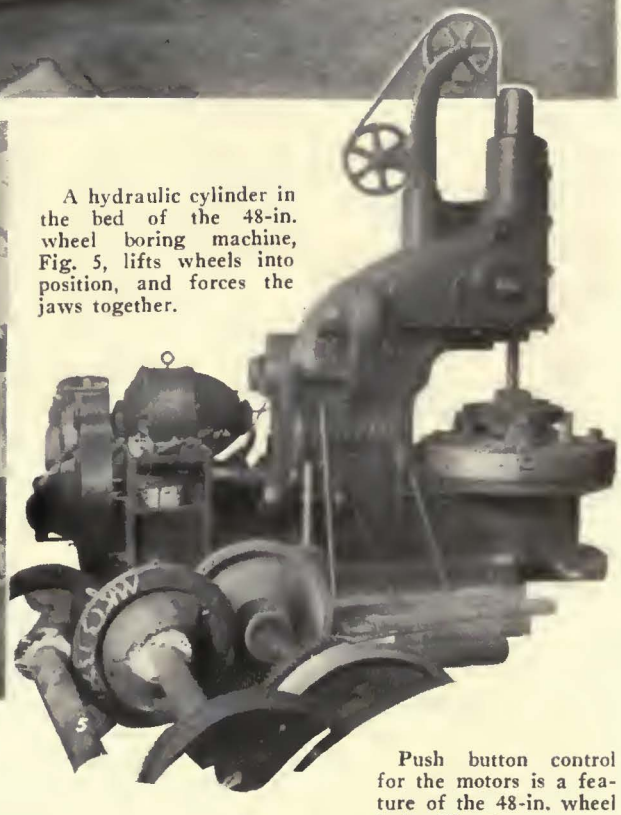
Like other officials of city railway systems, those of the Brooklyn property felt that suitable facilities and shop equipment for maintenance work are essential to safe and reliable car service. Particular attention was given to the selection of machine tools. Experts studied the various machining operations that are necessary for car repairs, improvements were added and several special machines were built by manufacturers to meet the specific class of work. Each machine is provided with individual electric drive. Work and materials can pass through the shop without delay, floor space can be used to the best advantage and any congestion at one machine does not interfere with independent operation of another.

The accompanying illustrations show some of the apparatus of this extensively equipped shop. At the top of this page one of the 10-ton cranes is shown serving the hydraulic wheel press. A general view of the truck overhauling bay with the machine shop at the rear is shown below.

The Wheel and Axle Department *is a busy section*

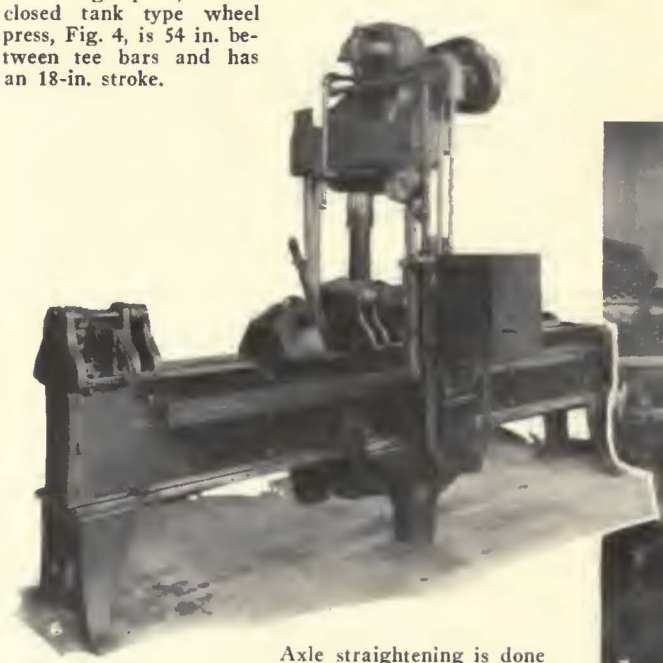
The helical geared ball bearing lathe, Fig. 3, is used almost entirely for turning armature shafts. It is large enough to take the broom shafts of sweeper equipment.

The high-speed, 300-ton closed tank type wheel press, Fig. 4, is 54 in. between tee bars and has an 18-in. stroke.

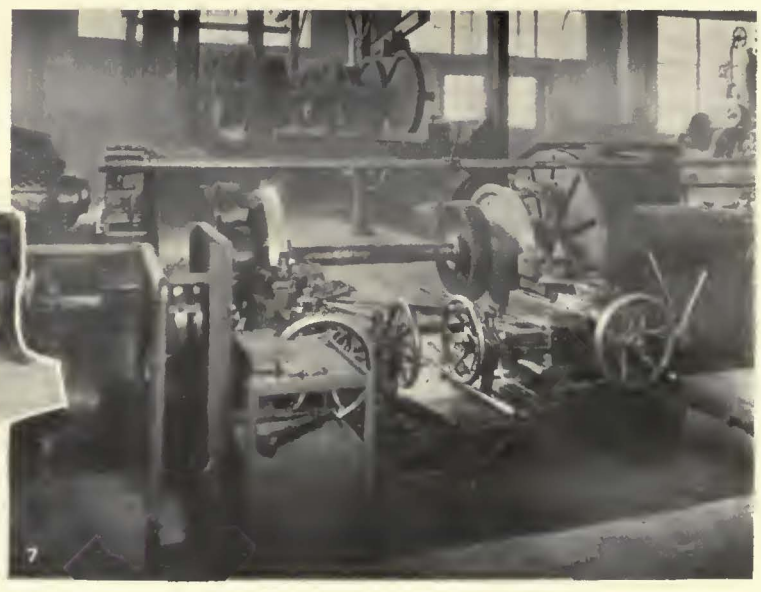


A hydraulic cylinder in the bed of the 48-in. wheel boring machine, Fig. 5, lifts wheels into position, and forces the jaws together.

Push button control for the motors is a feature of the 48-in. wheel lathe, Fig. 7.

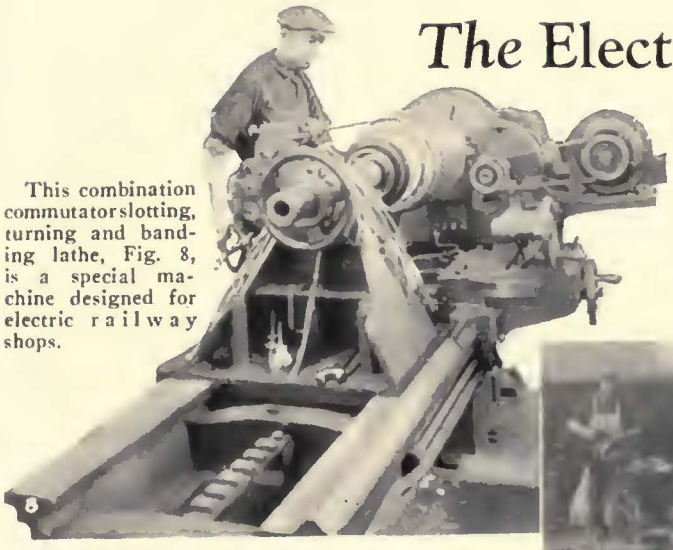


Axle straightening is done in the 125-ton hydraulic press, Fig. 6.

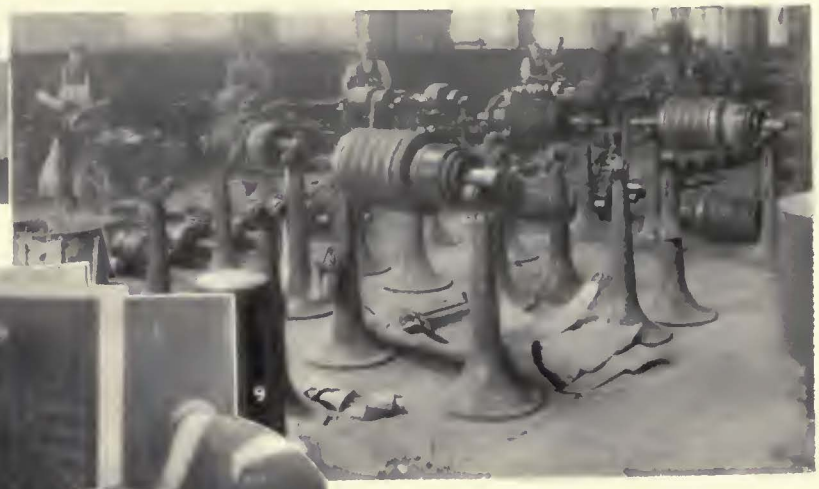


The Electrical Repair Department

is completely equipped for maintenance of all motor and control apparatus



This combination commutator slotting, turning and banding lathe, Fig. 8, is a special machine designed for electric railway shops.



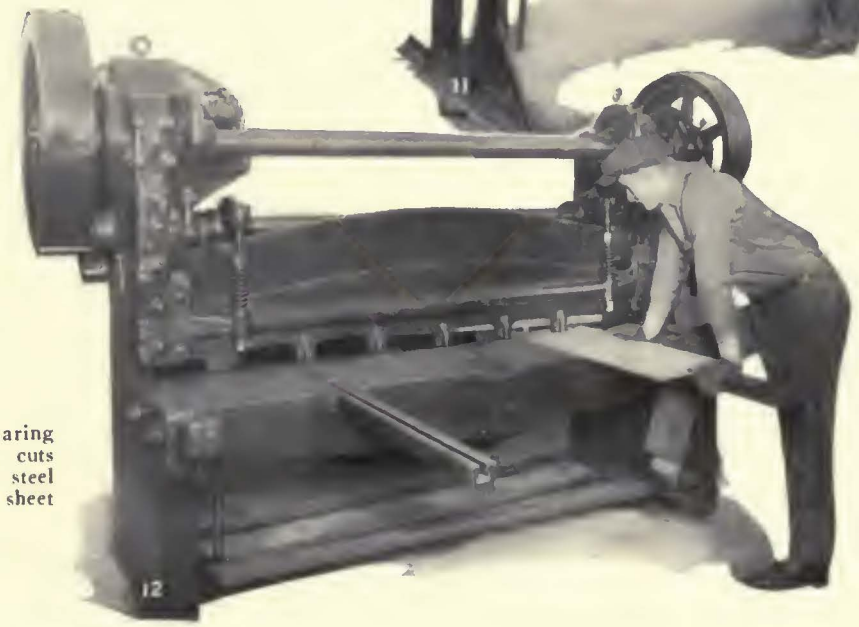
Conveniently arranged armature stands facilitate work of rewinding, Fig. 9.

The baking and drying ovens, Fig. 10, have thermostatic heat regulation and clock control for turning off the heat.

Steel car repairs require

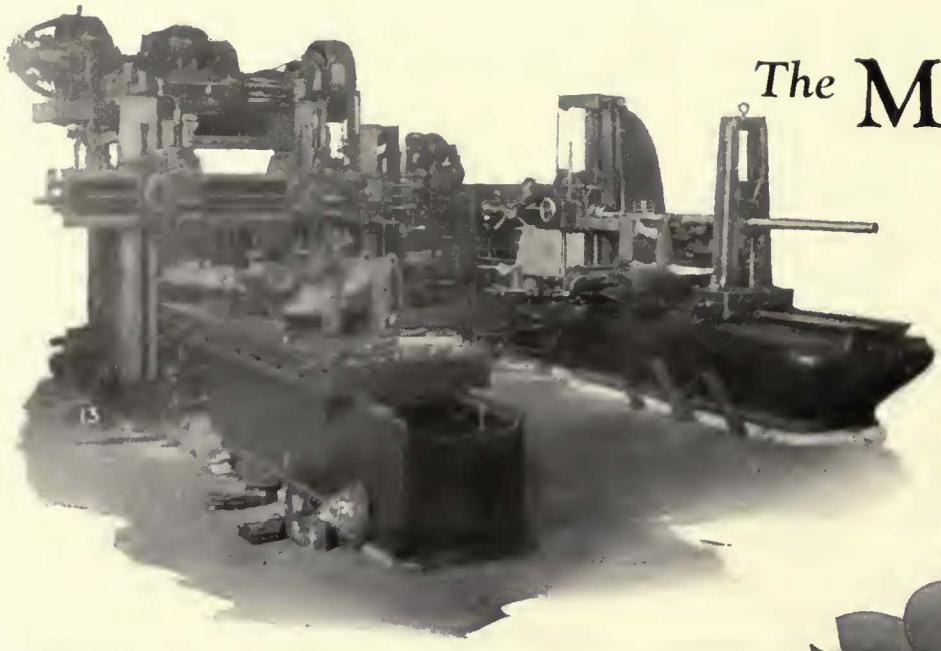
Modern Sheet Steel Machines

A hand bending brake shapes sheet steel for splash guards and sand boxes, Fig. 11.

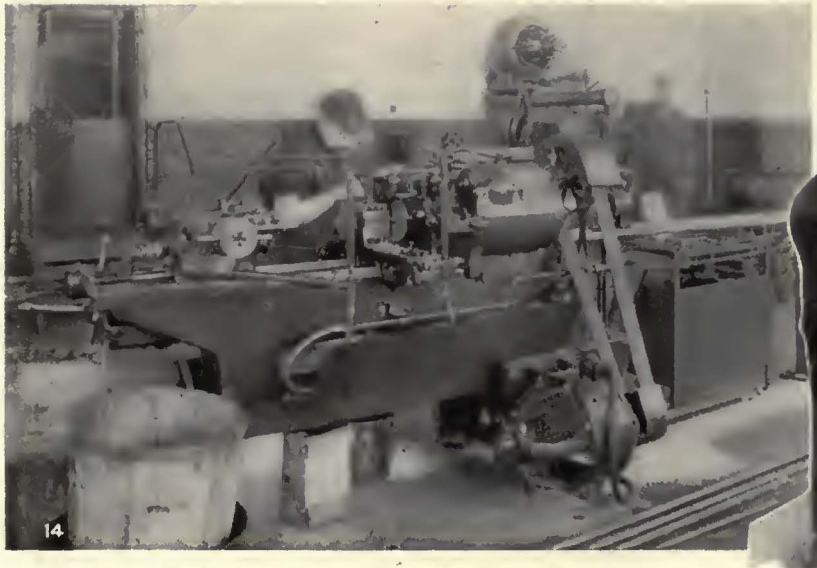


The power squaring shears, Fig. 12, cuts side sheets for steel cars and other sheet metal work.

The Machine Shop

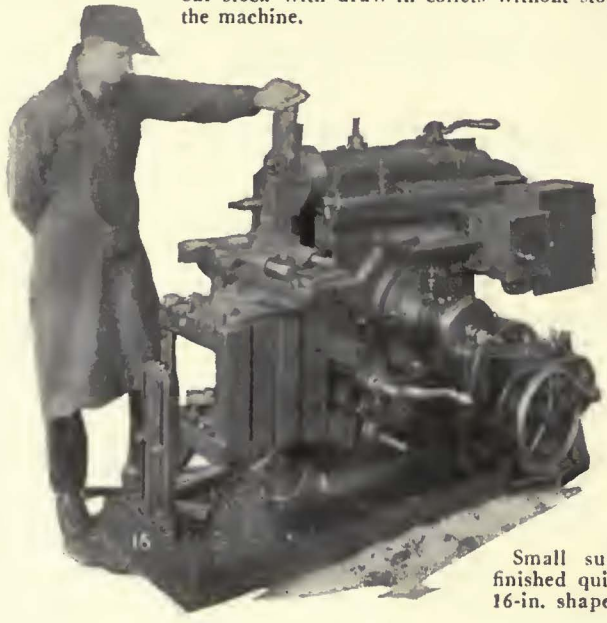


Surfaces of motor shells, gear cases and truck frames are finished on the planer in the foreground, Fig. 13. A motor shell is being rebored in the horizontal boring mill in the rear.



Bushings and pins are made economically on the universal turret lathe, Fig. 14, which feeds bar stock with draw-in collets without stopping the machine.

Motor shells and truck frames can be clamped permanently when drilled in the radial drill, Fig. 15.

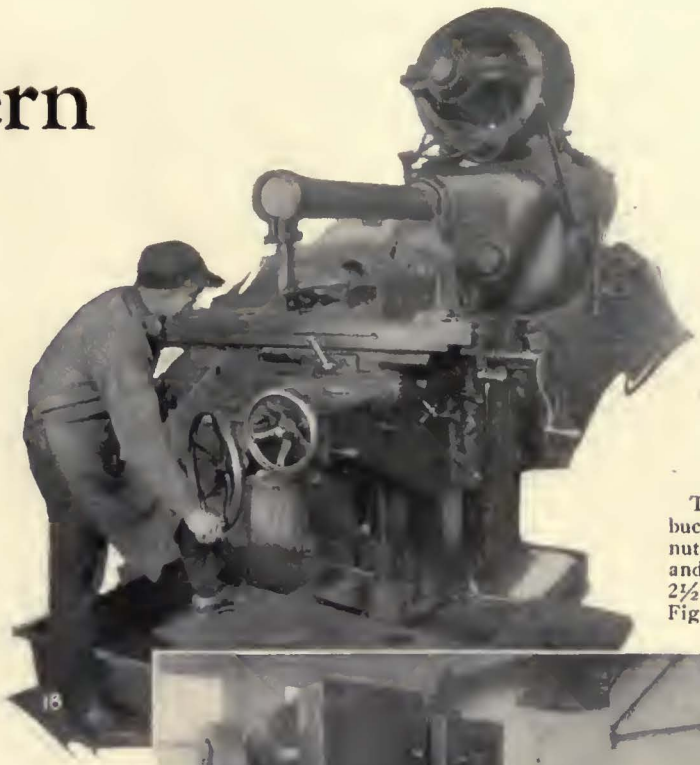


Small surfaces are finished quickly in the 16-in. shaper, Fig. 16.

The friction of a disk on the pulley of the grindstone, Fig. 17, rotates a pump to supply water for wet grinding.

s Most Modern

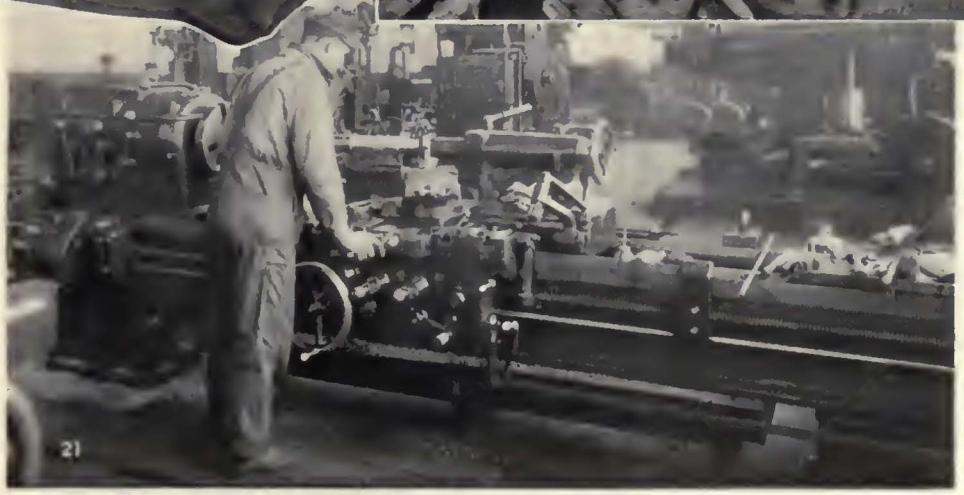
To maintain and repair cars speedily and keep them up to the modern standards of excellence a completely equipped machine shop was installed



Axle caps are bored with a special jig in the universal milling machine, Fig. 18.

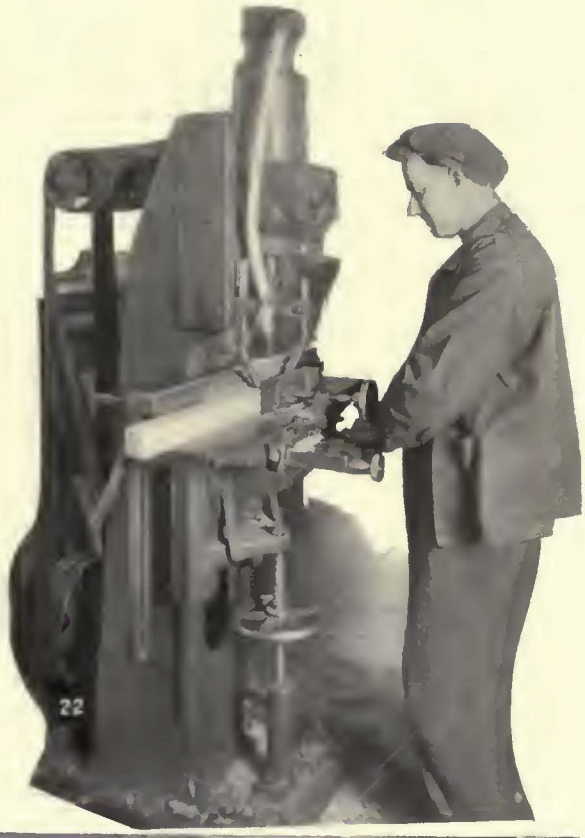
Truck bolts, turn buckles and special nuts are threaded and tapped in the 2½-in. bolt cutter, Fig. 20.

The forcing and broaching press, Fig. 19, is convenient for broaching controller handles and pressing in bushings.



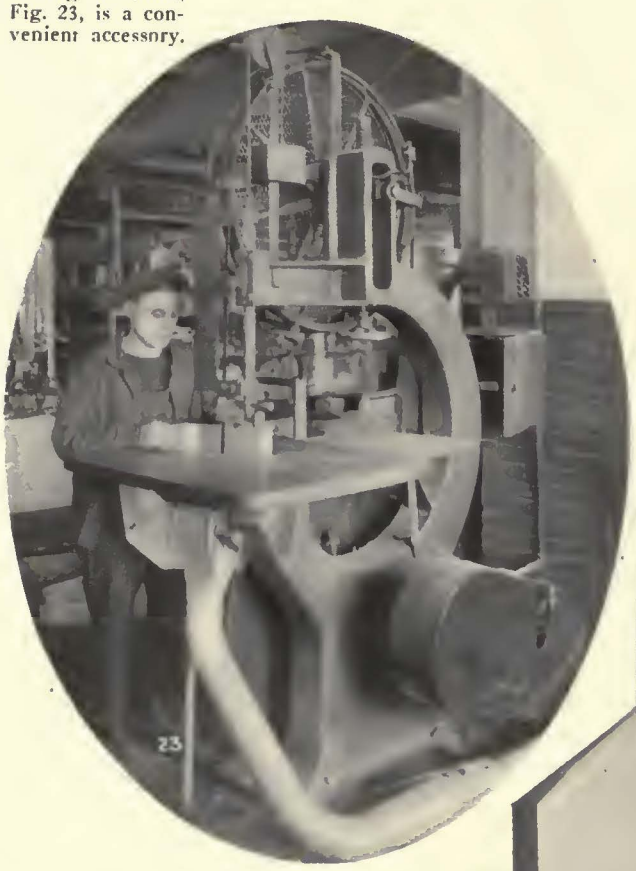
Turning of car axles is done quickly on this lathe, Fig. 21.

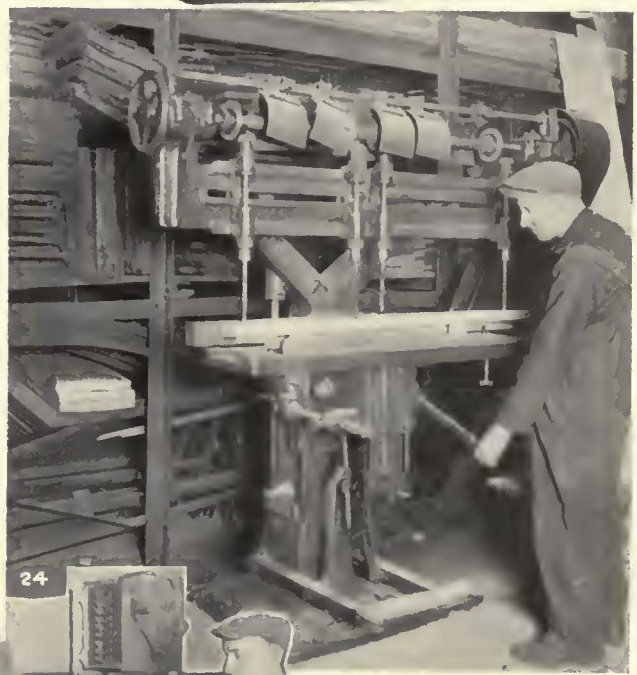
Modern
Wood-Working Machines
eliminate much hand work



Stiles and rails for sash and doors are mortised on this automatic vertical hollow chisel mortiser, Fig. 22. It has a power stroke for the chisel ram.

The 36-in. band, scroll and rip sawing machine, Fig. 23, is a convenient accessory.

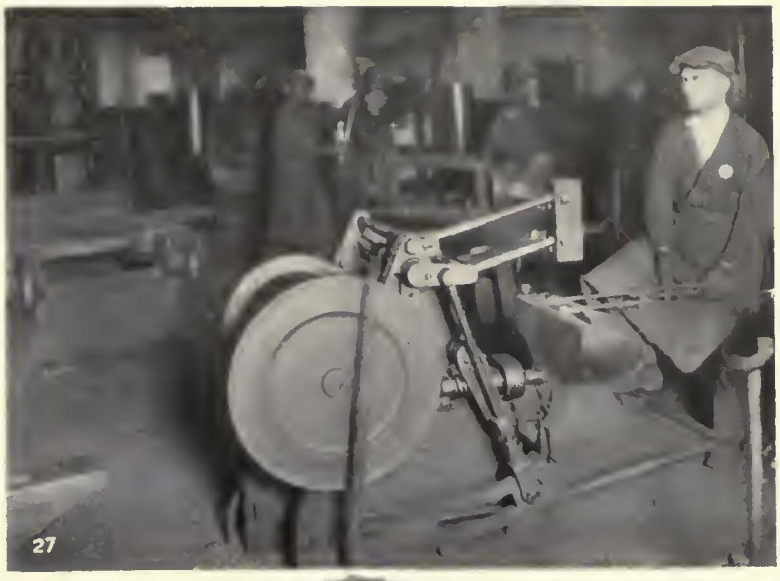




This four-spindle boring machine, Fig. 24, has a vertical adjustable table.

Material is cut quickly into slats and narrow widths on the automatic self-feeding rip saw, Fig. 25.

The oil burning furnace, Fig. 26, is used for heating heavy pieces with a long surface.

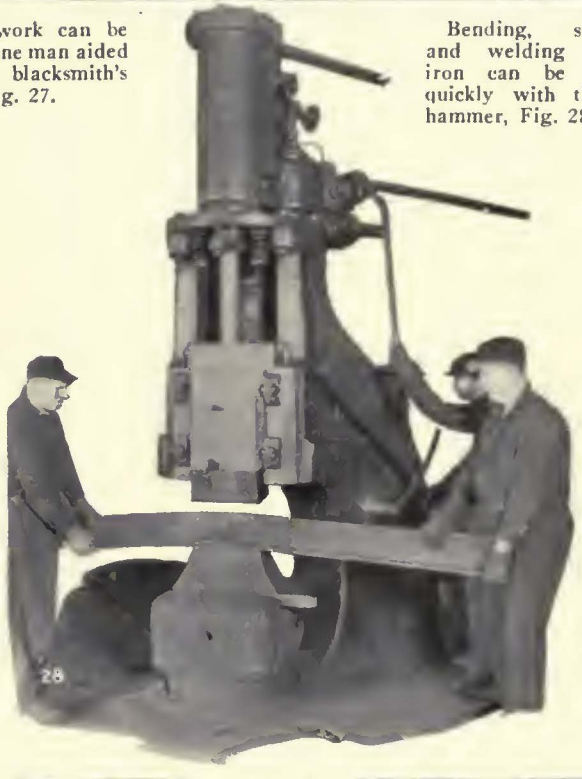


Small work can be done by one man aided by the blacksmith's helper, Fig. 27.

Bending, shaping and welding heavy iron can be done quickly with the air hammer, Fig. 28.

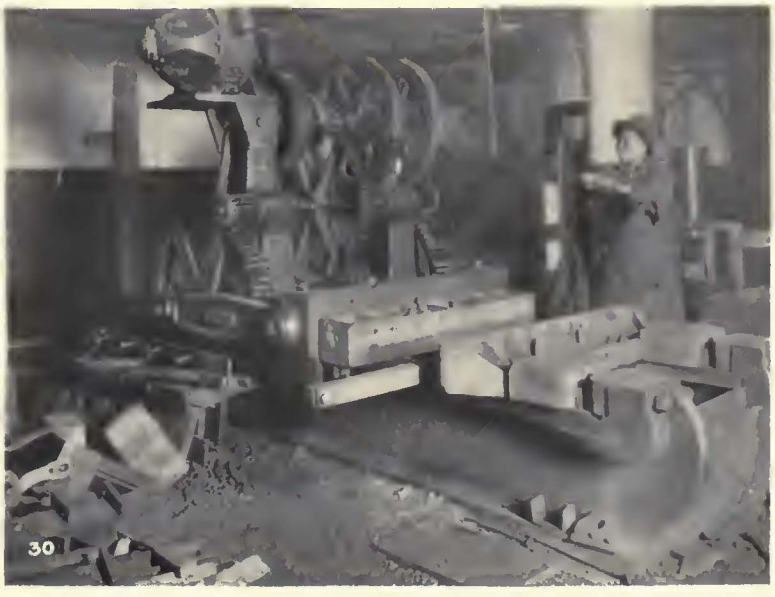
Forge Shop Equipment

is suited to light and heavy work



Bending and pressing are essential operations of the bulldozer, Fig. 30. It is used also for testing the compression of heavy springs.

Rods, angles, and other small pieces are heated in the forge, Fig. 29.



Electric Trucks *are a great convenience for material handling*

A crane truck, Fig. 31, handles heavy parts in the material storage yard.

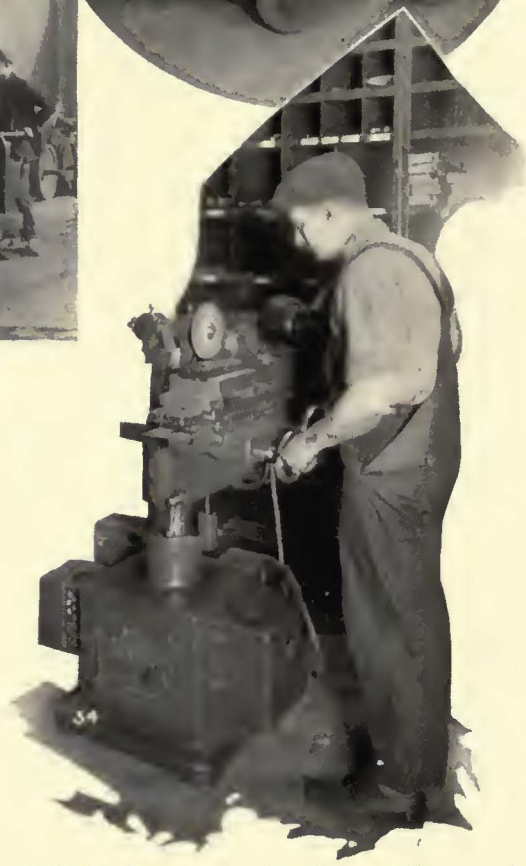
Small material is moved quickly by trucks, Fig. 32, with stationary platforms.

Controllers, compressors and other car equipment can be placed on work benches by one man with the elevating platform truck, Fig. 33.

32

31

33



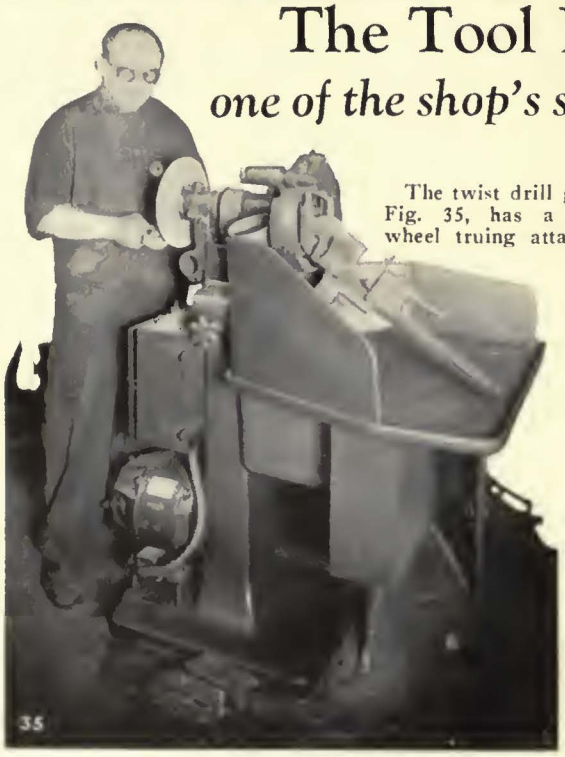
34

The Tool Room *one of the shop's show places*

Cylindrical, internal and surface grinding are done on the universal cutter and grinder, Fig. 34.

Many operations are done economically on the universal milling machine, Fig. 36.

The twist drill grinder, Fig. 35, has a special wheel truing attachment.



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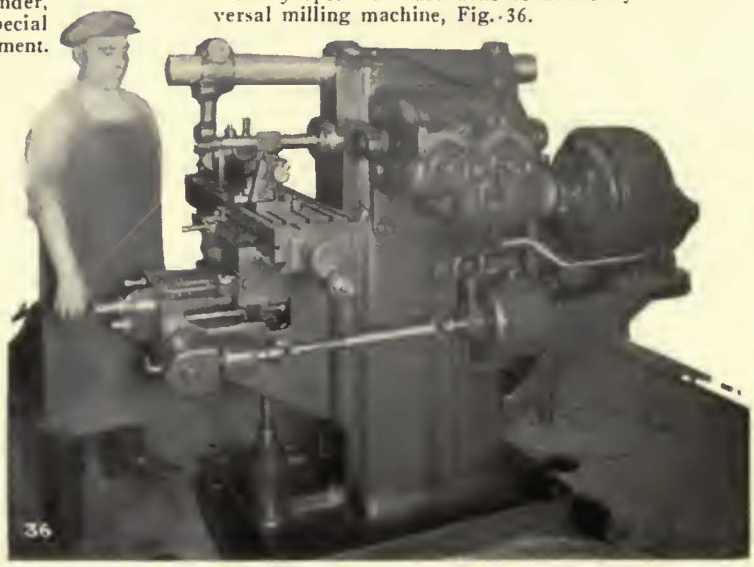


36

Electrical Maintainers Are Not Trouble Men

Successful Maintenance Should Keep Property and Equipment in Such a State of Repair that There Are No Reports of Trouble—Rigid Inspection at Regular Intervals Has Produced Gratifying Results in Chicago

By Dwight L. Smith
Electrical Engineer Chicago Rapid Transit Company, Chicago, Ill.

PROBLEMS in electrical maintenance that require daily solution on the lines of the Chicago Rapid Transit Company are quite different from those of the average city property, but similar procedure and organization can be used by most railways. The route-miles operated total 77 and the single-track miles 217. As most of the track is on elevated structures with third rail and as there are 224 passenger station buildings and an extensive private telephone system maintenance work is quite varied in character.

The electrical department is responsible for all electrical maintenance except that of rolling stock, signals and interlocking. The principal items include the following:

Third rail	200	miles
Overhead trolley	17	miles
Telephone cable	66	miles
Telephone instruments	575	
Feeder cable, underground and overhead	286	miles
Street and yard lights	1,010	
Electric sign lights	1,560	
Station and building lights	27,130	
Storage batteries (railroad)	6	
Substations (owned by railroad)	5	

Despite the magnitude of this task it is accomplished with a force of less than 50 men and the property is not only well maintained but its physical condition is being bettered continually.

Some years ago these maintenance workers were called "trouble men," with the natural result that they believed their work was to take care of only such trouble as was reported. Now the word "trouble" is taboo, the men are known as "maintainers" and their efforts are directed toward keeping property and equipment in such a state of repair that there are no reports of trouble.

A thorough system of inspection is a big factor in approaching this goal. Every item in every location is given a rigid inspection at regular intervals, varying from once a day to annually, based on the type of property and the location. This system is laid down in detail in the inspection manual with which each maintenance foreman is furnished and which he uses as a text book to school his men. In the manual there is a division of the property into classes and groups and the railroad is classified into zones, according to the density of traffic. A definite interval for inspection is assigned for each class and group of property, varying with the zone; for instance, subway lights and signs are inspected daily, third rail in the central zone bi-weekly and bonding in yards annually.

On some classes of inspection, principally those which come at longer intervals, the exact dates are left to the discretion of the foreman to fit in with his work.

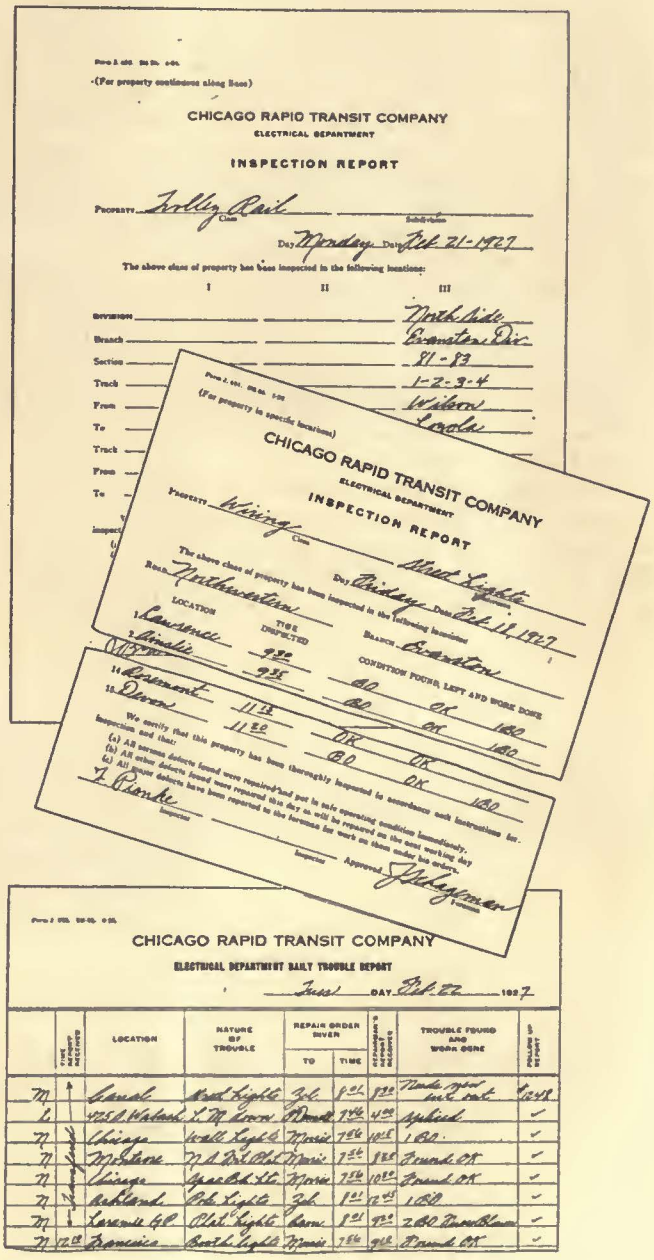


Fig. 1 (at top)—Inspection report used for property along lines

Fig. 2 (in center)—Form used for reporting results of inspection

Fig. 3 (at bottom)—The trouble sheet serves as a permanent record of cases as reported

Otherwise a schedule of dates for each inspection is published periodically in a bulletin, and no deviation from them is permitted. This is notably the case with trolley wire, where inspections must be made at night and where both foremen and inspectors were prone to postpone the date if any reasonable excuse offered. Now no excuse is deemed adequate.

Not only does the manual assign regular periods for inspection but it includes a catechism for each class and group of property. A series of questions indicates what possible faults are to be looked for and the answers tell what is to be done when any of these faults are found.

The inspectors in general do the maintenance work. Small faults found by them are repaired on the spot. Larger faults are reported to the maintenance foreman, who arranges for the necessary men and material for the repair. Faults too large to be taken care of by the maintenance forces are reported by the foreman to the office for inclusion in the construction schedule. The seriousness of any fault discovered determines the celerity with which it is repaired. Emergencies are reported immediately by telephone and the necessary men and material are despatched at once.

Reports of routine inspections are made out by the inspectors, approved by their foreman and forwarded to the office, where they are noted by the electrical superintendent and then recorded. This record shows the dates of inspection of each class and group of property in each location. A frequent check-up serves to show whether inspections are being kept up to the required interval. The forms used in reporting inspections are shown in Figs. 1 and 2.

In line with the policy of prevention is the practice of anticipating possible trouble caused by necessary interference with electrical property by the work of other departments. This information is given through an exchange of work orders, by written and telephone reports and by close liaison between the supervisory forces of the departments. In some cases the interference can be eliminated temporarily while work is going on. A close watch always is kept and inspections are made more frequently than normally.

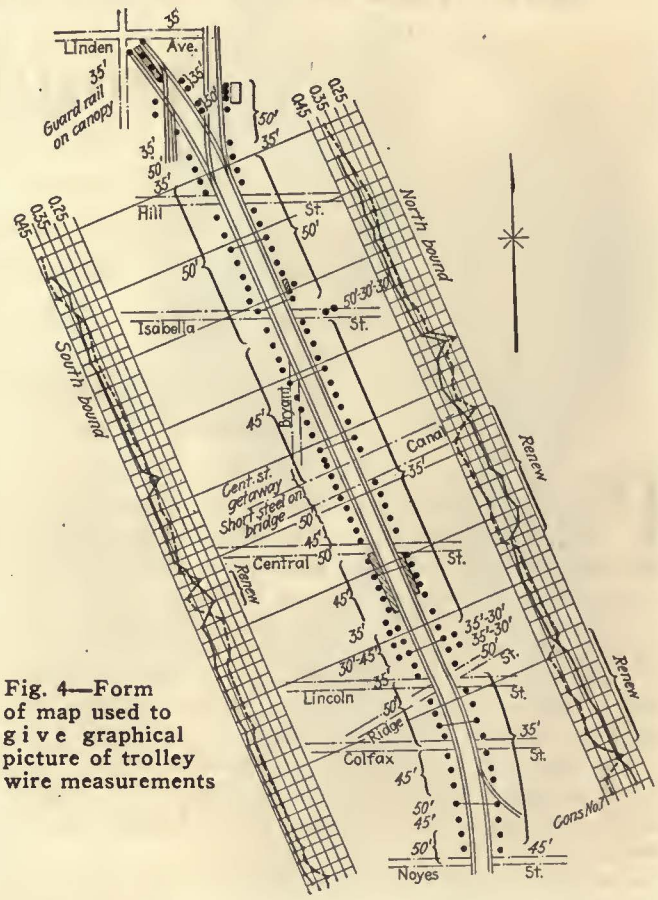


Fig. 4—Form of map used to give graphical picture of trolley wire measurements

Maintenance men are grouped into gangs of from six

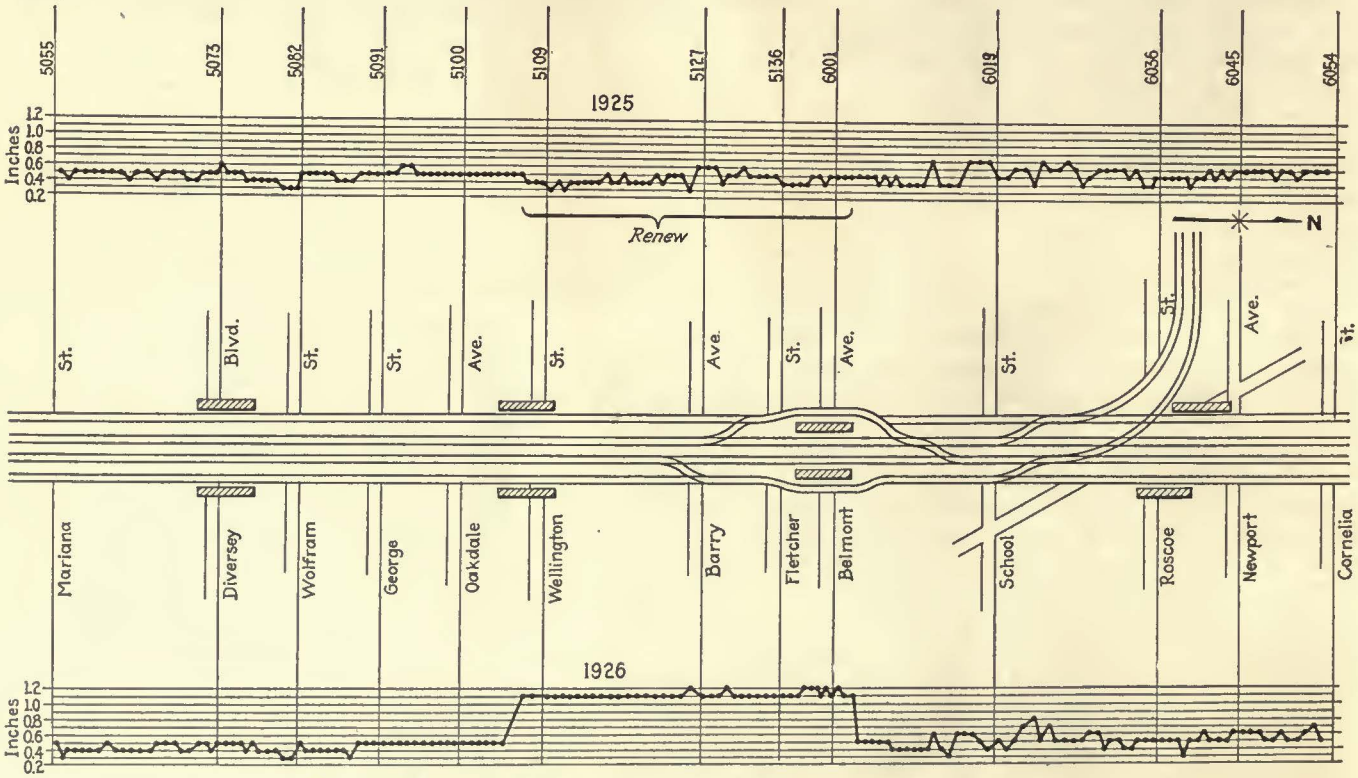


Fig. 5—Map and graphs are used to show third rail measurements

The maintenance shops serve as headquarters for the men—they report and quit work at the shop

The illustration at the left shows method of measuring the thickness of head of the third rail

to eight, each in charge of a foreman. There are five such, one for third rail, one for telephone, one for cable and one for line work, small wire and lighting. These four gangs not only do maintenance but minor items of construction, and work over the entire system. Each has a maintenance shop as its headquarters and as the men work one place today and another tomorrow, they report and quit at their shop. Each shop is equipped with the necessary tools and a working stock of material which is taken out as needed.

The fifth gang includes the maintainers, who are assigned to divisions and branches of the road and who, in general, work singly, but are always on hand in their assigned territory. A large part of the work of these men is replacement of burnt out lamps and taking care of trouble as it is reported, but in spite of this, the term "trouble man" is avoided and they are known as "maintainers." Each of these men has a headquarters at the geographical center of his territory. There he keeps his necessary small tools and stocks of lamps and material, arranged neatly in steel cases. The foreman of this group acts largely as an inspector, spending time with each of his men in turn, checking up their practices and standardizing their methods. He is responsible for keeping their headquarters supplied with the necessary stock of materials, which are ordered from and delivered by the electrical materials man.

The first four gangs mentioned are on duty only during regular working hours. The fifth one not only has a day shift but has a second shift of two men who are on duty up to 1 a.m. with a consolidation of territory. Between 1 a.m. and 8 a.m. the small amount of maintenance necessary other than that regularly scheduled is cared for by men acting in the dual capacity of signal and electrical maintainers.

The costs of maintenance work of each class are kept by the cost clerk on maintenance work orders. These cover twelve-month periods ending Oct. 1 so that the data are ready for use in making the budget for the succeeding calendar year.

The power supervisor acts as work dispatcher and clearing house for all electrical trouble. He can reach by telephone every point on the system. All foremen and maintainers keep him informed as to their whereabouts, all electrical trouble is reported to him and he can reach the proper personnel quickly to cover any emergency. The territorial maintainers are directly under his control at all times, receive from him trouble assignments in their territory and report back on each case and to get their next assignment. A "trouble sheet" kept by the power supervisor serves to record cases as reported, designates assignments and "OKs" with the time that the order is given. This becomes a permanent record kept on file for three years and to which reference is frequently made. This is shown in Fig. 3.

The maintainers on the afternoon trick have a large territory and skillful routing by the power supervisor

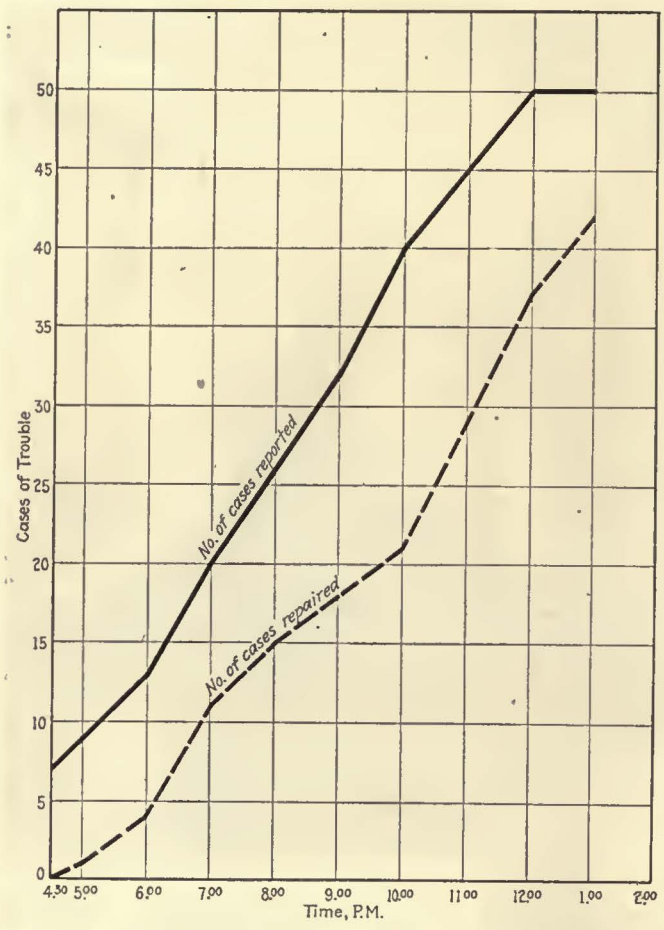


Fig. 6—Graph gives a continuous record of cases reported and repaired

is necessary to enable them to cover all reports. He keeps a graph of the number of defects reported and repaired. Fig. 6 gives such a graph. This is of value to provide a constant picture of how the work is progressing.

Sometimes the territorial maintainer can make only temporary repairs which are safe enough for operation for a few days. When such repairs are made a "follow-up slip" is filled out by the power supervisor and sent to the foreman of the appropriate maintenance gang, which makes the repair permanent.

The Chicago Rapid Transit lines are a consolidation of five properties, each of which originally used a different standard of construction and materials. Since the consolidation universal standards have been laid down to which all new construction and rehabilitation conform. Many of the old parts must still be kept in stock for maintenance, which makes quite a variety of maintenance materials, but standardization is progressing gradually.

Renewals are really wholesale maintenance, but there is a definite point, determined by an economic balance, where smaller repairs should stop and larger renewals begin. In determining this point the first requisite is accurate information; estimation will not do. The service on this road is so severe that in places No. 0000 hard drawn copper trolley wire has a life of only eighteen months. To determine when renewals are necessary and their extent the trolley wire is calipered in each span with a micrometer caliper about every 50,000 wheel passes, the passes being measured by an automatic contactor-operated counter. These measurements are plotted on a map and a study of this record gives the desired information. Fig. 4 shows such a map. Where weak spots are found which do not as yet require renewal they are calipered at more frequent intervals. This plan has enabled the company to keep wire in service until worn to 40 per cent of its original area, without a wire break in 2½ years due to wear.

The useful life of the original installation of third rail is just being reached. The same method has been used to determine the necessity for renewal, the rail head being measured for thickness every rail length and the results similarly plotted. The gage used for this measurement was designed and built by the department. It is arranged so that the operator is insulated from the rail, can place his gage on the rail without stooping and take his reading from a scale at the height of his eyes. A small clipboard attached to the upright holds the sheets on which the readings are recorded. The resulting graph is shown in Fig. 5. This method has resulted in renewals of comparatively short lengths where absolutely needed, rather than the previous practice of renewing long lengths which were estimated to require it, only to find that a part of the rail renewed still had several years of useful life.

Throughout this system of maintenance the keynote is inspection—catch the possible faults before they occur and remedy them. The result has been that delays because of electrical faults are now almost unknown, and that in spite of the continued addition of property the maintenance man-hours are steadily decreasing.

Modern Cars and

Pneumatic apparatus must be given careful attention,
Regular and systematic care is essential.
Oil and grease will prevent abnormal wear.
Periodic cleaning will assure continuity of service;
Even the door engines should not be neglected.
Require all inspections to be of the highest type.

Men should be instructed in proper care of parts.
All valves must be carefully tested during inspection.
Instead of criticising the design, do the work well;
No apparatus will function right if maintained wrong.
The secret of good operation is good care—
Every nut, bolt and moving part should be examined,
Nothing should be taken for granted.
Analyze failures carefully to prevent a repetition,
Note the cause of each one and correct the cause.
Careless work should not be tolerated.
Even the motormen can help by proper operation.

With every man helping maintenance will be improved.
Insist on regularity of inspections, as
Long overdue inspections invite road delays, so
Let delays decrease and public friendship will increase.

Personal supervision will prove beneficial.
Running apparatus until it fails is poor practice, for
Old or defective parts should be replaced.
Vision of 100% perfect operation can be attained, and
Every management wants successful performance.

Each man will do his share if instructed properly;
Co-operation must exist. To do this
Only capable men should be used on the work and
No inferior material should be used for repairs.
Old methods of drainage are not always suitable.
Much depends on the piping arrangement;
Inspect all piping and apparatus for slow leaks.
Carefully operate all parts before return to service
And if these details are taken care of properly
Long and successful operation will be assured.

Just to the north of the main carhouse and repair shop in Chattanooga is a 70x200-ft. garage recently built by the Tennessee Electric Power Company

Bus and Vehicle Maintenance

Centralized in New Building

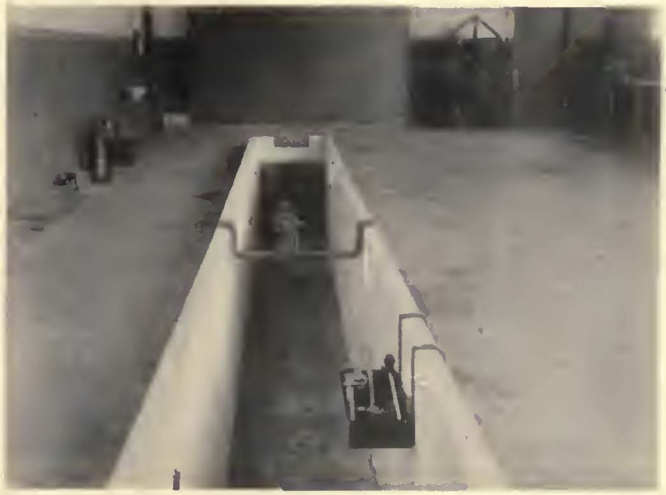
Railway and Power Motor Vehicles of Tennessee Utility Housed in 70x200-Ft. Steel-Tile Structure—Mechanical Costs Kept for Individual Vehicles—Facilities Include Railway Type Pit with Lights Mounted in Side Recesses

By E. D. Reed

Manager Chattanooga District, Tennessee Electric Power Company, Chattanooga, Tenn.

WITH the opening of a new garage early this year and the working out of a system for keeping costs on individual vehicles, the Tennessee Electric Power Company is now well equipped to handle under the one roof all of its 57 motor vehicles. These include five Model Z Yellow buses, 29-passenger capacity, operated from the downtown section to outlying parts of the city of Chattanooga, and 52 trucks and automobiles. The latter include various makes and types—Packards, Buicks, Dodges, Chevrolets and Fords. The trucks are White and Federal. In this list are vehicles used by both railway and power departments, line and emergency cars, as well as official automobiles.

A site for the garage was available immediately to the north of the present trolley carhouses. As shown in the accompanying plan, the garage runs through from Market to Broad Street with two doors on each. This location simplifies the supervision, since J. R. Anderson, superintendent of railways, has jurisdiction over the garage, which is directly in charge of O. E. Nix as foreman. Under him are four day mechanics and two night mechanics with a washer on duty day and night to do oiling and greasing as well. Another employee is a boy whose sole duty is to keep the garage clean. This job we consider rather important. He is supposed to wash down the bottom of the repair pit every day and to clean up immediately any oil or grease that may get on the floor.



A repair shop feature is a 40-ft. pit with openings along the side for electric lights. The rolling steel door leads into the main storage space

The new building, which

THE TENNESSEE ELECTRIC POWER CO.

DISPATCHER'S DAILY RECORD OF AUTOMOBILES AND TRUCKS DATE ---------- 192 ----------

	NUMBER	LICENSE NUMBER	CAR	OUT			IN		OUT			IN		REMARKS
				TIME	Speedometer Reading	DRIVER	TIME	Speedometer Reading	TIME	Speedometer Reading	DRIVER	TIME	Speedometer Reading	

1

THE TENNESSEE ELECTRIC POWER COMPANY

AUTOMOBILE MONTHLY COST RECORD MONTH---------- 19---

CAR NO						CAR NO.						CAR NO.					
	LABOR COST	MATERIAL COST	GAS COST	OIL COST	TIRE COST	LABOR COST	MATERIAL COST	GAS COST	OIL COST	TIRE COST		LABOR COST	MATERIAL COST	GAS COST	OIL COST	TIRE COST	

2

THE TENNESSEE ELECTRIC POWER CO.

AUTOMOBILE INSPECTION AND REPAIRS

CAR NO.---------- MAKE OF CAR---------- IN ----------

OUT ----------

CLASS OF WORK ----------

RATE	LABOR	TOTAL HRS.	COST

	TOTAL LABOR		
	TOTAL MATERIAL		
	GRAND TOTAL		

REPAIRED BY ----------

REPAIRED BY ----------

3

Form R-101-1B 10-26 THOMPSON

Car No.---------- Date----------

Location ----------

Speedometer Reading ----------

Tire Number ----------

4

Form R-101-1B 10-26 THOMPSON

Car No.---------- Date----------

Location ----------

Speedometer Reading ----------

Tire Number ----------

Cause for Change ----------

5

Form R-16 600 10-26 THOMPSON

THE TENNESSEE ELECTRIC POWER COMPANY PUMP NO.--------

GARAGE DAILY GASOLINE AND OIL RECORD

7 A. M.---------- TO 7 A. M.---------- 19----

	CAR NO.	REGISTER READING—START	REGISTER READING—STOP	NO. GALS.	QUARTS OIL	CAR No.	REGISTER READING—START	REGISTER READING—STOP	NO. GALS.	QUARTS OIL	CAR No.	REGISTER READING—START	REGISTER READING—STOP	NO. GALS.	QUARTS OIL
	1					102					27				
	2					103					28				
	3					104					29				
	4					106					30				
	5					108					33				
	86					23									
	95					24					Shop				
	96					25									
	97					26									

REGISTER READING STOP---------- REGISTER READING STOP----------

" " START---------- " " START----------

TOTAL GALLONS---------- TOTAL GALLONS----------

SIGNED---------- SIGNED----------

6

Form R-100 300 7-26 THOMPSON

PNEUMATIC TIRE RECORD

TIRE No. MAKE SIZE COST

CAR No.	POSITION	ON	SPO. READING	OFF	SPO. READING	NET MILEAGE	TOTAL MILEAGE	COST OF REPAIRS	DEFECT

7

No. 1. "In and Out" form for all vehicles; 19 in. across and 11⅝ in. high, printed on white bond paper with blue rules.

No. 2. Monthly costs are tabulated under five headings. The form, which is 13⅞ in. x 11⅝ in., is printed the same on front and back.

No. 3. On each vehicle being inspected or repaired is this 5½ x 8½-in. white card showing labor and material, the latter listed on the back of the form under Quantity, Kind of Material and Cost.

No. 4. This is a yellow tag, 2⅝ x 5½ in., marked "Tire On" the back.

No. 5. Is a red tag of same size with "Tire Off" printed on the back.

No. 6. Car numbers are repeated so that two entries can be made daily. The form is on 12⅝ x 14⅛ in. white stock with blue rules.

No. 7. The tire record contains the life history of each tire as well as its location. This is a 5 x 8-in. card.

Yellow buses and Packard touring cars are some of the equipment that is stored and maintained at Chattanooga. At the rear are tools used in the repair shop

has a steel frame with brick and hollow tile walls, represents an investment of about $45,000, while the garage equipment installed required an investment of at least $1,000 more. Roof and ventilators are of the Roebling steel type and a Wing blower heating system is installed. The roof is mounted on steel trusses with 15-ft. headroom and set on 20-ft. centers.

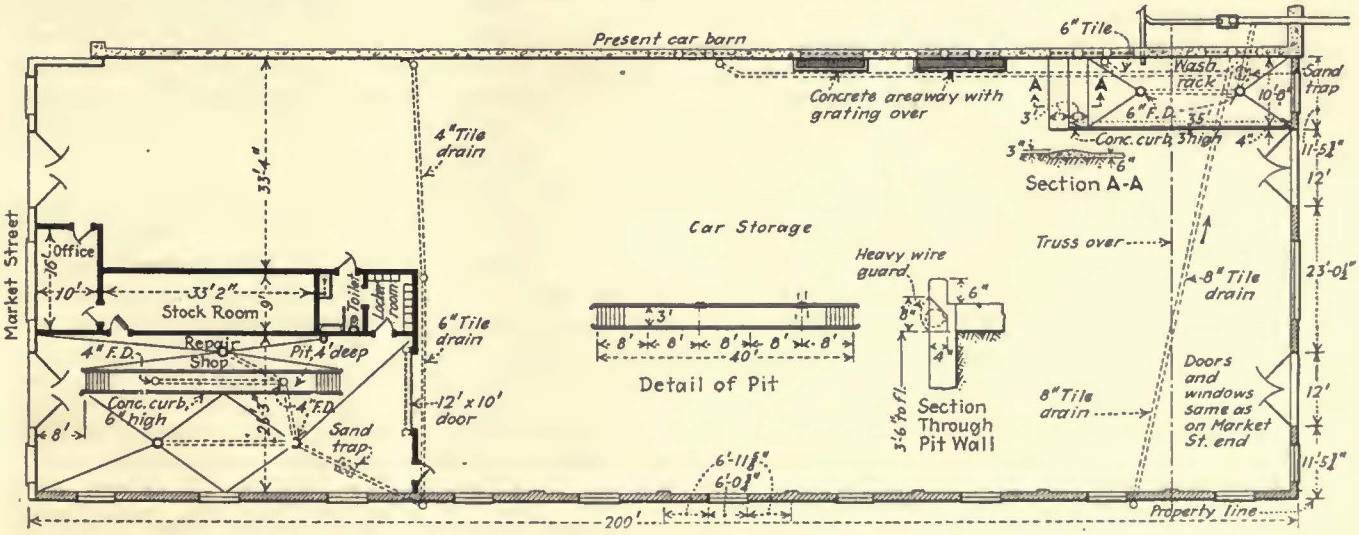
At the Market Street end there are grouped in one corner an office, stock room, locker room and repair shop as indicated in the plan. These are separated from the storage portion of the garage by 8-in. hollow tile walls carried to the roof. Thus of the total 14,000 sq.ft. of area, a little more than 80 per cent is used for storage, about 11 per cent for the repair shop, and 8 per cent for the other rooms. There is a wash rack in the southwest corner which is separated from the garage by a concrete curb 3 in. high and 4 in. wide along the side. It has a raised portion at the end over which vehicles can be driven.

A useful part of the repair shop is a pit 40 ft. long, built along railway lines. It is 4 ft. deep, and along each edge for its full length is a concrete curb 6 in. high and 4 in. wide. Four 50-cp. Mazda lamps are placed in pockets, two on each side of the pit, as illustrated in the plan and one of the views. Over each bulb is placed a heavy wire guard.

Two useful home-made devices are shown in the picture of the pit. The one spanning the pit is to support the jacks used for lifting the rear end of a bus. It is made of 1-in. x 6-in. steel bar. Its shape is such that it gives the men plenty of room to work. The other device consists of two pieces of strap bent to hook over the edge of the pit so as to support a tool chest or a box for spare parts.

Gasoline is bought from the Standard Oil Company. It is stored in two tanks, each of 560 gal., from which it is pumped direct to the buses or automobiles. Galena oil is used for the company's Yellow buses. It is kept in drums fitted with single-stroke pumps. These vehicles also use Dixon No. 677 differential grease and No. 672 gear grease.

Smaller parts kept in the storeroom are held in a



Two 12-ft. doors are placed at each end of the Chattanooga building, leading to two of the main streets

Berloy Berger all-steel cabinet. Parts most frequently needed for the various vehicles are stored here, although no effort is made to keep many of the heavier parts. Three all-steel work benches 6 ft. long and 30 in. wide have been placed in the repair shop. They are fitted with vises made by the Reed Manufacturing Company.

Several devices have been installed for the more efficient handling of equipment. These include three Chisholm Moore chain hoists, three Weaver garage jacks, three Reese portable jacks and one Weaver High-Lift jack of 4-ton capacity. For routine repairs there are a Black & Decker valve refacer, electric drills, a Russell relining machine, Alemite pressure grease gun, and a 40-ton Weaver gear press. The Monarch 9-in. engine lathe, the Hisey-Wolf double-wheel electric grinder, an acetylene welding outfit and a Marshall constant-potential battery charging outfit have also been found useful.

Two methods are used for keeping track of the company's miscellaneous collection of buses, trucks and automobiles. First, a daily record is kept of the time a vehicle is taken out of the garage, the time it is returned, the miles covered in the period and the driver's name. The form used is reproduced with this article.

Second, a cost record is kept for each vehicle. Totals are entered on a sheet which is used for making the monthly report to the executive officers. There are five divisions of costs, built up as follows: All labor and material are recorded on the card "Automobile Inspection and Repairs," a copy of which is attached to any vehicle which is in the garage for repair work or inspection. The next items, fuel and oil, are taken monthly from the sheet headed "Garage Daily Gasoline and Oil Records," which is filled out each day as any vehicle is supplied.

The system used for the tire costs also permits keeping track of the location of any given tire. When a new tire or one repaired is placed on a vehicle a yellow card, "Tire On," is filled out with the number of the car, the speedometer reading and the tire number. This number is also entered on another card, "Pneumatic Tire Records," kept for each individual tire in use. When the tire is removed a red card, "Tire Off," is filled out with location, speedometer reading and the cause for the change. The information from the red card in turn is transferred to the proper tire record card. Any expense in repairing a tire is noted on this red card and is totaled at the end of the month from the cost record to give the item "Tire Costs."

This garage is considered large enough to take care of our requirements for some time to come. More equipment may be added as additional experience is gained, but the results so far indicate that our engineers have made a wise selection not only in the building construction and facilities but also in the garage equipment.

Combination Salt, Sand and Side Wing Car

By Robert Harris
Master Mechanic New Brunswick Power Company, St. John, N. B.

KEEPING snow at a reasonable distance from car tracks so that additional roadway space would be available for vehicles following a snowstorm is a necessity in the northern country. To meet the requirement for additional equipment for the purpose the New Brunswick Power Company, St. John, N. B., built a combination car in its shops. The dimensions of the car are given in an accompanying table.

The underframe construction of the car is of steel and wood. The outside sills are ⅜-in. x 4-in. x 4-in., 8.5-lb. angles, laid with the flanges on the outside and the bottom. A 5-in. x 6-in. wood filler is attached to receive the outside sheathing and double floor. The intermediate sills are 1¾-in. x 5-in., 6.5-lb. channels, placed 3 ft. 5 in. on centers and an equal distance from the outside. Provision is made for trapdoors for the inspection and repair of motors. The use of a shallow channel permits a low center of gravity. The channels are notched into the cross sills, which are spaced to suit motor conditions, and the whole framework is tied together with tie rods spaced 3 ft. 4 in. apart. Angles and crown heads are used under vestibules. The side sills, intermediate sills, drawbar sills are all fastened securely to a 6-in. channel bumper 15.5 lb. to the foot.

The sides of the car are built up of 2½-in. x 3-in. ash posts with double cross bracing. Sheathing is used inside and out with ¾-in. tongued and grooved material. This runs perpendicular outside and longitudinal inside. The roof is of the arch type. Windows are provided in the cabs for double-end operation and a window on each side is used when winging back snow.

Metal boxes installed directly over each wheel are fastened securely to the side of the car. These contain approximately 18 cu.ft. of sand to be used for sanding the rails. The sand also acts as ballast for the car while winging back heavy snowfalls. The flow of sand to the rail is controlled by means of hand levers which operate the two forward boxes in the direction that the car is going. The sand flows through slide valves and down metal lined hose to the rail, the amount being regulated by the distance that the lever travels.

In addition to carrying sand, the car is also loaded with from 40 to 50 bags of salt, each bag weighing 160 lb. Individual bags are placed on a table on each side of the car from which the salt is emptied into hoppers. The salt is distributed to the tracks after passing through rollers and a metal pipe.

DIMENSIONS OF COMBINATION SAND, SALT AND SIDE WING CAR OF NEW BRUNSWICK POWER COMPANY

Length over bumpers	25 ft.
Width over drip-boards	6 ft. 8 in.
Height rail to top of trolley board	11 ft. 2 in.
Height (inside) floor to roof boards	7 ft.
Type of truck	Single, 21-E-Brill, reinforced, 7-ft. wheelbase
Wheels	Rolled steel, 33 in. diameter, 5-in. axle, solid gear
Motors	Westinghouse 101-B-2, 15:69 gear ratio

A solid steel side wing is installed on each side of the car. This is constructed of ⅜-in. x 24-in. x 14-ft. material and weighs 1,000 lb. The wings are arranged so that they swing out from the body of the car and they may be set to any desired distance from the rail up to approximately 14 ft. The wings are also provided with interchangeable blades on the bottom that can be raised and lowered to clear certain obstructions.

The total weight of the car is approximately 20 tons. In addition to being used during winter weather, it is proving a valuable piece of equipment for all-year service. To add to its utility it is planned to attach an ice breaker.

Electric Railway Journal Maintenance Data Sheet

This Section Represents a

New Service to Maintenance Readers

of "Electric Railway Journal"

MANY electric railway men have suggested the advisability of publishing the maintenance note material which has appeared in the JOURNAL for many years in a form which would make it more convenient for handy reference. Complying with this desire, a maintenance data sheet section will become a regular feature of future issues of the JOURNAL and will appear in the third issue of each month.

For convenience in indexing the data for reference, each item will bear a departmental heading such as "Rolling Stock," "Line Department," "Track and Way Department," "Buses and Trucks," "Standards," "General Data," "Power and Electrical Department," etc.

If desired, these general headings may be further classified into specific operations or departments. Thus, items headed "Rolling Stock" may be divided into "Machine Shop," "Truck Repairs," "Motor Repairs," "Electrical Repairs," "Sheet Metal Work," "Tool Room," "Carpenter Shop," "Car Body," "Blacksmith Shop" and "Paint Shop." Other general headings may be subdivided similarly.

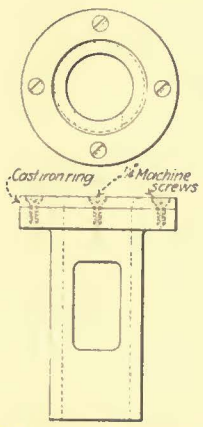
Suggestions are requested from JOURNAL readers as to the character of material that will make this section of greatest value. Maintenance men are urged to take part in the interchange of new ideas. The other fellow wants to know about improved methods of doing a routine maintenance job or a new kink or fixture that saves muscle and labor. By helping him you help yourself. A photograph or sketch with a brief description of the operation or fixture is all that is required. ELECTRIC RAILWAY JOURNAL will pay $5 for each idea published.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Bearing Flanges Reclaimed with Cast-Iron Rings

WORN armature bearing flanges are being reclaimed in the shop of the Washington, Baltimore & Annapolis Electric Railroad at Academy Junction, Md., by the installation of cast-iron rings on the worn surface. Master Mechanic J. A. Mellor believes that at least doubled life of bearings is obtained. The worn flange and the two surfaces of the cast-iron ring are machined and the ring is fastened to the flange by means of four ¼-in. flat-head machine screws countersunk at least ⅛ in. below the outer surface of the ring. When installing these reclaimed bearings a fiber ring is placed between the cast-iron surface and the bearing surface of the oil deflecting ring to keep the metallic wear of these parts at a minimum.



Method of attaching cast-iron ring to worn armature bearing flange used by the W., B. & A.

This practice has been adopted for all types of motors where it is applicable. The rings are being installed when required on all motors as they come through the shop for overhauling.

No trouble has been experienced with these cast-iron rings and it is believed they have effected a large saving in bearing maintenance.

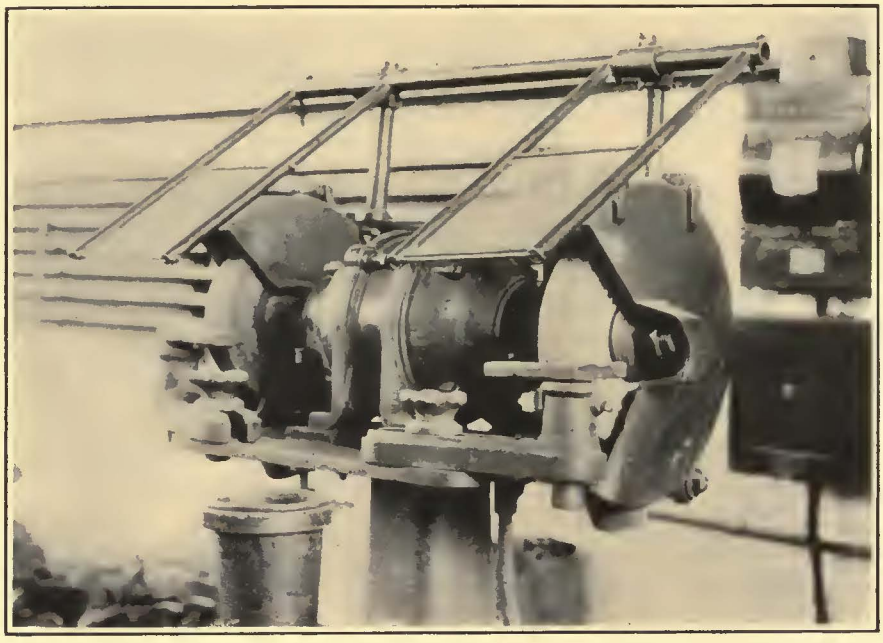
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MACHINE SHOP

Safety Glass on Grinder Replaces Goggles

PLATE glass safety guards are mounted on emery grinders in the South Park shops of the Los Angeles Railway to protect the operator's eyes. These 8½ x 10-in. glass guards, one in front of each wheel of a double grinder, are made of ¼-in. plate glass. The frame is supported by brackets attached to uprights mounted on the grinder. The side members of the glass frame are of ½-in. pipe, the cross-member and the uprights at the back are ¾-in. pipe. The brackets which hold the horizontal member are made with set screws so that the frame may be slid sideways to cover wheels of various widths or those mounted with extended arbors so they do not fall in the same line as the standard wheel.

This type of guard has been approved by the local council of the National Safety Council. It allows operators to use wheels so equipped without wearing goggles.



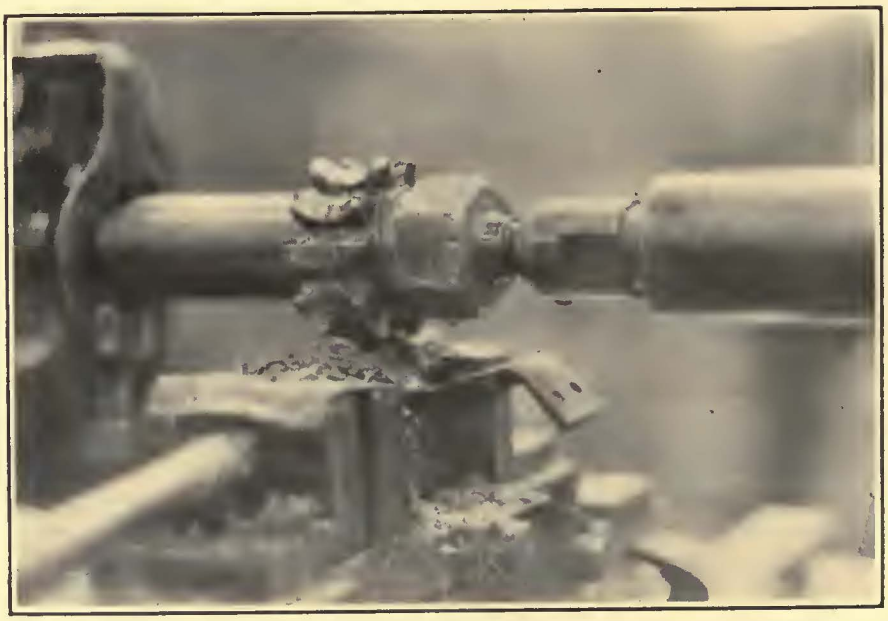
Protecting windows mounted over emery wheels as a substitute for goggles, Los Angeles Railway shop

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Contact Fingers Refinished in Lathe

BURNED contact fingers on K-35 controllers used by the Market Street Railway of San Francisco are refinished with a milling cutter in a lathe. The finger is held in a special clamp which allows for adjustment both horizontally and vertically. This clamp is mounted on the cross-feed carriage. The concave-shaped milling cutter is carried on a mandrel. Alignment of the fingers to be refinished is obtained by the use of the longitudinal feed on the lathe and the adjusting screw in the clamping device. The finger is fed against the milling cutter by the automatic cross feed. A very fine cut removes all the imperfections on the finger.

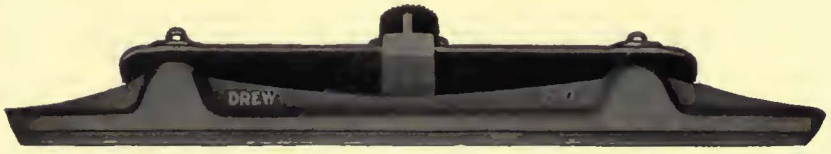


Controller fingers are refinished in lathe operating as a milling machine. The concave cutter takes a fine cut off of the finger

DREW Equipment for Electric Railways

Drew Floating Bell Hanger
Positively eliminates loose ears because of tight lock between hanger and ear. Prevents rusted and worn threads. Assures better service with a saving.

No. 7520 Porcelain Strain Clevis
Used in large quantities by leading railway companies for great variety of overhead work. Practical. Convenient. Ample insulation. Strong enough for any overhead work.



Drew Spring Ear
Does away with destructive wear on trolley. Eliminates pounding on trolley wheel, base, hangers, trough structure. Insures smoother and quieter car operation.

Drew Overhead Line Material is always of the latest approved type. Built to a standard that has made Drew Products *first* among railway men, you can be sure that every article will give many years of good, hard service. Easy and quick to install. Economical to buy.

Whatever you need for electrical railway maintenance and installation work, you can know that Drew will deliver what you want, where you want it—when you want it. Drew service is quick, prompt, satisfactory.

Drew Products assure better service with a saving.

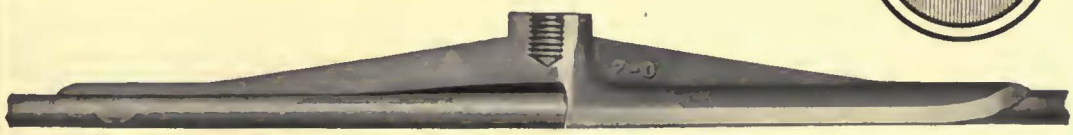
Descriptive material and prices on request.

Drew Safety Mirror
Greatly reduces boarding and alighting accidents. Quickly adjustable for different types of cars. Gives motorman clear view of steps. Cuts running time because motorman can always be ready for instant starting.

MEMBER AERA

Drew Electric & Mfg. Co.
Cleveland, Ohio

DREW



Drew Cushion Ear (Above). The merit of this ear is best recognized from its performance in actual service. Repeat orders over a period of years from large and small properties prove the claims we make for Cushion Ears. Longer life and complete protection for the trolley wire.

Type "L" Heavyweight or Type "R" (Lightweight) Splicing Ear or Splicer actually becomes a part of the wire in use, giving smooth under-run for the life of the wire. V shaped approach carries the current collector on and off with minimum jar or vibration. Prevents notching or rough spots.

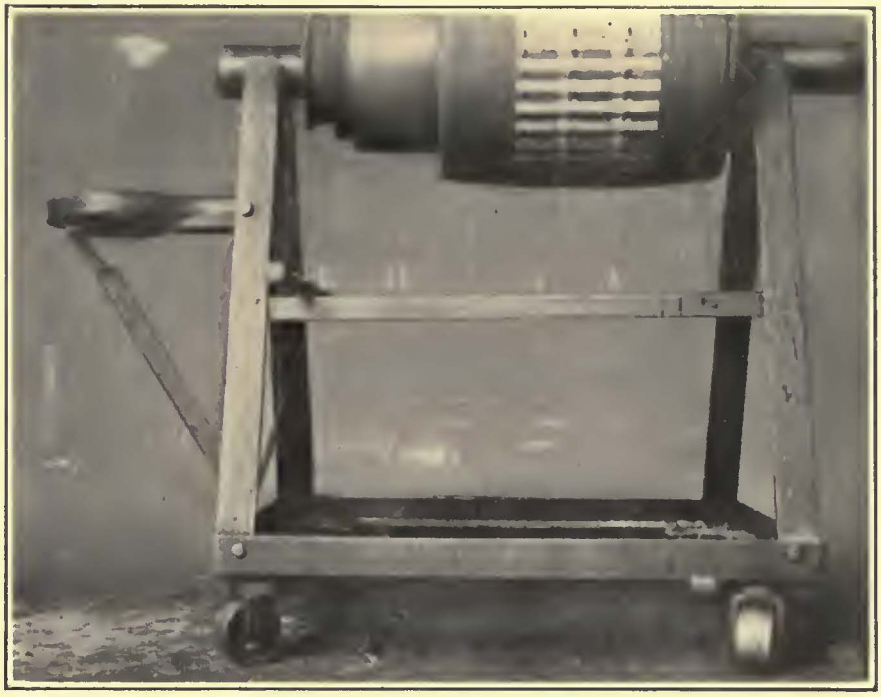
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Portable Armature Winding Truck

PORTABLE armature winding trucks are in use in the armature room of the Wilkes-Barre Railway, Wilkes-Barre, Pa. Each is equipped with a metal shelf and a drop seat. The truck framing is constructed of angles, rigidly bolted together.

The shelf is of sheet steel and is installed between the pedestals the full width of the truck frame. It is very convenient for the reception of the worker's tools and repair material. The wood drop seat is hinged to the pedestal and is found useful when the winder is working upon commutators and connections for commutators. It is claimed that the use of this truck has increased production due to the fact that tools and material are close at hand.



Portable armature winding truck with workman's seat and material shelf

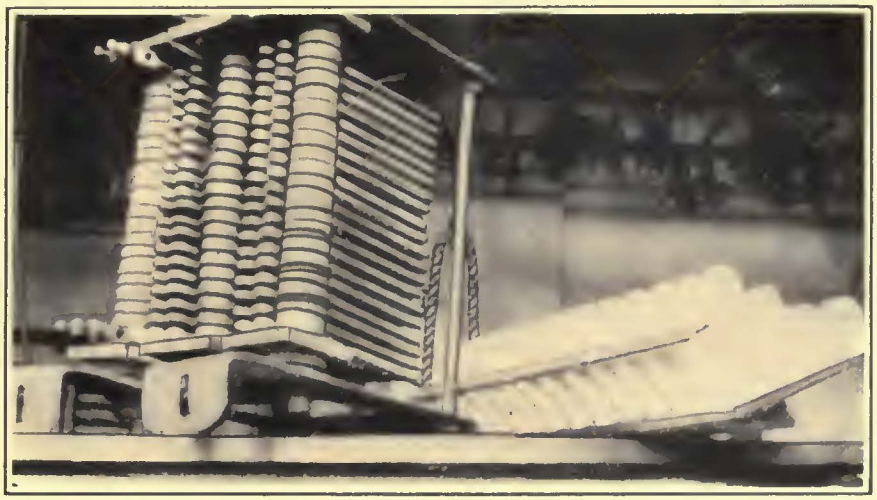
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Fiber Washers Increase Creepage Distance on Resistors

INCREASING the creepage surface on rheostats has been accomplished by the New York Railways through the installation of a 3-in. x 3-in. piece of red fiber on each grid-supporting rod between the last grid and the frame. This has eliminated creepage to the frame due to mud collection.

Breakage of controller air deflector backs has also been eliminated by the substitution of red fiber. This fiber has proved satisfactory under normal operating conditions and is obtained readily.



Red fiber washers increase creepage distance on car resistors

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Armature Coil Insulation Removed by Lye

ARMATURE coils having become inoperative due to deteriorated insulation are being reclaimed in the shop of the Lackawanna & Wyoming Valley Railroad, Scranton, Pa. These coils are immersed in a boiling solution of Red Seal lye and at the expiration of 72 hours the insulation can be readily scraped off. The vat is made of 1½-in. planking and lined with galvanized iron. The solution is heated by means of live steam.

After removal from the lye vat by means of hand hooks they are immediately washed with clean cold water to prevent injury to the workmen. After washing each turn of the coil is thoroughly cleaned, taped and the coil reassembled. It is claimed this process has effected a very material reduction in armature maintenance costs.

Armature coil lye vat

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Motor repair stand

Circular steel pieces bolted to the ends of the motor case, and small rollers on the supporting framework, allow the case to be turned to the most convenient position for work.

Rotating Frame Facilitates Motor Repairs

WORK on parts of motor cases that are ordinarily hard to get at has been made much easier by means of a rotating frame used in the Grand Avenue shops of the Connecticut Company, New Haven. This apparatus was designed by J. E. Dooley, master mechanic, and built in the shops. The frame consists of two A shapes held in position by two longitudinal members fastened to the ends by gusset plates, as shown in the accompanying illustration. The ends are continuous 3½-in. x 5½-in. angles bent to the desired shape. Longitudinal members are angles of the same size, but are not continuous. They are arranged to overlap and are bolted together. A series of bolt holes permits the length of the stand to be adjusted according to the size of the motor upon which work is being done.

At each of the upper corners of the end frames is a 4-in. cast-iron wheel. Two circular steel pieces are provided, one bolted fast to each end of the motor case. These circular pieces rest on the small wheels and allow the motor case to be rotated as may be desired.

This arrangement has proved to be a great convenience when field coils are being installed. Instead of being obliged to hold the coil against the top of the motor case, while he is fastening it in place, the shopman now simply turns the case through a half revolution and lays the coil in position on the bottom.

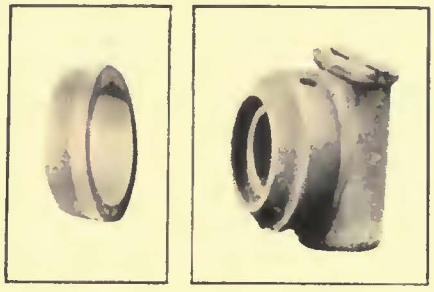
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Motor Heads Reclaimed with Steel Rings

STUDY of several methods for reclaiming Westinghouse 101-B motor heads, as compared with the cost of new ones, convinced J. W. Strawbridge, master mechanic of the Williamsport Passenger Railway, Williamsport, Pa., that reclaiming would be the cheapest proposition.

The method adopted was to shrink a cast-steel ring on the worn head. The steel castings are obtained from the foundry of the Lehigh Valley Transit Company, Allentown, Pa., in the rough. They are of such a bore and outside diameter as will suit every condition of worn head, worn housing or a combination of both. The worn head is turned down to a predetermined diameter and the cast-steel ring is bored to such a diameter as to allow for a tight shrinkage fit over the turned-down head. The casting has a flange and is installed on the head with the flange away from the oil well. After being shrunk on it is turned to the desired diameter. Where the field frame as well as the head is worn the frame is bored out to a standard oversize diameter and the head casting ring turned to the proper diameter to obtain a good fit.



At left, cast-steel ring ready for shrinking on to turned down motor head. At right, motor head ready for service with cast-steel ring shrunk on the machine

This method has resulted in quite a saving being effected in the repair work, and to date not a single ring has come loose in service.

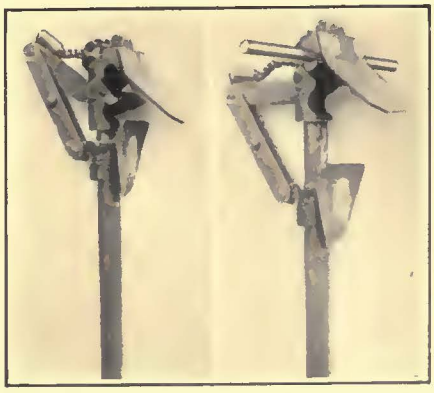
Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT

Power Take-off Insures Positive Contact

POWER take-off from the overhead trolley for the operation of portable tools requiring 600-volt energy is made on the Key System Transit Company, Oakland, Cal., by a pole and clamping device, the latter eliminating the possibility of arcing at the wire. The trolley stick, as it is known, is made up in four sections. Three of these are approximately 6 ft. long, while the top one is approximately 18 in. long.

The support for the head in the top section is 1 in. brass tubing, $\frac{1}{16}$ in. thick. Inside of this slides easily another piece of brass tubing. A casting having a boss on one side and a triangular shield of $\frac{1}{8}$-in. copper on the other side is attached to the top of the outer tube. The boss serves as an anchorage for the lever which operates the extreme outer end of the clamping device. The shield, which has a width of 3 in., serves as a guide to the trolley wire when the device is placed in position.



At left, head of power take-off open to receive trolley wire. At right, position when the pole is hooked over the trolley wire

A brass casting on the top of the inner tubing has a groove on the underside and a clamp which presses upward when the head is raised so as to hold the trolley wire in the groove.

The jaws are approximately 3 in. long. A shield of $\frac{1}{8}$-in copper is fastened to the head casting, which, along with the shield on the lower head, guides the trolley wire into the groove. A pair of levers hold the two heads together and actuate the clamp.

When not in use the head drops by its own weight, opening the jaws of the clamp. When the head is hooked over the trolley wire the wire seats itself in the groove and the weight of the pole lifts the head and causes the clamp to close up on the wire. Raising the pole, the weight of the head causes it to drop in the tube, opening the clamping device.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL

Emergency Magnet Winding Machine

WHERE coils are wound at infrequent intervals, or where a number of small magnet coils have to be wound in a hurry, it may be necessary to provide some sort of shop-made equipment to take care of the work. The accompanying illustrations show how a coil-taping machine was arranged to wind small magnet coils in the department of electrical repairs of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y. In the sketch the tension pegs, numbered 1, 2 and 3, and the tape holder, 4, of the original coil-taping machine were removed from the rotating member, *P*. Three equidistant poles marked *S*, *S*, *S* were drilled and tapped in the rotating part of the machine, as indicated. A disk, *K*, was then made of ¼-in. sheet steel and holes were drilled in this to correspond with the holes *S*, *S*, *S*. A ¾-in.-hole was also drilled in the center and the disk was then screwed to the rotating member, *P*, of the taping machine. Studded arbors, of sizes necessary to fit the spools of the magnet to be wound, were provided, and these were bolted to the disk through the center hole. A steady rest was provided for the outside end of these arbors. This steady rest, which was screwed to the bench, was provided with a hinge so that it could be rotated down out of the way while a spool was being inserted over the arbor and to provide for removal of the coil after it was wound. The machine was driven in the usual way by means of a belt. The necessary changes for installation of the disk in no way interfered with the usefulness of the machine for its original purpose.

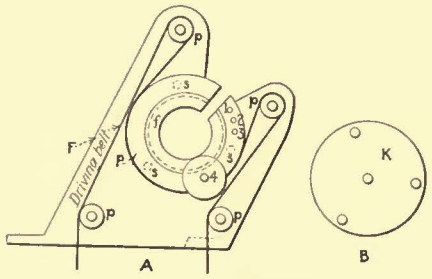


Diagram to illustrate changes in coil-taping machine to adapt it for winding small magnet coils

Winding a coil with the converted machine

Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT

Truck for Transporting Oil Lamps

LABOR of collecting and distributing way department oil lamps has been reduced materially by E. L. Greene, master mechanic York Railways, York, Pa., since the adoption of a manually operated truck designed and built in the company's shops.

This truck consists of a box-shaped skeleton frame 12 ft. long, 18 in. wide and 2 ft. high, with an over-all height of 48 in. above the floor. The frame is built of yellow pine timbers, 2 in. by 3 in., braced with ½-in. x 2-in. flat steel, and is mounted on a pair of 18-in. iron wheels.

Suitable hooks are installed on each of the longitudinal beams for the reception of the lamps. These are so spaced that the lamps can be suspended and moved about without damage to one another.

The truck weight being well balanced, one man can move it easily. Previously considerable time and labor were required to transport these lamps by hand.

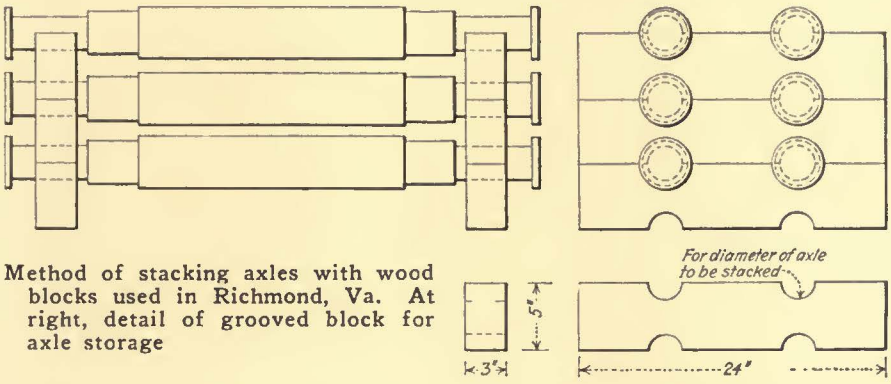
Using the portable truck, the labor has been reduced to such an extent as to permit of one man performing the entire operation.

Portable truck with lamps ready for transportation

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—TRUCKS

Grooved Wood Blocks for Axle Storage



Method of stacking axles with wood blocks used in Richmond, Va. At right, detail of grooved block for axle storage

DUE to car axles being scattered about the floor the machine shop of the Virginia Electric & Power Company, Richmond, Va., presented a rather untidy appearance until the master mechanic, W. J. Hicks, devised a method for their neat, compact and systematic stacking. This consists of the utilization of oak blocks grooved to conform to the diameter of the axles to be stacked, and placed between each pair of axles at either end. The blocks are 3 in. high, 5 in. wide and 24 in. long.

To permit of easy handling the axles are stacked under lifting facilities. New axles of one size are put in one pile, old axles of the same size to be turned are placed in another, and bent axles of the same size in a third. With this arrangement axles can be removed from the top of the pile and the ones on the bottom will not have to be disturbed, although they can be inspected readily.

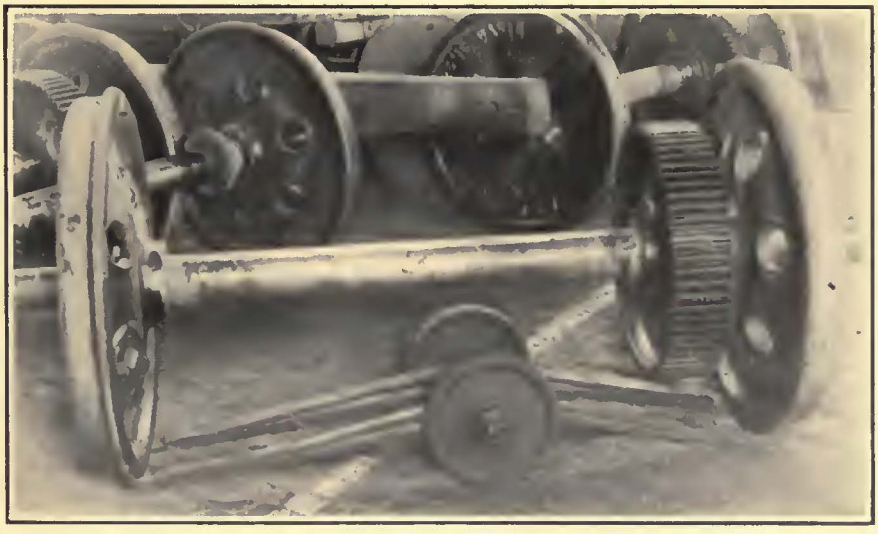
This stacking of axles has improved the shop appearance and has provided a means for decreasing the floor space required for the storage of a given number of axles. When not in use these blocks can be stored away in a neat and systematic manner.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—TRUCKS

Handy Type of Car Wheel Buggy

SHOPS are sometimes so crowded that it is impossible to roll wheels after they are mounted and unless some type of crane or hoist is available the transporting of wheels is rather difficult. To meet this condition a handy type of buggy has been devised in the shops of the Grand Rapids Railway, Grand Rapids, Mich. This consists of two central 8-in. diameter wheels connected by a shaft. Arms extend out on either side of this shaft a distance necessary to support a pair of mounted car wheels. Each supporting arm is made of two pieces of steel strap, one piece passing above and the other below the shaft. These are shaped to provide an ample bearing surface and the extreme ends are turned up so that a pair of wheels can be rolled into position and held without danger of slipping off. A pair of wheels mounted on the buggy can be balanced easily and so pushed endwise to any location desired. When the wheels are in a balancing position there is a small clearance for the ends of the supporting straps above the floor.



Pair of mounted wheels in position on buggy for transporting about shop

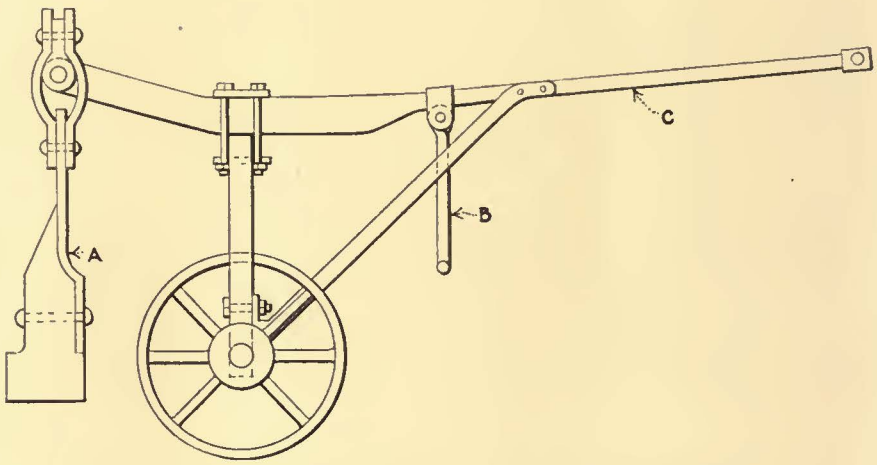
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—TRUCKS

Truck for Handling Car Axles

FOR moving car axles about the shop a handy truck is used by the Interborough Rapid Transit Company of New York.

This truck, which was designed and built in the company's shop, is shown in the accompanying sketch. To lift and move an axle the truck is placed so that the wheels straddle it and the handle, *C*, raised to such a height as will permit the tongs, *A*, to grip the axle slightly beyond the center of gravity. Lowering the handle, *C*, raises one end of the axle from the floor until the hook, *B*, can be slipped under the overbalanced end. By raising handle, *C*, the axle is then lifted clear of the floor so that it can be transported to any desired location.



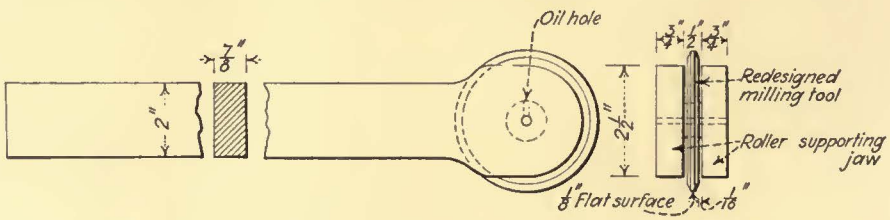
Truck used by Interborough Rapid Transit Company for handling car axles about the shop

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—TRUCKS

Polishing Bearing Surfaces of Axles

POLISHING bearing surfaces of axles is the purpose of a tool which has been designed and constructed in the shop of the Virginia Electric & Power Company, Norfolk, Va., under the supervision of the master mechanic, T. W. Madison. This tool consists of a redesigned 3-in. milling cutter, together with a suitable supporting arm. Finding that a 3-in. milling cutter with a 1-in. arbor hole had served its usefulness as a milling tool, the remnants of the teeth were turned off and the circumference was given a rounding contour except at the top, which was left flat for about $\frac{1}{8}$ in. The 1-in. arbor hole was bushed down to $\frac{1}{2}$ in. to provide for the insertion of a $\frac{1}{2}$-in. steel shaft. This bushing is installed with a $\frac{1}{16}$-in. projection beyond the side surfaces of the roller to allow sufficient clearance between the side faces and the inside surfaces of its supporting jaw.



Appearance of assembled roller and arm used for polishing purposes

The supporting jaw and arm are made from a 2-in. x 3-in. steel bar, one end being slotted and drilled for the roller and shaft. The bar is tapered down to 2 in. x $\frac{3}{4}$ in. about $\frac{1}{2}$ in. from the slotted end, to fit in the tool rest. A $\frac{1}{8}$-in. diagonal hole is drilled through the roller bushing for lubrication.

The axle to be polished is run in a lathe at about the same speed as for a finishing cut. The polishing tool installed in the tool rest with the roller forced against the oiled shaft surface produces a high-luster finish.

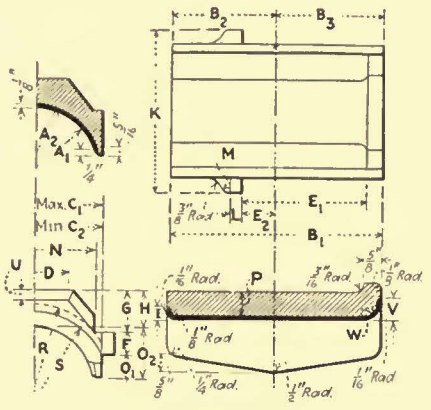
The results obtained with this polishing tool have been so satisfactory that the usual method of polishing by means of fine files or emery paper has been discarded.

Electric Railway Journal Maintenance Data Sheet

STANDARDS

Standard Dimensions of Journal Bearings

THE American Electric Railway Engineering Association has six standard journal bearings which are arranged to fit the six standard axles of the association. These were adopted as revised in 1926. The accompanying drawing and table give these. Originally the standard journal bearings for the six sizes of journals required six drawings. In order to provide uniformity a change on one usually required similar changes on the others, so that six drawings had to be changed each time. As a number of changes appeared desirable to the 1926 equipment committee, it was considered preferable to reduce the number of drawings and provide a table to show the different dimensions. In arranging this it was found that some of the dimensions were not uniform for various sizes. The use of the single drawing and table made these apparent at once, while when used on several drawings they would not be noticed.



Dimension drawing for journal bearings to be used with table

DIMENSIONS OF STANDARD JOURNAL BEARINGS

Size Journal	A1	A2	B1	B2	B3
3 x 6	1 3/4	1 3/4	5 1/2	2 1/4	2 1/4
3 1/4 x 6	1 3/4	1 3/4	5 1/2	2 1/4	2 1/4
3 1/2 x 7	1 3/4	1 3/4	6 1/2	3 1/4	3 1/4
4 1/4 x 8	2 5/32	2 5/32	7 1/2	3 1/4	3 1/4
5 x 9	2 3/4	2 3/4	8 1/2	4 1/4	4 1/4
5 1/2 x 10	2 3/4	2 3/4	9 1/2	4 1/4	4 1/4

Size Journal	C1	C2	D	E1	E2
3 x 6	3 1/4	3 1/4	1 1/4	3 1/4	1 1/4
3 1/4 x 6	3 1/4	3 1/4	1 1/4	3 1/4	1 1/4
3 1/2 x 7	4 1/4	4 1/4	2	4	1 1/4
4 1/4 x 8	4 1/4	4 1/4	2 1/16	4 1/4	1 1/4
5 x 9	5 1/4	5 1/4	3 1/4	5 1/16	1 1/16
5 1/2 x 10	6 5/16	6 1/4	3 1/4	5 11/16	1 1/16

Size Journal	F	G	H	I	K
3 x 6	1/2	1	1	1/2	4 1/16
3 1/4 x 6	1/2	1	1	1/2	4 1/16
3 1/2 x 7	1/2	1 1/4	1	1/16	5 1/4
4 1/4 x 8	11/16	1 1/16	1	1/16	5 1/4
5 x 9	1 1/16	1 1/16	1 1/4	1/2	6 1/2
5 1/2 x 10	1 1/16	1 1/16	1 1/4	1/2	7 1/2

Size Journal	L	M	N	O1	O2
3 x 6	1/2	1/2	3 1/2	1/2	1 1/4
3 1/4 x 6	1/2	1/2	3 1/2	1/2	1 1/4
3 1/2 x 7	1/2	1/2	3 1/2	1/2	1 1/4
4 1/4 x 8	1/2	1/2	4 1/2	1/2	1 1/4
5 x 9	1/2	1/2	4 1/2	1 1/2	2 1/2
5 1/2 x 10	1/2	1/2	5 1/2	1 1/2	2 1/2

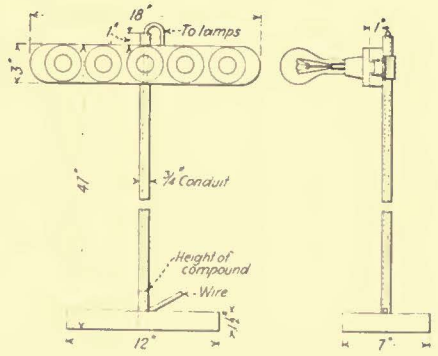
Size Journal	P	R	S	U	V	W
3 x 6	1/2	2	2	1	1/2	1/2
3 1/4 x 6	1/2	2	2	1	1/2	1/2
3 1/2 x 7	1/2	2 7/16	2 7/16	1	1/2	1/2
4 1/4 x 8	1/2	2 11/16	2 11/16	1	1/2	1/2
5 x 9	1	3 1/4	3 1/4	1	1	1/2
5 1/2 x 10	1	3 1/2	3 1/2	1	1	1/2

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—PAINT SHOP

Lamp Bank for Use in Paint Shop

EXTERIOR illumination of cars undergoing painting in the paint shop of the Lynchburg Traction & Light Company, Lynchburg, Va., has been improved greatly since several lamp banks were installed in convenient locations adjacent to the cars. These lamp banks were designed by Master Mechanic M. M. Cochran and built in the shop. They consist of a base made of dry oak 1½x7x12 in., in the center of which is installed a piece of ¾-in. conduit 48 in. long. About 1 in. from the end of the conduit is installed a piece of ash 1x3x18 in. long and fastened to the ¾-in. conduit by means of a ¾-in heavy pipe strap. This piece of ash acts as a base for the support of the five incandescent lamps and is grooved in the center to permit of the installation of the wires, which enter the conduit through a ⅝-in. hole drilled directly above the base, make their exit from the end of the conduit and drop down to the groove in the lamp supporting base. Compound poured into the pipe about 3 in. up from the base prevents injury to the insulation of the wires from chafing at their entrance to the conduit. A drilled wood plug inserted in the end of the conduit prevents chafing injury to the wires at the point of their exit from the conduit.

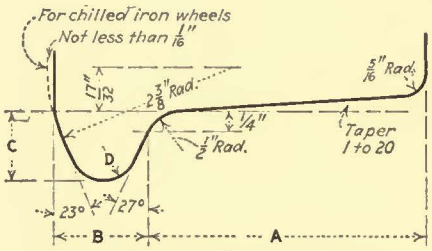


Lamp stands used in the paint shop of the Lynchburg Traction & Light Company, Lynchburg, Va.

Electric Railway Journal Maintenance Data Sheet

STANDARDS

Wheel Tread and Flange Contours

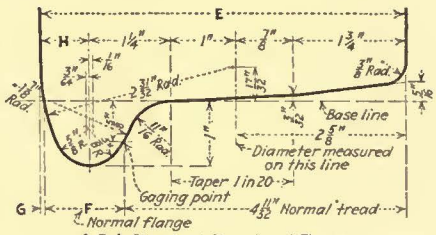


A.E.R.E.A. Standard Tread and Flange Contours for Steel and Chilled Iron Wheels

Standard Tread and Flange Contours	A	B	C	D
A-3	3"	1 3/16"	7/8"	27/64"
A-3½	3½"	1 3/16"	7/8"	27/64"
B-2½	2½"	1 1/8"	3/4"	15/32"
B-3	3"	1 1/8"	3/4"	15/32"
C-2½	2½"	1"	3/4"	5/8"
C-3	3"	1"	3/4"	5/8"
D-2½	2½"	1"	5/8"	29/64"
D-3	3"	1"	5/8"	29/64"

STANDARD tread and flange contours were adopted by the American Electric Railway Engineering Association in 1923. A-3, A-3½, B-2½, B-3, C-2½, C-3, D-2½ and D-3 provide four flange contours each in combination with two widths of treads and are for both steel and chilled iron wheels.

Contour E is for chilled-iron wheels as standardized by the American Railway Association in 1909 and contour F is for steel and steel-tired wheels as standardized by the American Railway Association in 1920. These latter contours were also made A.E.R.E.A. standard in 1923.



A.R.A. Standard Tread and Flange Contours for Steel, Steel Tread and Chilled Iron Wheels

Standard Tread and Flange Contours	E	F	G	H
E	5 5/8"	1 15/64"	3/64"	5/4"
F	5 5/8"	1 5/32"	0	5/8"

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—PAINT SHOP

Car Painting in Berlin

THE all-metal cars on the Berlin Street Railway system are painted with both the brush and the spray methods. Particulars of these cars were published in the ELECTRIC RAILWAY JOURNAL for Jan. 29 and Feb. 5. The schedule of application with the brush and spray methods appears in the accompanying tables:

SCHEDULE OF OUTSIDE ENAMEL APPLICATION WITH BRUSH, BERLIN CARS

1. Rub all rust spots with No. 00 sandpaper.
2. Wash the surface of the plate with a cleaner to remove any grease or remaining rust spots.
3. Put on foundation oil paint, white.
4. Putty (or cement) all cracks and screw holes.
5. Put on coat of oil paint, white and yellow.
6. Rub down with No. 00 sandpaper.
7. Put on coat of oil paint, white and yellow.
8. Rub down with No. 00 sandpaper.
9. Put on a coat of enamel, white and yellow.
10. Rub down with oiled paper and pumice.
11. Put on a coat of enamel, white and yellow.
12. Rub down with oiled paper and pumice.
13. Striping and lettering.
14. Apply outside varnish.

Total time required is five working days and the material used is as follows:

Material required:

Oil paint, white	6 kg. or 13.2 lb.
Lead putty	1.5 kg. or 3.3 lb.
Oil paint, yellow	3.5 kg. or 7.7 lb.
Enamel, white	3.0 kg. or 6.6 lb.
Enamel, yellow	3.0 kg. or 6.6 lb.
Enamel, black	0.5 kg. or 1.1 lb.
Outside varnish	2.0 kg. or 4.4 lb.
Rubbing enamel	1.0 kg. or 2.2 lb.
Pure turpentine	1.0 kg. or 2.2 lb.
Cleaning fluid	2.0 kg. or 4.4 lb.

SCHEDULE OF OUTSIDE ENAMEL APPLICATION WITH SPRAY, BERLIN CARS

A number of cars were painted with the spray method. The first four steps were the same as those just given for the brush method. The later steps were as follows:

5. Rub down with sandpaper.
6. Apply one coat of white oil paint to the upper half by spray.
7. Apply one coat of yellow oil paint to the lower half of spray.
7. Apply one coat of white japan enamel by spray.
9. Apply one coat of yellow enamel by spray.
10. Rub down with oiled paper and pumice.
11. Apply one coat of yellow enamel by spray.
12. Rub down with oiled paper and pumice.
13. Striping and lettering.
14. Apply outside varnish by spray.

Total time required three working days.

The temperature of the room should be 25 deg. C. (or 77 deg. F.) if possible. Artificial drying is not necessary.

The material required is as follows:

Foundation oil color, white; { (white paint)	0.75 kg. or 1.8 lb.
{ Pure turpentine	0.75 kg. or 1.8 lb.
Lead putty	1.5 kg. or 3.3 lb.
Oil paint, white	1.8 kg. or 4.0 lb.
Oil paint, yellow	4.0 kg. or 8.8 lb.
Japan enamel, white	1.0 kg. or 2.2 lb.
Enamel, yellow	3.5 kg. or 7.7 lb.
Enamel, black	0.5 kg. or 1.1 lb.
Outside varnish	2.5 kg. or 5.5 lb.
Pure turpentine	0.5 kg. or 1.1 lb.
Cleaning fluid	2.0 kg. or 4.4 lb.

Improved Equipment
for Electric Railway Maintenance

RELIABLE, safe and attractive transportation is a prime requisite of any campaign to attract additional riders. To provide this, much depends upon the equipment available for carrying on the various maintenance operations. More modern machine tools are needed in railway repair shops and improved tools for track and line maintenance work will assist materially in reducing delays and provide for the passengers a smooth, noiseless ride.

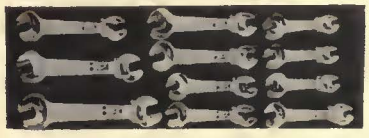
Some of the latest improved equipment for railway maintenance is described in the following pages. Careful study of them should produce many suggestions as to equipment needed to bring maintenance to a higher standard and carry on repairs efficiently and economically.

For Repairing Car Body and Overhauling Trucks

Wrench Set No. 311

BONNEY FORGE & TOOL WORKS
Allentown, Pa.

WRENCHES in sets, as shown, are suitable for general repair work. This set, designated as No. 311, consists of three each of the eleven most popular sizes. They are drop forged from vanadium steel, very light and

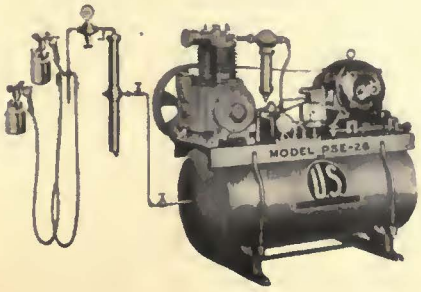


thin but yet strong and well balanced. Thin, pear-shaped jaws permit maximum clearance in close quarters. Each one is guaranteed to strip the thread or break the bolt without damage to the wrench.

Paint Spray Equipment

UNITED STATES AIR COMPRESSOR COMPANY
Cleveland, Ohio

MODEL PSE-26 paint-spraying unit, as shown, is of the twin-cylinder, air-cooled, single-stage type and has sufficient capacity for the continuous operation of two paint guns. It will operate within a tank pressure range of 90 to 125 lb. The reducing valve mounted on the moisture separator permits an air adjustment of from 40 to 90 lb. for painting. The displacement of this unit is 16 cu.ft. of air per minute.

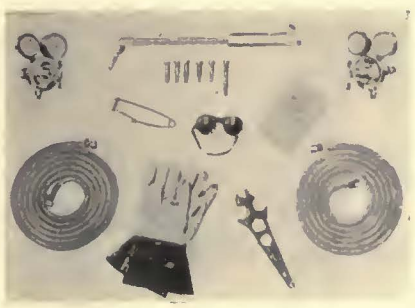


The 60-gal. tank has longitudinal seams, riveted and copper brazed. The compressor is belt-driven by a 3-hp. a.c. or d.c. motor, as desired. The complete unit is 36 in. wide, 52 in. long and 48 in. high. It is shipped with moisture separator, reducing valve, air gage, two paint spray guns with quart cups and two 25-ft. lengths of hose and fittings.

Combination Cutting and Welding Equipment

ALEXANDER MILBURN COMPANY
1416-1428 West Baltimore Street, Baltimore, Md.

WITH this equipment all operations of welding and cutting can be handled. It is necessary only to change the tips to cut or to weld. The outfit consists of a type N.I. combination torch, 21 in. long; three welding tips, three cutting tips, an oxygen regulator with 3,000-lb. initial pressure gage and 200-lb. delivery pressure gage, acetylene regulator with 500-lb. initial pressure gage and 50-lb. delivery pressure gage, 25 ft. oxygen hose and 25 ft. acetylene hose, both with couplings; a pair of fiber frame goggles, a pair of workman's gloves, friction torch lighter, combination wrench, instruction book and pressure chart. The approximate shipping weight is 45 lb.



Lawson Pipe Wrench

LAWSON MANUFACTURING COMPANY
6505 Carnegie Avenue, Cleveland, Ohio

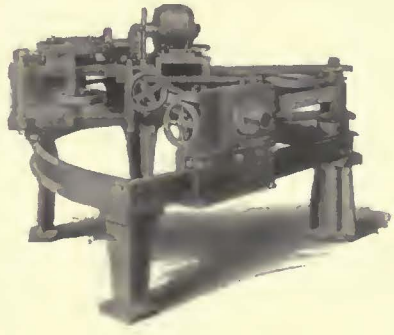
WRENCHES of the type shown are all drop forged from a high grade of steel and have removable jaw housings forged solid with the handle. The jaw teeth are said to be hardened and tempered to give the greatest strength with the least wear. Because it has an angle handle, the Lawson pipe wrench is adaptable to many positions. It has working access to pipes lying close to the floor, wall or ceiling, where it will give ⅛ turn of the pipe. The

wrench has exceptional strength in both handle and jaw. Its compact, self-contained and well-balanced design is mechanically correct. The jaws, which are always in an open position ready to grip a pipe, will release instantly when the wrench is to be removed from the pipe. The location of the adjusting nut and the one coil spring used to hold the jaws open permit of one-hand operation. It is made in sizes of 8, 10, 14, 18 and 24 in.

Type E Motor-Operated Pipe-Bending Machine

AMERICAN PIPE BENDING MACHINE COMPANY, INC.
37-39 Pearl Street, Boston, Mass.

BENDING of 1¼-in. to 4-in. cold pipe without having it filled with any substance is the purpose of the machine shown. It is capable of making 1¼-in. to 2-in. pipe bends at the rate of ten to fifteen per hour and 2-in. to 4-in. pipe bends at the rate of five to ten per hour. A 3-hp. motor is fur-

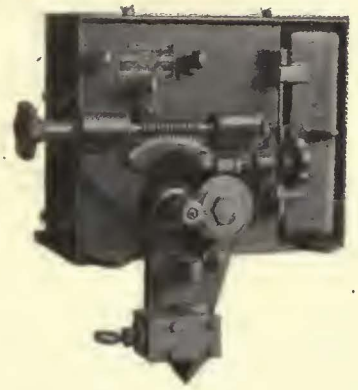


nished with each machine. The complete machine weighs approximately 3,800 lb. and occupies a floor space of 7 ft. 6 in. x 7 ft. 6 in. Suitable bending forms and pipe holders are furnished for the bending of 1¼-in. to 4-in. pipe. Other motor-operated machines in production are the type F standard for bending 3-in. to 6-in. cold pipe and the type F special for bending 3-in. to 5-in. cold pipe. Where hand-operated machines are desirable type F Junior can be furnished for ½-in. bends, type A for ⅜-in. to 1-in. bends, type B special for 1¼-in. to 2-in. bends and the type B Hercules for 3-in. to 4-in. bends. The same construction is incorporated in the hand-operated machines as in the motor-operated machines.

The Auto Arc

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
East Pittsburgh, Pa.

WESTINGHOUSE auto arcs or automatic arc welding heads are designed for production or repair work on repetition operations, by which production can be greatly increased due to the greater welding speed obtainable. They are adaptable to welding axle housings, gear cases, metal pans or boxes, building up worn car wheels, flanges or brake equalizers and any work where a bead of metal is to be laid in a regular path. The machine automatically feeds the welding electrode to the work at the required speed for the job and will maintain a con-



stant arc voltage. The auto arc will strike the arc automatically. The unit is entirely self-contained, no other mechanism being required except the actual work handling machinery designed either to move the auto arc along the seam to be welded or to pass the work under the arc. The machine consists of a housing approximately 18 in. long, 7 in. wide and 14 in. high, in which is contained a control and driving mechanism. The rolls, guides and nozzle through which the electrode is fed to the arc extend from the front of the case.

The driving and feed mechanism is regularly supplied for use on 110 volts, 25, 50 or 60 cycles alternating current or 230 volts direct current, as desired. Special machines for other voltages may be obtained. The driving and feed circuit is entirely separate from the arc circuit and is not affected by it. It is claimed that the auto arc will stand up under shop conditions and have practically no maintenance except lubrication and an occasional inspection of the moving parts. Adjustments are possible on the nozzle so that the arc can be directed to the part of the work where the weld is desired.

Petersen "Oiljak"

OIL JACK COMPANY, INC.
15 Park Row, New York City

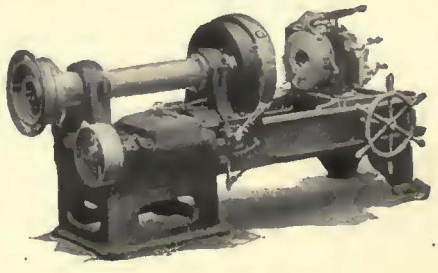
TWO popular models of the "Oiljak," the JB-3 of 3 tons capacity and the JB-10 of 10 tons, are now in full production. Any load within the capacity can be raised with little effort, steadily,

smoothly and quickly. Loads can be lowered without jar or shock and can be stopped instantly at any position. An important feature permits of operation of the jacks with short, inch by inch motions of the handle if desired. A full stroke is not necessary, as is the case of most jacks. This makes the jack advantageous for use in cramped quarters. Where danger exists the jack can be operated from a distance by using a longer handle.

No. 4 Peerless Improved Pipe Machine

BIGNALL & KEELER MACHINE WORKS
of the N. O. NELSON MANUFACTURING COMPANY
Edwardsville, Ill.

MODERN machine tool design trends toward elimination of cone pulleys and belts. The pipe threading machine shown is designed along these lines. While using a single driving pulley, a constant belt speed is obtained which can be suited to the heavier work. Eight speeds are obtainable with a constant speed motor by shifting the gears. The motor is bolted to the rear of the machine and power is transmitted through a silent chain drive. The machine has a universal gripping chuck which can be set quickly for any size of pipe, thus adapting it for all-round shop use. A Peerless adjusting mechanism permits adjustment to obtain threads at different gages. A cut-off tool and a reamer provide for the cutting off and reaming of all pipe. Accessibility of all gears and ready removal of dies are outstanding features. A direct-connected oil pump is furnished for lubricating purposes.



All parts of the machine are accessible for inspection and repairs. It occupies a floor space of 34 in. x 98 in. Each machine is furnished with one set of right-hand dies for threading 1-in., 1¼-in., 1½-in., 2-in., 2½-in., 3-in., 3½-in. and 4-in. pipes.

Portable Car Hoists

WHITING CORPORATION,
Harvey, Ill.

PORTABLE car hoists of this manufacturer embody the same basic principles as the Whiting locomotive and truck hoists now widely used. The car hoist consists of a machined steel screw of ample diameter mounted on a worm gear in a substantial base and housed by a structural frame. The projecting step or support by which the car body is lifted rests on a bronzed nut on the steel screw. The car weight is carried on a hardened and ground alloy steel roller bearing. Power is supplied by an electric motor.

By using two pairs of portable hoists, one pair at each end of the car, the entire car body may be raised off the truck at once. The trucks can then be coupled and handled at one time.

All four hoists may be operated as one unit, with the control in one push-button station.

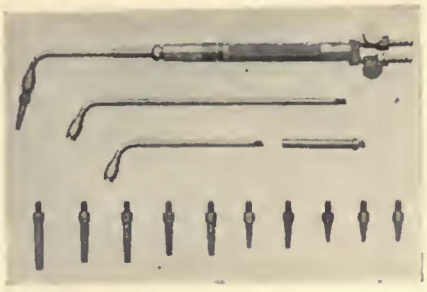
A toggle mechanism lifts the base of the hoist off the ground high enough to put the weight on the wheels, allowing the hoist to be pulled from place to place like a small truck. After being moved into position alongside the car a reverse movement of the toggle lowers the hoist so that its three bearing surfaces rest squarely on the floor. These are spaced to give much greater stability than ordinary jacks. The hoist shown needs no foundation or pit, but may be used on any level floor capable of sustaining the load. No air or water lines are required. Power is used for lowering, so that blocking is not needed under a car, which may be left over the noon hour or night without danger. The hoist will handle cars of any class or size, making unnecessary an assortment of special jacks.

Airco-Davis-Bournonville Style 7700 Welding Torch

AIR REDUCTION SALES COMPANY
342 Madison Avenue, New York, N. Y.

GAS consumption at the rate of one volume of oxygen to one volume of acetylene, which is the ideal for a perfect neutral flame, is said to be practically attained in the style 7700 torch with oxygen of 99.5 per cent purity. The principles of mixing embodied in the design produce a soft, high temperature neutral flame which favors high quality welding with speed and economy. The new torch is approved by the Underwriters Laboratories and is especially well balanced. The possible combination of extension tubes, mixers and tips provides a torch for a full range of welding from sheet metal to heavy forgings or castings.

The rear end is a brass forging. The



handle is made of seamless knurled brass tubing. The head is of special bronze. Seamless oxygen and acetylene tubes are silver soldered to the head and rear end. Extension tubes 6 in., 9 in., and 16 in. long fit either mixing head. The complete weight of the torch with an 8-10-in. mixer, 9-in. extension tube and with the No. 10 tip is 30 oz.

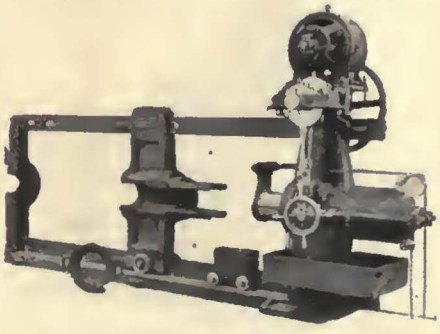
Wheel and Axle Machining

Wheel Press

NILES TOOL WORKS COMPANY
Division of Niles-Bement-Pond Company, Hartford, Conn.

CAR wheel presses of 48-in. size have the cylinder member resistance head and end post mounted on a heavy base plate. The cast-steel cylinder is lined with copper expanded into place and burnished. The piston is packed with cup leather.

The hydraulic pressure for working the ram is obtained from a triple plunger pump. Each plunger has a safety valve. All three plungers may be worked simultaneously or any one or any two may be thrown out, giving



a variety of pressures that may be exerted on the piston up to the maximum capacity. The pressure is released by a hand wheel operating a relief valve which permits the water to flow back from the cylinder to the suction tank. A gage indicates the pressure on the ram as well as the total pressure in tons. The resistance head is made of cast steel, supported on rollers running on planed ways on the base. An opening permits the passage of axles. The end post has an opening corresponding to that in the resistance head so that long shafts may be handled. Unless otherwise specified trucks are provided to support the wheels in the press and handle them on and off the axles. These machines can be furnished for either belt or motor drive.

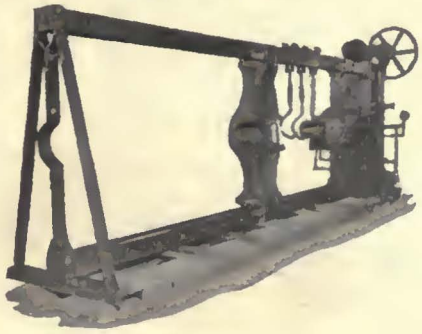
In order to press off wheels from their axles without interfering with the gears a removable attachment with projecting legs can be provided. These legs pass through the holes of the gear wheel and a hinged collar is provided to be placed against the body of the wheel in order to afford a surface against which the wheels can press.

Hydraulic Wheel Press

LOURIE MANUFACTURING COMPANY
Springfield, Ill.

THIS press was designed especially for heavy pressures. Double bars prevent buckling of the press and shaft if the work is not perfectly centered or if more pressure is needed on one side than the other. The crosshead is a steel casting and a steel gate is furnished for the gap. The resistance pins are tool steel. The ram is returned into the cylinder by means of springs. It is hollow, but has a removable disk fitted into the face. The standard equipment furnished includes all hooks, hangers and fittings, as shown in the illustration, as well as a hydraulic gage, safety valve, operating valve and all other necessary valves and fittings. An automatic differential type of pump used operates the ram rapidly under low pressure and slowly under high pressure.

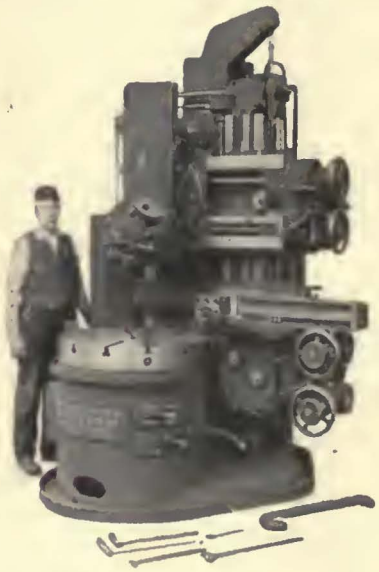
The buttress behind the cylinder is built up of structural I-beams. This permits the use of standard close-grained semi-steel cylinders and pumps. The cylinders are highly polished. Machined cast fillers are placed between the strain bars and the webs of the I-beams. Beams, fillers and strain bars are clamped together by stud bolts.



Side-Head Boring Mill

NILES TOOL WORKS COMPANY
Division of Niles-Bement-Pond Company, Hartford, Conn.

WITH the side head of this boring tool in working position the machine will take work up to 38 in. diameter. A feature is that the side head may be lowered below the table, so that work up to 44 in. diameter can be finished all over with the vertical head. The bed and column are cast integral. The left-hand housing has a flat bearing and the right-hand housing has a three-track bearing with a long narrow guide for the cross rail and side head. The table and chuck are made in one unit mounted directly on the spindle. The three-jaw chuck which is regularly furnished can be operated either universally or independently. The spindle has a taper bearing for absorbing the vertical thrust. Power is delivered to the table through beveled gears and a disk type clutch. The speed change unit is of the selective sliding gear type, with twelve speeds controlled by two levers. The cross rail is elevated and lowered by means of power. The



turret slide can be swiveled in either direction to an angle of 30 deg., the swivel being graduated on both sides. This adjustment is made by a worm and worm segment which can be operated from either side. Sixteen positive feed changes are provided. Rapid traverse in all directions and a complete equipment of micrometer dials and observation scales are at the operator's command.

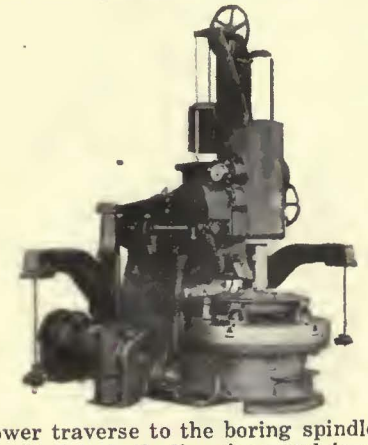
The turret rotates around a cylindrical stud and has bearings equal to the full diameter of the turret. The turret has ten indexing positions so that it can be indexed half way between each of the regular positions. With the turret indexed half way, two tool holders are brought within the field of operation. The side head is mounted directly on the column and there are but two movable joints between the cutting tool and the column. The head extends across the column with a bearing at the center so that all strains are taken on the full width of the column. Rapid power traverse is provided in horizontal and vertical directions for the side head as

well as the vertical head. Each head has sixteen feeds. Flood lubrication is provided for the spindle bearings, speed change gear unit, the feed gear units and the cross rail elevating mechanism. The machine can be furnished for belt drive through a single pulley or with a motor drive. The floor space required is 81 in. x 93 in. It is made in 36 in. and 44 in. sizes.

48-In. Wheel Boring Machine

MANNING, MAXWELL & MOORE, INC.
Putnam Machine Works, Fitchburg, Mass.

RAPID power traverse in either direction to both the boring and the facing spindles is regularly furnished with this 48-in. wheel-boring machine in addition to the usual power feeds. One lever controls the feed and traverse movements in each case. The chuck can handle wheels from 6½ in. to 42 in. diameter on the tread. The table is driven by a high carbon cast steel bevel gear and a forged nickel steel pinion. The boring spindle is of large diameter and travels in a long bearing. It has ample travel to allow of running the boring bar above the throat of the machine. The boring spindle is equipped with four feeds controlled from the operator's working position.



Power traverse to the boring spindle is provided in both directions and is controlled from one lever.

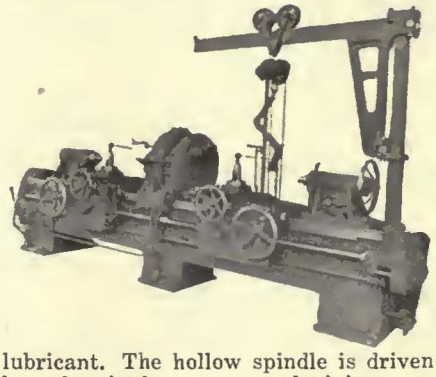
The chuck table has five chuck jaws of hardened steel, conforming in shape to the flange and throat of the wheel tread contour. They are operated universally by a slight motion of one of the three cam studs that are provided so that one will always be convenient to the operator when the table is stopped. If desired, a pneumatic chuck, a hub facing attachment and a pneumatic or mechanical crane can be furnished. The hub facing ram is fitted with a sliding head at its outer end for vertical adjustment of tools. Hubs may be faced while the wheel is being bored.

The drive is through a unit and self-contained gear box giving four speeds in geometrical progression through sliding gears running in oil. If the machine is belt-driven the power is transmitted to the gear box through a constant speed pulley. With electric drive a constant speed motor is geared directly to the gear box. The gear box may be omitted and a three to one variable speed motor geared directly to the table pinion shaft. The machine is started and stopped by starting and stopping the motor.

Double Axle Lathe

MANNING, MAXWELL & MOORE, INC.
Putnam Machine Works, Fitchburg, Mass.

RIGIDITY is said to characterize this axle lathe. The bed is of a deep, box section and the side walls are connected at short intervals by broad box ties. Longitudinal trusses having cast racks, against which the tailstocks are braced, are located between the shears. The legs are cast integral with the bed, one of them being utilized as a tank for the cutting



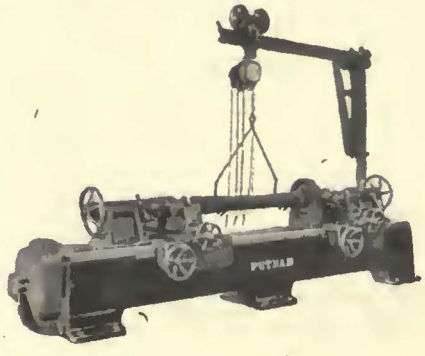
lubricant. The hollow spindle is driven by a herringbone gear and pinion running in a bath of oil, thus affording positive lubrication. The spindle revolves in bronze bearings, one on each side of the main gear. The drive is by means of a double tailed dog which bears against the cast lugs on the equalizing plate. Both tailstocks are adjustable along the bed. Pawls attached to the body engage cast racks in the bed to prevent slipping under a heavy cut. The carriages are guided by V's on the front and rear of the bed and are gibbed on horizontal and vertical surfaces directly in line with the tool thrusts. The feed aprons are of a double wall construction, furnishing a support for all shafts at each end.

An inclosed feed gear box gives three positive feeds which are changed from the center of the bed. The gears are of hardened steel and run in oil. If desired, a crane can be furnished for lifting the axles in and out of the lathe.

Axle Burnishing Lathe

MANNING, MAXWELL & MOORE, INC.
Putnam Machine Works, Fitchburg, Mass.

JOURNAL burnishing is the principal function of this machine, which in general consists of two tailstocks and two carriages mounted on a base, each carriage having a front and a rear burnishing tool. Both journals of an axle are burnished at the same time. The bed is of box section. The side

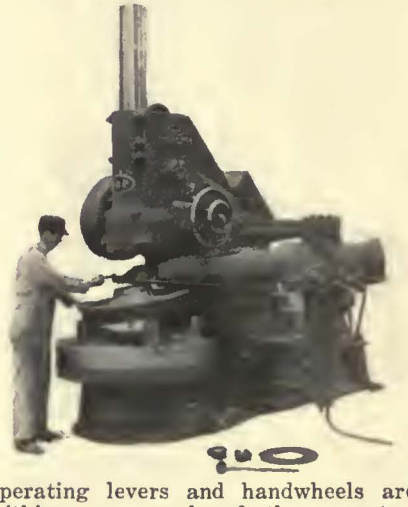


walls are connected at short intervals by box ties. The legs are cast integral with the bed. Both tailstocks are adjustable along the bed. Permanent alignment is maintained by means of taper gibs. The two burnishing rolls are brought into contact with the axle by means of a large diameter screw, operating in bronze nuts. The screw is not confined in the carriage endwise, but is free to float, thus the burnishing tools are forced against the axle with equal pressure and no end thrust is taken by the screw or carriage. By setting the burnishing rolls at a slight angle they feed automatically and therefore a feeding mechanism is not required. The aprons contain only the pair of gears and rack pinion for the hand movement of the carriages. A suitable crane can be furnished with this machine. The floor space required with a motor drive and without the crane is 14 ft. 6 in. x 4 ft. 8 in.

48-In. Wheel Borer

NILES TOOL WORKS COMPANY
Division of Niles-Bement-Pond Company, Hartford, Conn.

IN this line of heavy boring machines a self-contained single casting frame makes for rigidity. There are no joints to allow the boring bar to be thrown out of alignment with relation to the table. As soon as the machine is started the wheel is locked rigidly in the self-centering automatic chuck. Stopping and reversing the operation of the table will automatically loosen the wheel from the chuck. All



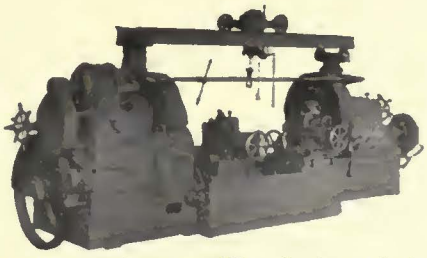
operating levers and handwheels are within easy reach of the operator. Four feeds are available. Changing from a roughing to a finishing feed is accomplished by means of a single lever. There are tapered bushings for both the boring bar and the table spindle. Either a pneumatic or drum type quick-acting crane can be furnished, as desired. The table revolves in a bath of oil on an annular bearing. The bevel driving gear is of semi-steel and the bevel pinion of forged steel. When so ordered, the machine will be equipped with a hub facing attachment. The hub facing bar feeds from the center outlet, so that it can be used at the same time as the boring bar is feeding downward. These machines can be driven by a constant speed motor, an adjustable speed motor, or a belt, as desired.

48-In. Wheel Lathe

MANNING, MAXWELL & MOORE, INC.,
Putnam Machine Works, Fitchburg, Mass.

WHEELS from 24 in. to 44 in. in diameter on the tread can be turned on this lathe. The bed is heavy, deep and of ample width for the swing of the lathe and it is braced with cross and longitudinal ribs. All bearings are bronze bushed. The spindle and faceplate are made as one piece. Twelve radial T-slots are provided so that either three or four driving dogs may be used. The end thrust is taken by thrust washers running in a bath of oil. The faceplates are driven by forged steel pinions mounted on a high carbon steel shaft which is carried in bronze lined capped bearings. Each faceplate is equipped with four adjustable, equalizing driving dogs. The tailstock has a power traverse by individual motor and a friction clutch allows the motor to be started under no load. The tool rests are designed with an adjustment to take care of the minimum and maximum diameter of wheels.

The feeding mechanism gives several impulses per revolution and is practically continuous. The feed ratchets operate in either direction and are of the inclosed type, excluding chips and eliminating accidents to the operator. A simple calipering attachment furnished with each machine enables the operator readily to size both wheels to the same diameter. When desired a pneumatic hoist can be furnished for raising and lowering the wheels. Either inside or outside journal turning attachments, or both, can be supplied. The machine can also be equipped with a wheel boring attachment. If facing the rims and hubs of the wheels is part of the shop procedure, a cross feed can be furnished. These machines can be supplied with a constant speed motor drive, a variable speed motor drive or a belt drive.

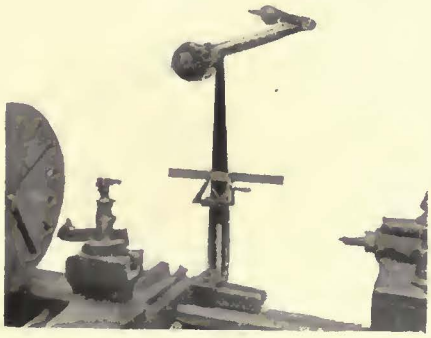


Equipment for Electrical Repairs

Mica Undercutter

HULLHORST MICRO TOOL COMPANY
Toledo, Ohio

MOUNTING on any make of lathe carriage through the medium of an angle plate is possible with the No. 9 commutator mica undercutting machine. The main standard is held to the angle plate with two cap screws, which provides for vertical adjustment



to take care of commutators up to diameters of 22 in. Regulation of the depth of the undercutting is obtained with the depth gage mechanism mounted on the vertical standard. The lower arm of the undercutter slides on the depth gage bar.

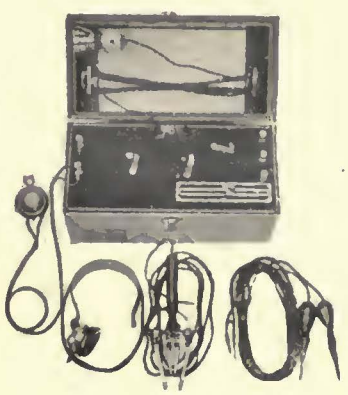
The cutter spindle and the tapering arbor are made of crucible steel lapped into bronze bearings. Sufficient rigidity is assured by building the spindle in the lower arm with a tapering arbor of $\frac{3}{8}$ in. diameter at the cutter.

Mill-cut precision cutters can be supplied for any depth of slot. The motor is installed at the top of one swinging arm and the power is transmitted to the spindle through a belt turning through a triple mechanism at the center pivot. It is stated that this machine will undercut mica $\frac{1}{32}$ in. deep at the rate of more than 200 ft. per hour. The undercutter is furnished with either a 60-cycle, 110-volt a.c. motor or a 110-volt d.c. motor. The swinging arm can be placed out of the way in the upward position when not in use.

Field Tester

CENTURY ELECTRICAL COMPANY
100-102 Randall Avenue, Syracuse, N. Y.

FIELD and armature coils of direct-current motors and generators may be tested conveniently with the New Century field tester. Fields may be checked either in place or out of the machine. By testing them in place there is no danger of removing the wrong coil unnecessarily, while the checking of new or repaired coils previous to installation prevents faults leading to the burning out of an armature or the remaining field coils. A scale shows the exact condition of the coil under test, making it possible to detect partial short or open circuits. In testing armature coils, the Century tester will locate open or short circuits, wrong or crossed connections and grounds without unsoldering any lead wires from the commutator or removing the hoods.



Martindale Slot Cleaning Outfit

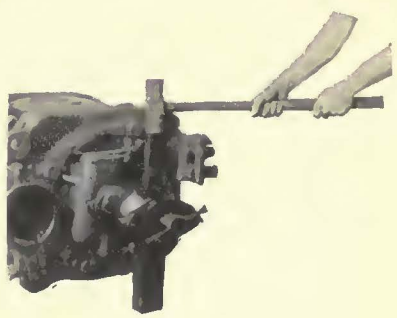
MARTINDALE ELECTRIC COMPANY
Box 2660, Lakewood Branch,
Cleveland, Ohio

CLEANING the armature core slots by means of grinding disks is the ideal method of removing old insulation prior to the rewinding of the armature. It saves 75 per cent of the time and labor required for the usual cleaning process. The machine shown will perform this work and in addition will remove quickly old solder from the riser slots. With the addition of a fiber stiffener between the disks, burrs that will turn a file can be ground off easily. A complete outfit consists of a motor, flexible shaft, ball bearing handpiece disk holder, 36 assorted grinding disks, three fiber stiffeners and a box of shaft grease.

Pinion Puller

GENERAL ELECTRIC COMPANY
Schenectady, N. Y.

SPLIT rings are used with this pinion puller, each half being provided with lugs through which hinge pins are placed to hold the two firmly together.



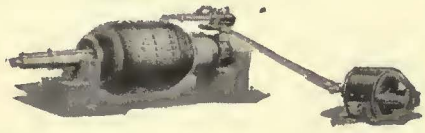
The wedging principle is used, but the wedge, instead of being where it can damage bearings and housings, is placed where it can do no harm. The puller ring grips all the pinion teeth equally, eliminating the possibility of damaging a number of teeth.

The component parts of the pinion puller are the puller ring, the pressure cap if required, the jack-screw, the wedge box, the wedge and the hinge pins. The wedge, wedge box and jack-screw are the same for all pullers, but the puller rings and pressure caps vary with the pinion for which the puller is required. A common ring may be used in some cases for pinions varying only slightly in diameter.

Commutator Grooving Machine

GENERAL ELECTRIC COMPANY
Schenectady, N. Y.

COMMUTATOR grooving machines of two types have been developed by this company, one portable and the other stationary. In form 2, the stationary machine, the base has ad-

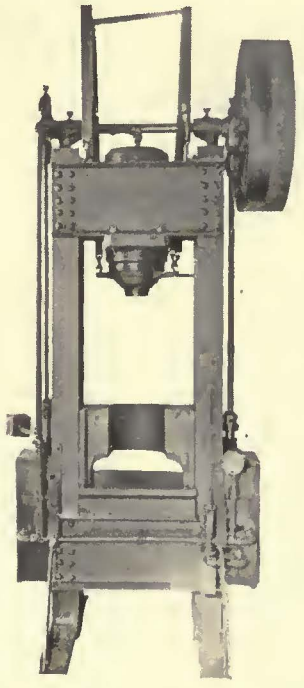


justable pillow blocks with V-shaped bearing surfaces and brass rollers. The slide arm is designed for both vertical and angular adjustment, the latter to be used where the commutator bars are not exactly parallel to the shaft. The rotating saw is mounted on an extension of the motor shaft supported by an offset bearing. This readily permits the grooving of commutators having ears. Owing to the small size of driving motors used no starting resistance is necessary. The form 3 portable machine is simple and can be moved readily to any part of the shop. It is designed to be clamped to the armature shaft. This machine has adjustable stops which direct the travel of the saw to the brush surface of the commutator. A floating driving shaft permits the grooving of a number of slots at one setting of the armature. An angular adjustment can be used when the commutator bars are not exactly parallel to the shaft.

Inverted Forcing Press

LOURIE MANUFACTURING COMPANY
Springfield, Ill.

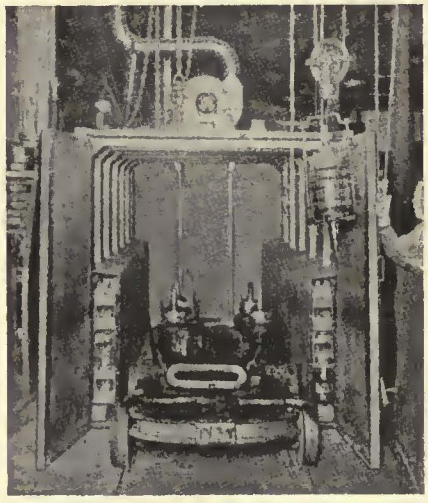
STRUCTURAL steel I-beams and channels hot riveted are used in this inverted forcing press. It is a complete self-contained unit. The pumps, most of the valves and the piping are inclosed in the oil reservoirs on the side. This eliminates leakage around the press. Leakage oil from the ram is carried to the reservoir by a telescoping pipe. The ram is returned into the cylinder by means of springs. The two pumps used on this press are of the differential type and work automatically. Two large pistons operate the ram rapidly under low pressure. When about one-seventh of the total pressure capacity of the press is reached the large pistons cease to function and the small pistons produce the heavy pressure. The press as shown is suitable for forcing, straightening, bushing work, etc. A hydraulic gage and a safety valve are furnished as a part of the equipment.



Electric Ovens for Baking Armatures

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
East Pittsburgh, Pa.

TYPE M electric oven is of the kiln type, consisting of an insulated room into which the work to be baked is wheeled on trucks or supported on angle brackets on the oven walls. The



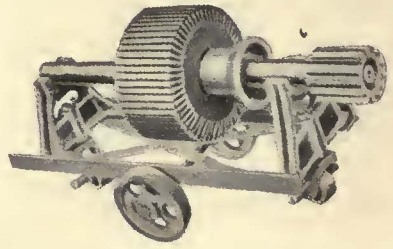
inside and outside walls are sheet metal and the 2-in. space between them is filled with high-grade insulation. The angle framework is bolted together and tie rods hold the sections firmly in place, making the oven capable of withstanding the heavy service of railway work. Sides, top and bottom are all of similar construction, giving the oven a nigh thermal efficiency. The heaters are placed on the side walls and, if conditions allow, along the middle of the oven floor, since this method gives better heat distribution. A wire screen protects the heaters from injury through contact when loading or unloading the oven. Ventilation is by a fan blower system, which increases the drying rate and prevents explosions. The control may be mounted on the side of the oven or separately, depending on which will be more convenient.

The temperature of the oven is held at the proper point by a sensitive thermostat. It is possible to maintain a temperature within 5 deg. F. of the desired point by this means. This control instrument actuates a magnetic contactor control panel which opens and closes the circuit supplying power to the oven and the temperature rises or falls. It is made in three sizes, M-107, M-109 and M-114. The M-107 size will handle six armatures per bake, the M-109 will handle eight armatures and the M-114 twelve armatures.

Armature Buggy Occupies Little Space

COLUMBIA MACHINE WORKS & MALLEABLE IRON COMPANY
3303 Atlantic Avenue, Brooklyn, N. Y.

VERY small space is occupied by this adjustable buggy. Due to its adjustable features it is suitable for the reception of any size of motor armature. This adjustment is made by



loosening two thumb screws located on the left-hand side of the frame and shifting the pedestals to the desired centers. A buggy of this type used for the transportation of armatures will reduce the possibility of injuring the commutators, shafts, etc. It is made of iron and strongly constructed throughout.

Adjustable Armature Stands Facilitate Repairs

COLUMBIA MACHINE WORKS & MALLEABLE IRON COMPANY
3303 Atlantic Avenue, Brooklyn, N. Y.

THESE armature stands are substantially made with a broad circular base, a low center of gravity and a screw to obtain a 10-in. height adjustment. The screw threads are made square in order to facilitate handling. Roller bearings in the cradles provide a means for the easy revolving of an armature as well as eliminating

mechanical injuries to the armature shaft. Two pockets cast on the side of the stand provide receptacles for the brackets to support the workman's tool and material tables. These stands can be adapted to many repair jobs about the shop.

Electrically Heated Babbitt Melting Pot

GENERAL ELECTRIC COMPANY
Schenectady, N. Y.

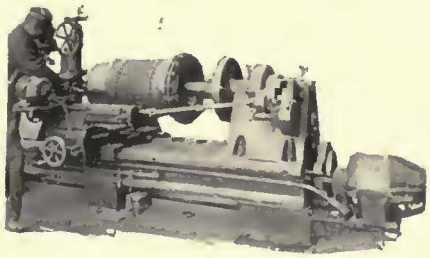
NEARLY all armature, axle and journal bearings for electric car equipment are rebabbitted. For this a conveniently arranged system for melting the babbitt is essential. To meet the requirement the General Electric Company has developed several different sizes of electric melting pots. The one shown in the illustration has a capacity of 5 tons. It is equipped with six cast-in heating units, each of 5 kw.

capacity. This will melt 1,000 lb. of babbitt per hour. Temperatures of from 700 to 775 deg. F. are maintained by thermostatic regulation.

Banding, Slotting and Turning Machine

LEA COURTENAY COMPANY
Newark, N. J.

ON THIS machine an armature can be turned, slotted and banded without removing it. The machine is especially designed to handle heavy



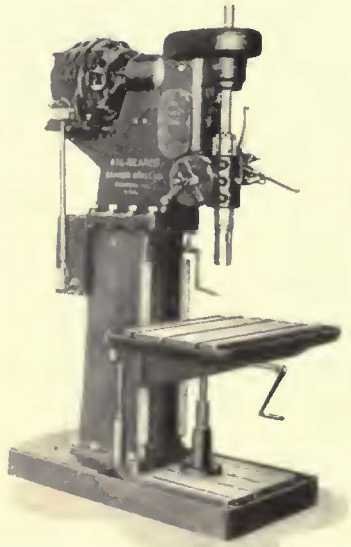
armatures such as are used on subways, elevated railways or interurban lines. The banding equipment is furnished with a device which can be adjusted to any given tension. An individual motor is used to drive each part.

Machine Shop

Ball Bearing Geared Drill and Tapper

BARNES DRILL COMPANY
814-830 Chestnut Street, Rockford, Ill.

CORRECT speeds and feeds for any one size of twist drill from ⅜ in. to 1½ in. can be obtained on the machine shown. Its direct-connected motor drive through a multiple disk clutch

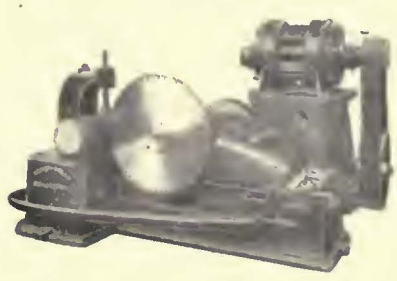


gear provides for simplicity and convenience of control. All important shafts have radial ball bearings and a fixed splined spindle has a roller thrust bearing. The self-oiling system lubricates all radial ball bearings and gears. The gearing throughout is alloy steel and all important gears are heat treated. A 5-hp., 1,200-r.p.m. motor is recommended. The star wheel handle is conveniently located on the right-hand side of the machine. A table with a finished working surface of 27 in. x 17 in. is surrounded by oil channels. The rack is dovetailed to the sleeve and no screws are used. A counterbalance chain facilitates the quick return of the spindle. An added feature is a safety device to prevent overloading and minimize breaking of drills. There is an automatic stop, giving full spindle travel. The height of the machine is 75 in. and it occupies a floor space 34 in. x 48 in. The net weight without motor and starter is 1,750 lb.

Cold Saw Cutting-Off Machine

ESPEN-LUCAS MACHINE WORKS
Front Street and Girard Avenue,
Philadelphia, Pa.

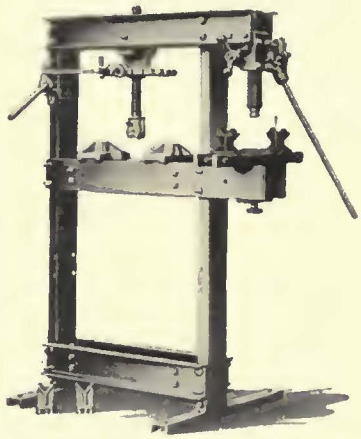
BARS, billets and other steel shapes can be sawed quickly on this machine. The housing and other principal castings are made of gray iron having thick walls and heavy webs. Spindle, driving gears and other working parts are made of high carbon steel forgings. The driving worm gear and main bearings are of bronze. Roller bearings take care of the heavy thrust. A self-priming pump supplies the lubrication for the saw. The feed, as well as the quick traverse in both directions, is accomplished by means of a low-pressure oil feed system. All speeds of traverse, including feed variation, are controlled by the movement of conveniently located levers. Automatic control can be had at the limits of the traverse, or at points determined by the operator. The machine can be operated by individual motor drive or from a countershaft, as desired.



Forcing Press

MANLEY MANUFACTURING COMPANY
York, Pa.

CAPACITY of 35 tons is obtained in the new Manley Press. Five leverages are used to change quickly from one speed to another, thereby enabling the operator to use the power best suited for the job. To change the leverage it is only necessary to slide the retaining collar forward, lift the connecting link and drop the pin in the proper hole, using either the first, second or third leverage. The press has a winch-operated table which is raised or lowered through a chain



working on two drums and controlled by a handle. A counterweighted handwheel suspended on ball bearings is used. The frame is of an open type which permits of long work such as shafts, small axles, etc., passing through the frame in a central position for straightening.

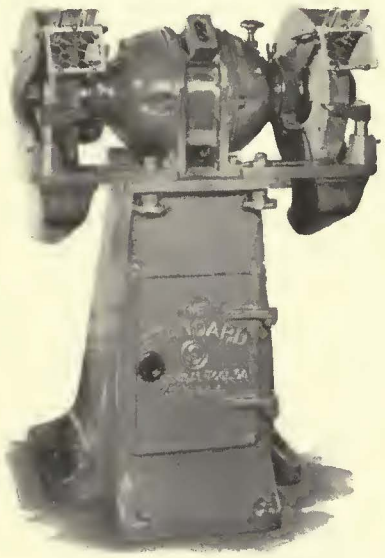
Quite often a bearing is rusted or frozen so that pressure alone will not remove it. The upper end of the 4-pitch Acme thread screw used in the press is so placed that it may be struck with a heavy hammer without injury. The leverage of the press is in the ratio of 4,800 to 1. High-speed leverage is used when pressure up to 8 tons is required. Ten notches on the hand wheel are obtained at each stroke. The high-speed screw leverage eliminates the criticism against screw pressure being too slow. The lever bar is placed at a suitable working height for full muscular action when pulling on it. The stroke is also made with the operator in such a position that he can see exactly what he is doing and just what is taking place on the pressing job. The frame is of bolted construction.

An independent rack and pinion press is also furnished with this outfit and is a separate and complete unit from the screw press. This can be used for small work. Leverage on this press is 44 to 1 and it has a capacity of 3 tons. The floor space required is 30 in. x 52½ in.

3-Hp. and 5-Hp. Improved Pedestal Grinders

STANDARD ELECTRICAL TOOL COMPANY
1938-46 W. Eighth Street, Cincinnati, Ohio

ELECTRICALLY driven grinders of this type are made in two sizes, 3 hp. and 5 hp. capacity, A General Electric motor and GE push-button con-



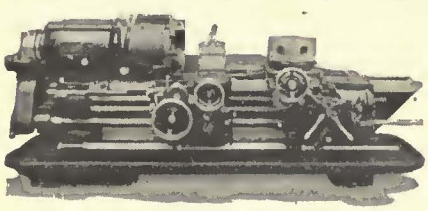
trol are furnished. The control is located on the inside of the pedestal or base of the grinder. The armature shaft is made of 3½ per cent high grade nickel steel. SKF ball bearings are used, incased in dust-proof chambers. Guards of the hinged door type with exhaust connections protect the emery wheel. The guards are equipped with a spark breaker, also a polished wire-glass adjustable eye shield.

The 3-hp. grinder is equipped with emery wheels 12 in. x 2 in. or 14 in. x 2 in., as preferred. The 5-hp. grinder is equipped with emery wheels 18 in. x 3 in.

Turret Lathe

GISHOLT MACHINE COMPANY
Madison, Wis.

BED, headstock and bearing housing of this turret lathe are cast in one piece. By extending the headstock walls above the top of the turret housing an oil-tight reservoir is formed for the splash oiling system. The machine is driven by a single pulley. Eight



changes of speed are obtainable by means of levers located conveniently at the front. All gears are made of treated alloy steel and a multiple disk clutch transmits the power. The transmission shafts are mounted on ball bearings. An outstanding feature is the short distance between the bearings.

The full swing feature of the side carriage eliminates interference of the square turret with the tools of the hexagon turret. Aprons of both side carriage and turret carriage are self-contained, each having complete independent feeds, lead screw, rapid traverse, automatic feed and traverse trips, screw-cutting index, micrometer dials and selective feed levers. Each carriage and the cross slide have micrometer dials. The feeds are all positively geared and eight changes of feed, forward and reverse, are provided in each apron.

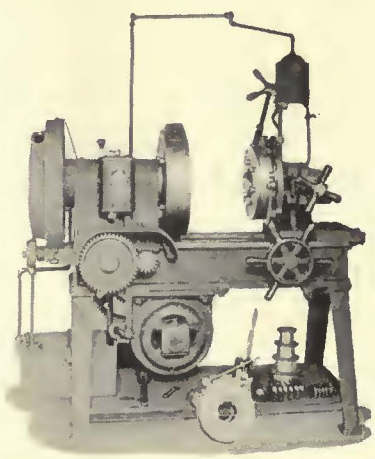
Independent longitudinal feeds permit the use of any one of the coarse or fine feeds of one carriage irrespective of the feeds on the other. One set of eight chain gears is provided for cutting all standard threads up to two per inch.

Each carriage has a separate rapid traverse independent of the feeds. The automatic feed trips are a feature. The 3-L machine occupies a floor space of 67 in. x 135 in. and the 4-L machine 80 in. x 190 in.

Motor-Operated Pipe Threading and Cutting Machine

D. SAUNDERS' SONS, INC.
Yonkers, N. Y.

PIPE from ½ in. to 4 in. inclusive can be threaded and cut with the 4B machine, while the 5D machine cuts and threads pipe 1 in. to 6 in. inclusive. Where desired these machines can be furnished with a bolt-threading

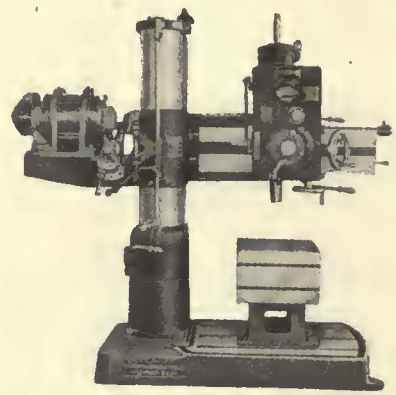


attachment. The machine is suitable for operation by either a.c. or d.c. A 5-hp. constant speed motor with a drum type controller designed for forward and reverse operation is direct geared to the driving shaft of the machine. Sufficient gear changes are furnished to obtain the correct cutting speed for all sizes of pipes within the capacity of the machine. The cutting off head is arranged with a tool slide and self-centering V jaws to steady the pipe being cut off. A handwheel connected to a rack and pinion moves the carriage containing the cutting off head and the die head. The die head slides on ways and permits it to be brought close to the gripping chuck for holding the pipe, which is of the standard universal type. The pipe is centered by a two-jawed self-centering chuck mounted at the rear end of the spindle on the side of the large driving gear. An automatic oil pump supplies a constant flow of oil to the chasers and cutting off tool.

Heavy-Duty Radial Drill

MORRIS MACHINE TOOL COMPANY
Cincinnati, Ohio

MORRIS radial drills are arranged for electric drive with the motor mounted on the arm. They are made in sizes of 3, 3½ and 4 ft. The head is fully inclosed and balanced on the arm. The spindle is a hammered steel forging running in bronze bearings in the sleeve and driven by two keys. It is fitted with a ball thrust bearing and



the spindle gear is mounted on ball bearings. The helical spindle gears are made of alloy steel, heat-treated and hardened. Feed gears are of steel, heat-treated and hardened. The feed unit is mounted in the head. There are six feeds on the 3-ft. and 3½-ft. drill, ranging from 5 to 30 thousandths of an inch per revolution of spindle. On the 4 and 4½-ft. radial there are eight feeds ranging from 5 to 42 thousandths per revolution of spindle and four thread leads, 8, 11½, 14 and 18 threads per inch.

The tapping attachment and back gear bracket is a unit mounted on the back of the head. The back gears, back gear clutches, spindle gears and feed gears are made of chrome nickel steel, heat-treated and hardened. A sliding gear speed box is equipped with ball bearings. The alloy steel gears run in oil. A speed chart at the change-speed lever permits the operator to select quickly any one of the spindle speeds. The column or sleeve is mounted on an inner column which extends through to the top and revolves on ball bearings. The column is of semi-steel, ground to size. The arm is designed to resist torsional and lifting strains. The ribbed base is fitted with T-slots.

Trailer Trucks

AMERICAN CAR & FOUNDRY COMPANY
30 Church Street, New York

TRAILER trucks of this type are especially designed to withstand heavy loads and rough usage. The frames are of channel and angle steel, hot riveted with corners gusseted. The bodies are of sheet steel reinforced with angles and bands. Cast-iron wheels with self-contained roller bearings and Alemite pressure lubrication are mounted on high carbon steel axles, heat treated to a Brinell hardness of 250. Pressed steel caps are shrunk on the ends of the wheel hubs, making a close fit around the axle, keeping out

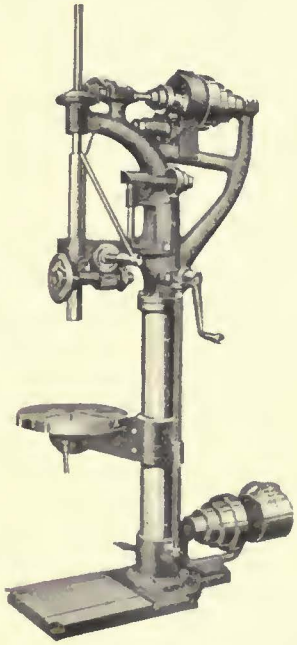
the dust and dirt. Each trailer is equipped with a rear drop forged gravity coupler hook to permit of train operation. Due to the counterweight it automatically locks and cannot be jarred open by rough roads.

These trailers are made with a gondola body or a dump body. The gondola body is adapted to the handling of miscellaneous loose material and crated or boxed material. The body has removable corner posts and if desired can be equipped with a special bolster for handling long material, loaded on two trailers. The dump body is self-clearing and automatically locks itself in the upright position after its return from dumping. The gondola trailer has a capacity of 6,000 lb. and the dump trailer has a capacity of 24½ cu.ft. or 6,000 lb.

Back Geared Upright Power Drill

BUFFALO FORGE COMPANY
Buffalo, N. Y.

INSTANT change from a plain to a back gear drive without using a wrench is possible in the machine shown by disengaging a knurled knob in the top gear and throwing in the back gears with a hand lever. A locking screw is provided for holding it in



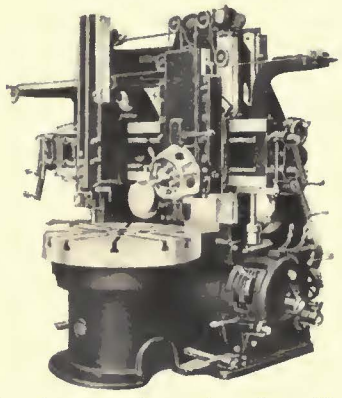
place. An adjustable automatic trip throws out the power feed when the piece has been drilled to the required depth.

The ball bearing spindle is graduated and ground. The lever handle is adjustable from 6 to 18 in. and is held in place by a tension spring. All bearings are split and adjustable for wear. The latch hinged worm feed wheel runs in oil. All gears are machine cut and are fitted with heavy bronze bushings. With spindle travel of 14¼ in. the machine is amply fitted to handle reboring work with ease. It weighs 1,100 lb. If desired, the machine can be furnished with a direct-connected motor.

Vertical Boring and Turning Mill

GISHOLT MACHINE COMPANY
Madison, Wis.

TWO plain swivel heads are features of the machine shown. A driving pulley is geared to a friction back-geared headstock having six mechanical speed changes which, in connection with a two-speed countershaft, provides



twelve changes of speed to the table, all in geometrical progression. The plain table has four pairs of parallel and four radial T-slots. The feed change levers, rapid traverse levers and table control levers are located on both sides of the machine together with a foot brake at either side. Two plain independent heads, furnished with the machine, can be swiveled to any angle from 45 deg. from the vertical. The ram is a box section type having a 3½-in. central core extending through the entire length. The bore for the tool holder is 3 in. diameter. Ten mechanical changes of feed are obtainable for each head. A feature is a device to eliminate breaking of gears and other parts. The micrometer index dials reading in thousandths of an inch facilitate accurate setting of tools.

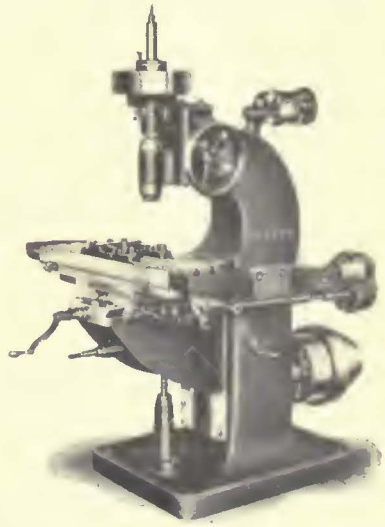
A feed tripping device stops the feed automatically at any predetermined point. In addition, safety stops trip the feed before the head reaches the end of the travel. Rapid traverse enables the operator to move the head quickly by power in either direction. The ratchet handles on the feed rods disengage automatically when the feed or rapid traverse is used, thus eliminating chance of injury to the operator caused by revolving handles. All feed gears and other gears subjected to heavy duty are made of steel. A two-speed tight-and-loose pulley countershaft is standard, but a motor drive is easily installed without increasing the floor space occupied, which is 97 in. x 120 in.

Improved Die Sinker and Vertical Milling Machine

REED-PRENTICE CORPORATION
Worcester, Mass.

LIKE other Becker machines, the model shown is supplied with an adjustable auxiliary head which keeps the spindle in perfect alignment. The spindle is made of high-grade steel with ground main bearings running in taper bronze bushings, adjustable for wear. Belt pressure of the spindle guiding pulley is taken by ball bearings supported in brackets at the top of the column. The main spindle has ball bearings at top and bottom. The table, of liberal proportions, has power longitudinal feed in either direction. The feed of the table is through a pair of three-step cones. Two additional changes can be effected by means of a pull gear on the feed box, to which the telescopic shaft is attached. Head, table, carriage and knee are furnished with adjustable gibs for taking up wear. The machines can be arranged for a single pulley gear box drive, if desired, which will permit of a direct drive from the main line without a countershaft. This machine is also suitable for direct motor drive. Where a constant speed motor is installed, it is necessary to provide a gear drive. This drive will provide fourteen spindle speeds ranging from 20 to 500 r.p.m. The quick changes in speed are obtained through two handles conveniently located on top of the gear box. For this method a 3-hp. constant-speed motor of 1,150 or 1,200 r.p.m. is recommended.

Where a variable speed motor is furnished it is not necessary to provide a gear box, since a spindle variation from 25 to 500 r.p.m. can be secured by



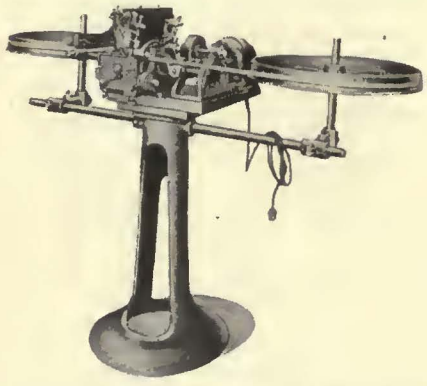
means of shifting the handle of a regulating rheostat, located on the side of the machine.

The floor space required for this machine is 74 in. x 60 in. x 75 in.

Machine for Filing and Setting Band Saws

WARDWELL MANUFACTURING COMPANY
110-112 Hamilton Avenue, Cleveland, Ohio

FILING, setting and joining of band saws all in one operation can be done by this machine. It will handle saws from ⅛ in. to 2 in. wide. Motor or



belt drive can be furnished as desired. By the positive and powerful movement of the file all spring or medium tempered band saws can be accurately filed and set at a speed of 70 ft. a minute.

Circular Relief Grinder

CLEVELAND TOOL ENGINEERING COMPANY
Main and West 25th Streets, Cleveland, Ohio

YEARS of experience, development and expert engineering are claimed to have produced an original circular relief grinder that effects economy unapproached by the older methods of relief grinding. It has proved its

worth in time, labor and money saved and in superior precision of the work.

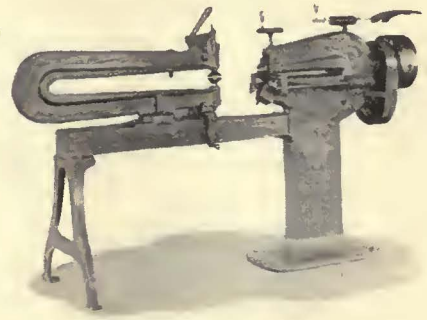
Grinding of the relief in a proper and economical manner can be performed on such tools as adjustable reamers, tapper taps, milling cutters, face mills and boring heads, core drills and various other tools. Where two or three distinct operations are usually needed to grind tools, it is said that the grinder shown will perform the entire work in one operation. The outside face of the wheel is dressed concavely to exactly the same curve as the tool to be ground. The tool is then offset from the center of the wheel curve to give the desired clearance. Then it is ground to the cutting edge. The circular relief leaves the outside of the tool convex with all the metal possible to support the cutting edge. The clearance is determined by the distance the tool is moved in or out against the curve of the grinding wheel.

Sheet Metal and Forge Shop Equipment

Power Ring and Circular Shear

PECK, STOW & WILCOX COMPANY
Southington, Conn.

CIRCLES or internal rings and irregular curves can be cut on this ring and circular shear. Clamping disks are provided with center points and blanks and are held securely between clamping disks and released through an eccentric lever. The circle arm moves easily and freely by means of a



rack and pinion and hand crank. The angular position of the cutter and the ability to raise and lower the upper cutter through a handwheel enable one to cut circles from square blanks, or to cut inside circles without cutting the outer edge. This machine is furnished regularly with tight and loose pulleys.

Turning, Wiring and Burring Machine

PECK, STOW & WILCOX COMPANY
Southington, Conn.

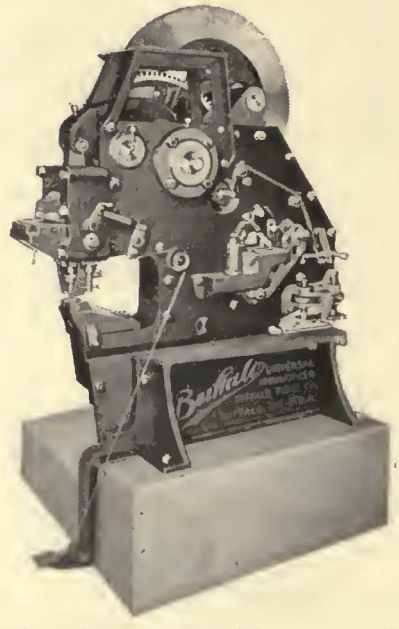
VARIOUS operations can be performed with the necessary additional rolls by this self-contained unit. With the belted motor drive the speed of rolls for turning, wiring or burring operations can be changed by simply

changing the size of the motor pulley. It has a capacity for No. 16 gage steel and lighter and its turning capacity is for No. 16 gage steel with ¼ or $\frac{5}{16}$-in. wire or No. 18 gage steel with $\frac{7}{16}$-in. wire. With wiring rolls the capacity is No. 16 gage steel with ⅛-in. to $\frac{5}{16}$-in. wire and with burring rolls No. 16 gage steel. The machine is furnished with a pulley drive and treadle friction clutch attachment. All bearings are bronze bushed.

Armor Plate Universal Iron Workers

BUFFALO FORGE COMPANY
Buffalo, N. Y.

BUFFALO armor plate universal iron workers are complete, reliable and modern machines for cutting metal. With one of these, rounds, squares, angles, tees, beams and channels can be cut and shear plates, flats, girders, H-columns, I-beams and angles punched. With a few special tools,



angles, channels and I-beams can be coped. These machines are made in four sizes, No. ½, 1, 1½ and 2. The same design is used on all models. There is a punch at one end and a slitting shear at the other with a bar cutter adjacent to the shear. The machines are supplied with a high and low die block and long and short punch holder. The triple punching attachment may be used on the machine if desired. The shear knives are suitable for slitting plates of any width or length as well as for flats. An exclusive feature of the machine is the stripper used on the shear.

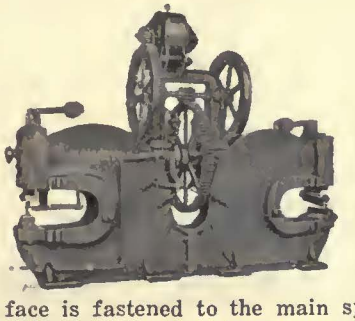
This is operated by means of a crank requiring no tools and is very wide to permit cutting short pieces of plates or flats. The bar cutter has five-piece knives so that replacement and sharpening are easy and inexpensive.

These machines, like all other Buffalo metal working machines, have frames of rolled steel armor plate, guaranteed forever against breakage. Due to the heavy cast-iron base a concrete foundation is unnecessary. The gear and pinions are made from machine cut steel.

Punching and Shearing Machine

LONG & ALLSTATTER COMPANY
Hamilton, Ohio

PUNCHING and shearing machines of this type have the slide counterbalanced and fitted with a bronze gib for taking up wear. Camshaft and pintle are made of steel. Bronze bushed bearings are furnished for the main journal and the cam pintle. The clutch is made of high-carbon cast steel and



the face is fastened to the main spur wheel by means of a tongue, groove and bolts. It is detachable, providing for renewal of worn parts. An automatic stop will throw out the clutch at the completion of each stroke and may be adjusted for any point of the stroke desired. The camshaft may be turned by hand for any adjustment.

Standard Blacksmith Forge

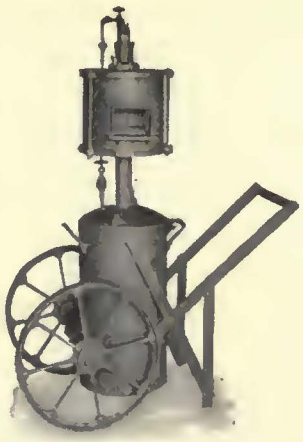
BUFFALO FORGE COMPANY
Buffalo, N. Y.

FORGES of the type shown are equipped with the No. 200 ball-bearing silent blower with a 14-in. fan. The forge has a cast-iron hearth mounted on four steel pipe legs and reinforced with cross-bar braces. A steel half hood vulcan tuyère is part of the regular equipment. The gear ratio of the blower is 47¼ to 1. The fire pan is 28 in. x 40 in. and the net weight of the entire outfit is 273 lb.

Oil-Burning Rivet Forge

BUFFALO FORGE COMPANY
Buffalo, N. Y.

INCONVENIENCE and danger from flying sparks in heating rivets are overcome by using the oil-burning rivet forge shown. This forge consists essentially of a welded steel oil tank on which is mounted a head or fire chamber. This head is made up of a cylindrical steel plate housing held between cast-iron top and bottom plates by means of three through bolts. The lining is a one-piece circular firebrick 2 in. thick made of the best quality of refractory material. To replace the old lining it is necessary only to unscrew three nuts and lift the top off the fire chamber. The oil tank is tested with air at a pressure of 125 lb. Air is supplied through a single connection which furnishes pressure for the oil supply as well as air for the atomizer.



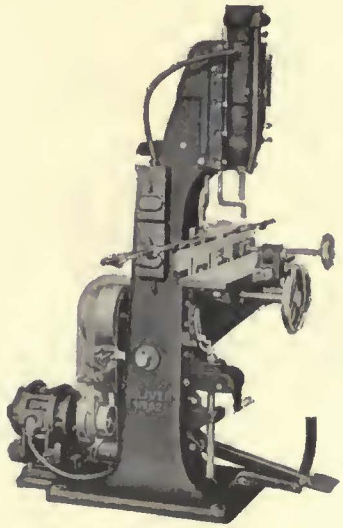
It will burn kerosene, distillate, or any fuel oil. The tank has two convenient handles, one on either side. A forge mounted on a truck as shown makes an ideal arrangement for portability.

Woodworking Machinery

Power Feed Hollow Chisel Mortiser

OLIVER MACHINERY COMPANY
Grand Rapids, Mich.

USE of a rigid, hollow, box type, one-piece casting having a wide flanged floor support for the column features this hollow chisel mortiser. The column incloses the power feed mechanism, with the exception of the drive pulley. A built-in fan blower behind



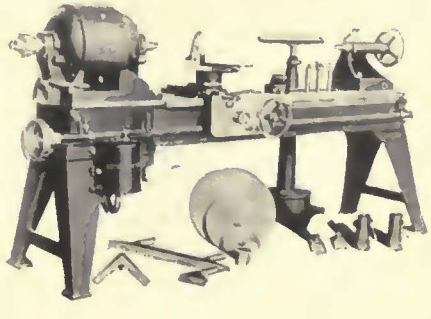
the column furnishes a constant air blast for cooling the tools and keeping the work free from chips. The mortising ram or plunger reciprocates in adjustable gibbed ways and has an adjustable travel from 2½ in. to 4 in. long, controlled by the treadle for single or continuous power feeding strokes. The machine will handle chisels from ¼ in. to ¾ in. square. Hollow chisels with 4-in. blades will mortise in 12-in. high material.

A universal compound table with screw clamp for 6-in. wide stock and a handwheel, rack and pinion for longitudinal travel, gaged by adjustable stops, are regularly furnished. The table is 36 in. long, 6 in. wide, 32 in. above the floor at the lowest position and 44 in. at the highest. It is fitted with a vertical adjustable back fence having a lip hold down and carries a 6-ft. layout stop rod with six spring stops for automatically locating mortises. A rod and two adjustable stops directly in front of the table govern the length of the mortises. The floor space required for the machine is 3 ft. x 5 ft.

Motor Head Pattern Lathe

OLIVER MACHINERY COMPANY
Grand Rapids, Mich.

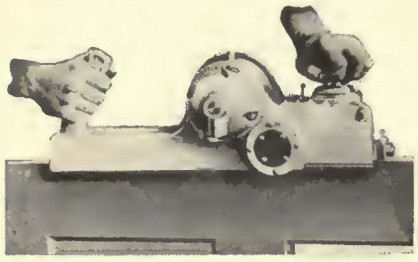
PATTERN lathe No. 25, shown in the illustration, is made in three sizes, 16 in., 20 in. and 24 in. swing. The head incloses an Oliver direct-current motor of 2-hp. capacity whose speed can be varied from 400 to 2,000 r.p.m. The armature shaft is made hollow for faceplate work and with suitable take-up for end thrust. The front end of the shaft is bored for Morse taper. Ordinarily a drum type controller with proper resistances is attached to this machine. The tailstock is made with a strong spindle and bored for Morse taper. The iron bed can be furnished in any length from 6 ft. upward, advancing by 2-ft. sections. All sizes of lathes are provided regularly with power feeding carriages, but hand-feeding carriages can be substituted.



Electric Hand Plane

WAPPAT GEAR WORKS
Meade Street and Braddock Avenue, Pittsburgh, Pa.

THIS electric hand plane can be used on doors and sash. The cutting is done by a jointer head which is driven through gears from a $\frac{3}{10}$-hp. universal type motor that operates from any light socket. The short shoe at the

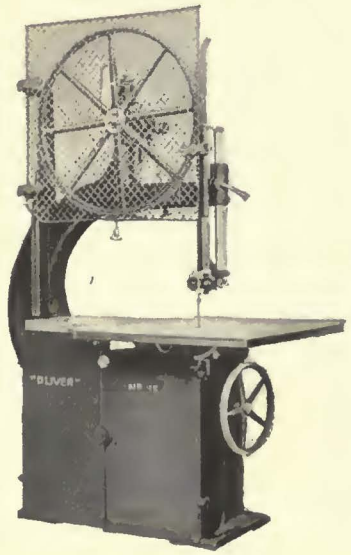


front of the plane and just ahead of the cutter can be raised or lowered by turning a knob with the left hand, thereby regulating the depth of cut. A graduated dial at the base of the knob enables the operator to set the knife for any cut from zero to $\frac{1}{8}$ in. This adjustment feature is unique in that by turning the knob forward or backward while advancing along the material it is possible to vary the depth of the cut and smooth out any high spots in one stroke. Another interesting feature is the beveling attachment, which can be set to cut accurately any required bevel on the edge of a door or sash. The body of the tool is aluminum and the total weight is 19 lb. It is easy to handle and simple to operate. The high speed blades in the cutter are easily removable for sharpening.

Band Saw

OLIVER MACHINERY COMPANY
Grand Rapids, Mich.

BASE and column arm of this machine are cast in one piece. The main table is carried on rockers for the angle adjustments. The table can be tilted both ways by means of a worm gear and hand wheel at the right of the operator. An auxiliary table is supplied between the column and the work table. The upper and lower wheels, of 38 in. diameter, are made of cast iron. The lower one is inclosed in a metal



casing, provided with two doors. The wheel shafts are fitted with machine ground journals and are mounted on tapered babbitted bearings. Each bearing has an oil well and cap. The upper shaft and bearing are adjustable vertically to suit various lengths of blades.

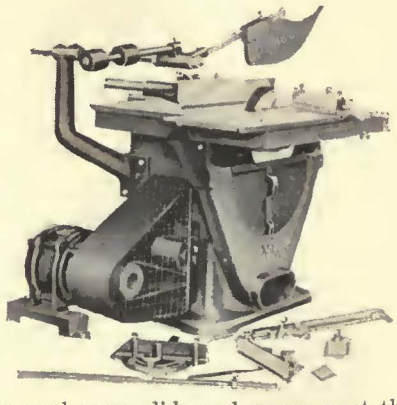
An outboard bearing which supports the lower wheel shaft is bolted to the frame. Saw tension is adjusted by a telescope spring. A guide post made of square steel is counterbalanced by an incased coil spring and can readily be locked in a fixed position. A grooved wooden saw guard on the column protects the saw on both sides. A steel front guard with a wood facing is carried on the guide post and covers the saw above the guide.

The main table is 36 in. x 40 in. and is designed to tilt 45 deg. to the right and 5 deg. to the left. The auxiliary table is 21 in. x 22 in. The floor space occupied by the machine shown is 68 in. x 54 in.

Universal Saw Bench

OLIVER MACHINERY COMPANY
Grand Rapids, Mich.

UNIVERSAL saw bench No. 90 is furnished with a cored form ribbed for strength with a wide flange at the base. A metal partition divides the saw from the balance of the working parts and prevents the sawdust from penetrating to them. The metal table has two sections, one stationary and the other arranged to slide past the saw. An extension bracket at the right supports the fence when ripping stock the maximum width. The table will tilt to an angle of 45 deg., the movement being controlled by means of a handwheel engaging a worm and gear. The movable table is mounted on a



tongued cross slide and moves past the saw for use in cutting off and for dado work. The cross slide is gibbed to main table frame and can be drawn 4 in. away from the saw line so dado heads and grooving saws may be used. The stationary section of the table is graduated its entire width in eighths and the sliding section is graduated into degrees.

Two crucible steel machine ground arbors fitted into bearings are lined with interchangeable sleeves having oil wells and wick conveyors that keep them flooded with oil continuously. The arbor pulleys are of the pneumatic type, machined and balanced.

The universal ripping fence may be used on either side of the saw or secured at any angle not in line with the saw, on either the stationary or the rolling table. It has a quick adjustment of 12 in. without changing the locating pins to the next set of holes. A micrometer will set the bench to and from the saw for fine and extremely accurate adjustment. It has a parallel adjustment whereby it may be set to or from the operator 9 in. A miter and cut-off gage on the sliding table swings to an angle of 30 to 135 deg. It has 18-in. and 36-in. auxiliary rods and stops for determining lengths to cut off. Two universal gages are supplied for the table grooves each side of the saw. They are graduated from 30 to 150 deg. The machine has a capacity to rip 22 in. wide, cut off 34 in. wide up to $1\frac{1}{2}$ in. thick. The 14-in. saw projects through the table 4 in. The machine with motor brackets occupies a floor space of 4 ft. 1 in. x 5 ft. 6 in.

Complete Woodworker

BUFFALO FORGE COMPANY
Buffalo, N. Y.

TEN machines in one is the manufacturer's description of the woodworking machine shown. It includes a rip and cross cut saw, a band saw, a planer, jointer, shaper or edge molder,

a lathe, a drill and a sander. A grinder can be furnished at extra cost. Three men can work on it at one time without interference with one another. Practically any woodworking operation can be performed.

Tight and loose pulleys are provided on the main shaft at the left of the cone pulleys, below the table. This construction makes it possible to run the belt up through the table to a line-shaft or motor overhead. There are three distinct parts to the machine, which may be operated together or individually. One is a lathe which is used also for drilling and grinding. The second is the band saw, and the third the arbor used for circular saw, planer, sander, jointer and shaper. These main parts are engaged by three conveniently arranged clutches. The main driver is provided with a belt shifter which can be operated from either side of the machine. With all parts of the woodworker operating at the same time only 4 hp. to 5 hp. is required.

An adjustable mandrel furnished can be run horizontally or vertically and on it may be inserted planer and dado heads and circular saws or knives of any size. It is made of cold rolled steel and carefully machined. A planer table is made in two parts which fit into the channel on the main table. An adjustable guide for the planer is furnished which can be set at a 90-deg. angle with the table top or tilted back to allow planing at an angle. The planer slides are 29x10 in. and 21x10

in., respectively. By raising the mandrel to a vertical position a shaper is obtained on which any kind of knives may be used. Rip and cut-off saws of 12 in. diameter are furnished with the machine. Cuts of any size or desired depth up to 3½ in. may be made. The removable gage for cross-cutting has a quadrant which permits adjustment for sawing at any angle from 30 deg. to 90 deg. The lathe will handle work up to 20 in. diameter by 40 in. long. Four step cone pulleys, of 5½, 7½, 9¾ and 12 in. diameter respectively, are an essential part of the lathe. A clutch is provided on the lower cone pulleys. A band saw table is cast in one piece with the main table. It measures 29½ by 30 in. The saw wheels are 27 in. in diameter and the maximum clearance below the guide is 15 in. A ½-in. band saw is furnished with the machine. The band saw is as strongly constructed as it would be in an individual machine, the shaft diameter is 1⅞ in. and the upper bearing is 10 in. long.

Track Maintenance Tools

Oil Preheater

ALEXANDER MILBURN COMPANY
1416-1428 West Baltimore Street, Baltimore, Md.

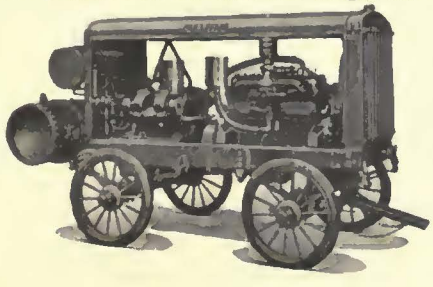
CASTINGS can be heated prior to welding, tar kettles can be heated, pipe can be thawed, etc., with the Milburn preheater. The oil burner is of the atomizing type, utilizing crude, fuel, kerosene oil or distillates, and

compressed air varying from 50 to 100 lb. pressure. The tank is constructed of heavy gage steel and the bottom is welded. Two handles welded to the tank facilitate handling. The weight of the unit is 60 lb. The outfit consists of a 5, 12 or 22-gal. reservoir, an atomizing burner, 25 ft. of air hose with couplings, 25 ft. of special composition oil hose with couplings, oil pipe feed line, air pipe feed line and suitable valves for air regulation.

Portable Air Compressor

SULLIVAN MACHINERY COMPANY
122 South Michigan Avenue, Chicago, Ill.

COMPRESSED air is supplied at the rate of 220 cu.ft. per minute by the four-cylinder V-type compressor shown, which is direct connected to a Buda engine. The parts, together with an air receiver, gasoline fuel tank and radiator, are mounted on a steel frame with sheet steel canopy top and removable side covers. The wheels and truck are a matter of selection. All compressors in the line are single acting and employ a Sullivan "wafer valve." They are automatically lubricated and have water-cooled cylinders, barrels and heads. The flywheel and crankshaft assembly are carefully balanced on a special machine. The compressor is said to be a new departure in design, the V-type arrangement of cylinders adopted entirely eliminating vibration and decreasing the weight. Each of the four cylinders is 6½ in. x 5¼ in.

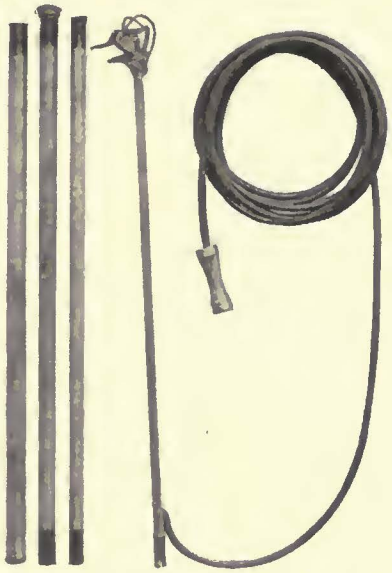


The Buda engines are four-cylinder machines provided with four-point suspension. They can be equipped to use kerosene instead of gasoline if desired.

Contact Hook and Pole

RAILWAY TRACK-WORK COMPANY
Clementine, Thompson and Mercer Streets, Philadelphia, Pa.

PIVOTED jaws 5 and 6 in. long, of special composition, grooved to grip the trolley wire above and below are features of the Ajax contact hook and pole. The weight of the pole clamps



the jaws on the wire. The lower jaw comes in contact with the clean undersurface of the trolley wire, preventing arcing and burning. When in position on the trolley wire, cars can pass without removing the pole. When the pole is raised, the lower jaw drops behind the guide lug, so that the upper jaw slips on the trolley wire into position for clamping. The lower end of the pole can be rested in any convenient position to clear passing cars. The contact will handle 300 amp. without injury to the wire.

Chausse Model E-3 Portable Asphalt Repair Plant

CHAUSSE OIL BURNER COMPANY
West Beardsley Avenue, Elkhardt, Ind.

MODEL E-3 asphalt repair plant is an improved development of the model E-1 and E-2 machines. It permits of laying hot asphalt and is suitable for large or small patchings or for supplementing stationary plants. The machine may be used as an independent unit directly where the repair work is being done as it is self-propelled on rubber-tired wheels and contains ample storage for raw material.

The plant is equipped with a Continental motor, small Kellogg air compressor for fuel-line pressure, S.K.F.

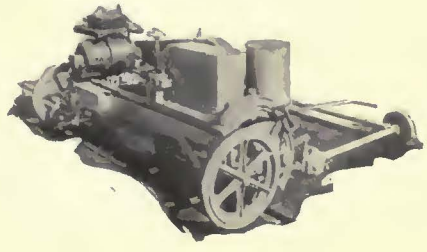
ball bearings on the sand drier, high-pressure lubricators on all other bearings, Cotta transmission, twin disk clutch, Geneva wheels and standard solid rubber tires.

The capacity of the plant is rated at 150 sq.yd. of 2-in. compacted mix per eight-hour day. Old asphalt can also be reclaimed during regular operations. A tool heater with an oil furnace is located at the rear of the machine. Bins provide for the storage of 135 gal. of asphalt, 2½ cu.yd. of mineral aggregate, 1,750 lb. of cement or lime dust, 50 gal. of kerosene and 9 gal. of gasoline. The light weight of the machine is 9,400 lb.

Rail Joint Grinder

RAILWAY TRACK-WORK COMPANY
Clementine, Thompson and Mercer Streets, Philadelphia, Pa.

BLOCKS of abrasive material 10 in. x 4 in. x 2½ in. with a steel pin inserted in one end are used in this machine. Two blocks are used in one setting of the machine, providing a grinding surface of 8½ in. x 2½ in. The blocks are placed endwise in the crosshead or brick holder which slides bodily in guides. It is reciprocated over the rail by means of a simple rocker arm movement at a speed of 340 strokes a minute. As the blocks wear, the end wedge is slackened by turning the small hand wheel over it, while the blocks are fed downward by means of the large hand wheel operating the feed screw directly over the blocks. With the long straight grinding surfaces it is impossible to grind the low spots. A 3-hp., 600-volt direct-



current constant-speed motor is used for driving the grinder. Turning the hand crank at the right of the machine lowers the derail wheels to the pavement and raises the grinder from the track, supporting 95 per cent of the weight so that the operator can lift the outrigger end of the machine and roll it off the track. The grinder weighs 1,350 lb. complete. The outrigger is hinged so that it can be raised vertically for storage or transportation.

Portable Oxyacetylene Plant

ALEXANDER MILBURN COMPANY
1416-1428 West Baltimore Street, Baltimore, Md.

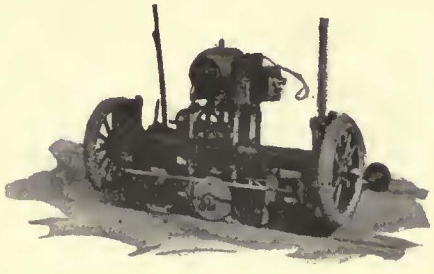
WELDING, cutting or a combination of the two can be done with the Milburn portable oxyacetylene plant. The truck is made to accommodate the small or large sized oxygen

or acetylene tanks. The truck illustrated is constructed of heavy steel angles bent and strongly welded to withstand rough usage. The diameter of the wheels is 16 in. A strong chain welded to the frame of the truck holds the cylinders in place so that there is no danger that they will slip when in transit.

Automatic Rotary Track Grinder

RAILWAY TRACK-WORK COMPANY
Clementine, Thompson and Mercer Streets, Philadelphia, Pa.

ROTARY track grinders of the type shown are automatic in travel. The motor and grinding carriage are mounted in the center of the machine, which travels along the track at a speed of 30 in. per minute when grinding. Its movement can be reversed for any length of travel. By means of a



clutch operated by a hand lever the speed is increased to 100 ft. per minute for moving the machine from one joint to the next. Two shoes 16 in. long are attached to the frame on which the machine rests. The shoes have openings through which the track wheels extend. By means of a heavy spring over each wheel, any tension can be applied so as to distribute the weight equally over the shoes and track wheels.

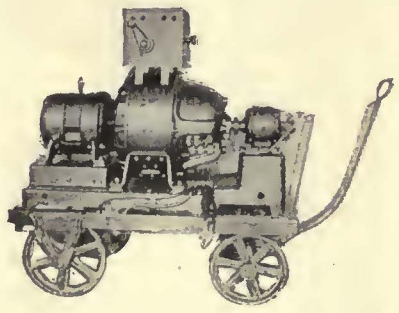
The machine is controlled from the operator's seat. Within his reach is a handwheel for feeding and one for tilting the grinding wheel, a hand lever for instantly or gradually raising the grinding wheel to obtain a run-off on the rail head and also the lever to control the lateral adjustment of the grinding wheel. The long lever shown at the left of the machine is for raising the machine from the track to the two roadway wheels to allow cars to pass.

A substantial silent chain drives the wheel arbor direct from a 5-hp. motor. The machine accommodates grinding wheels 14 in. in diameter by 2½ in. or 3 in. face. The grinding wheel arbor is operated on ball bearings with dustproof caps. The outrigger is hinged for raising when transferring the machine or transporting it on a truck.

Single Operator Arc Welding Equipment

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
East Pittsburgh, Pa.

PORTABLE 200-amp. single operator welding equipment as shown is an entirely self-contained unit. The control of the welding current is simplified so that only one handle rotating through 360 deg. is required for adjustments. The apparatus is mounted on a truck and the sturdiness of the various parts insures against breakage and accident on account of rough handling



to which such apparatus is usually subjected. The generator will deliver 200 amp. at 25 volts to a resistance load for one hour with a temperature rise not to exceed 50 deg. C. Its continuous rating is 93 per cent of its one-hour rating with the same temperature rise and the same voltage. It will deliver 275 and 300 amp. at the arc for welding duty. The generator operates at arc voltage and no external resistance is required in the circuit. The generator is designed to stabilize the arc inherently, thereby eliminating the necessity for automatic moving devices such as relays, solenoid-controlled resistors, etc. Either a direct-current motor or an alternating-current motor may be used, depending on the characteristics of the supply circuit. The driving motor and the generator are mounted on a common shaft and bed plate. To eliminate bearing and shaft troubles the exciter is coupled to the common shaft by means of a special flexible coupling and is supported by an extension of the common bed plate. Ball bearings of the radial type are used throughout, which allows the equipment to be operated in any location without danger of oil spilling and without the necessity for exact leveling. The complete control equipment for starting and regulating the current output is contained in a steel cabinet mounted on top of the generator. This company also manufactures arc welding rheostats for railway use as well as multiple operator equipment for manufacturing plants.

Electric Arc Welder

RAILWAY TRACK-WORK COMPANY
Clementine, Thompson and Mercer Streets, Philadelphia, Pa.

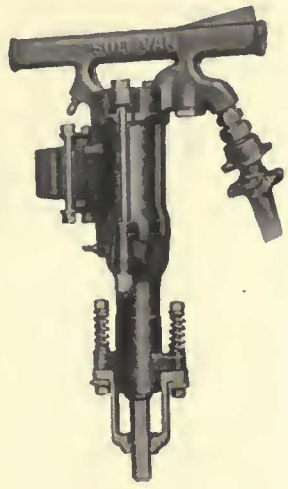
COILS of a high resistance wire, supported by insulator bars, which in turn are carried by a light but sturdy steel angle frame, form the essentials of this arc welder. At one end of the frame is mounted a switchboard to control the current. The unit is light and

portable, having large capacity with ample ventilation and accessible parts. The Ajax welding machine type RWY weighs approximately 120 lb. It is 18 in. x 28 in. x 36 in. The type IND machine weighs approximately 55 lb. Its size is 15 in. x 20 in. x 25 in. The hinged handles for carrying the machine drop parallel to the corner posts when released. Regulating switches provide a range of current from 19 to 333 amp. under normal line voltage with intermediate steps of 18 amp. each. If the line voltage drops to as low as 300 volts, 209 amp. can be obtained. It is claimed that the resistance wire used will not oxidize. A shunt switching device controls the several groups of coils independently, whether the full length of the coils is in operation or they are shunted. By means of the switchboard, 36 different values of current can be obtained. A sheet steel truck mounted on four rubber-tired ball-bearing wheels can be furnished if desired. This truck has compartments in the bottom for carrying a supply of welding rods and a box in the front for accessories.

Heavy-Duty "Busters" for Breaking Concrete

SULLIVAN MACHINERY COMPANY
122 South Michigan Avenue, Chicago, Ill.

SULLIVAN "Busters" are designed to meet the wide and increasing demand for a one-man compressed air tool to do quickly and cheaply such work as breaking up concrete, cutting asphalt, excavating frozen ground in trenches, etc. The DW-221 type weighs 75 lb., is economical of air and runs with little vibration. It uses a 1⅛-in. steel with plain hexagonal collar shank and requires a ¾-in. air hose connection. Characteristic features are the valves and piston motion, automatic differential pressure lubricator, inclosed dust-proof chuck, steel retainer, all-steel construction, light-weight, rapid action, positive control of the piston and the hard powerful snappy blow in parts through the piston. The valve mechanism is secured in the chest by side rods, and the valve buffers are made of heat-treated tool steel to resist shock and breakage. The pistons are made from bar stock of alloy steel and



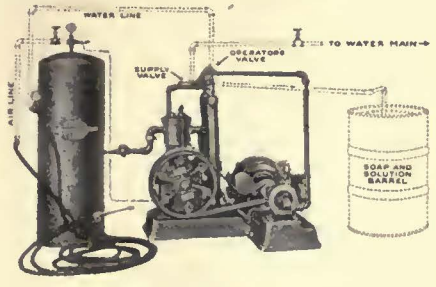
ground to fit the cylinders, which are solid drop forgings. The chuck and chuck bushing are inclosed in a dust-proof housing. Ample lubricating ports are provided in addition to the automatic lubrication incorporated in the machine.

Bus Repair Equipment

Car Washing System

CURTIS PNEUMATIC MACHINERY COMPANY
St. Louis, Mo.

THE Curtis air-mist car washing system is furnished with a 4½-in. x 4½-in. water-cooled compressor belt connected to a 5-hp. motor. The self-contained compressor is fully inclosed to protect the working parts from dust and dirt. The crankshafts and connecting rods are made from steel forgings. The cylinder head and valves are water



cooled and a radiator of suitable proportions is provided. The valves are of the light disk type, tempered, ground and polished. The valves seat on a phosphor bronze flat seat of a large area and can be removed independently without taking off the cylinder heads or loosening the pipe connections or fittings. An air pressure governor is part of the equipment. When the maximum pressure in the tank is reached the governor unseats a suction valve and the compressor runs idle until the tank pressure has dropped 5 or 10 lb. A centrifugal unloader prevents the motor from being started under load. The oil in the crankcase is picked up by knife blade throwers on the crankshaft.

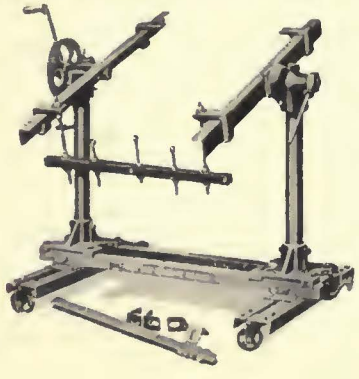
The equipment furnishes a full force spray for washing the undersides of fenders and chassis and a soft or mild spray for washing the body. The adjustment is made by turning the operating valve. A third position of this valve will shut off the water. A supply valve permits of the withdrawal of water from a barrel or tank or from the regular water service line as desired.

The equipment shown is furnished in only the one nozzle type. The whole unit, including the air tank, can be installed in a floor space of 3 ft. x 7 ft.

Universal Motor Stand

MANLEY MANUFACTURING COMPANY
York, Pa.

GASOLINE motors placed on the stand shown can be turned by one man into any convenient position to facilitate his work. The three-point suspension bar, of which two are furnished with the stand, is an important improvement. These suspension bars make it easy to mount and balance practically all types of three-point suspension motors. In addition to this a set of brackets slide on the side members for ready mounting of four-point suspension motors. A cone clutch installed on the top of the upright permits of locking the side rails to any desired position.



High-Lift Jack

WEAVER MANUFACTURING COMPANY
Springfield, Ill.

UNUSUAL range of lift is found in a sturdy, dependable jack designed with increased capacity for handling buses and trucks. This jack incorporates all of the good features which made the previous models popular, as well as many new ones. The lifting arm, of the screw hoist type, is raised and lowered by a traveling

nut attached to the end of the arm. The handle operates a wheel on the end of the shaft through a ratchet and dog. It has a capacity of 8,000 lb. and a lifting range of 40½ in. The screw extension permits a lift to be applied directly to the chassis frame in spite of low running board or gas tank. Accidental release of the load is impossible due to a special locking mechanism. A broad wheelbase prevents tipping.

Power Tire Spreader

WEAVER MANUFACTURING COMPANY
Springfield, Ill.

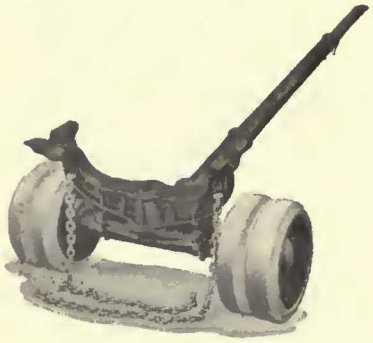
QUICKER and easier means for spreading pneumatic tires up to 10½ in. for inspection and repairs without danger of injuring them is possible by use of the machine shown. A feature is the method of spreading the tire naturally over the convex buffing plates with an outward and downward motion without subjecting the tread to any undue strain. Operation of the spreader by compressed air permits the repairman to devote his entire atten-

tion to the inspection of the tire. The device does not have to be bolted to the floor, since it is designed to support the largest and heaviest tires without the possibility of being overbalanced. Shipping weight of the spreader is 253 lb. and it occupies a floor space of 15 in. x 26 in.

Truck Ambulance

WEAVER MANUFACTURING COMPANY
Springfield, Ill.

PROVISION for quicker, easier and safer pulling of disabled buses and trucks is given as the reason for the design of the truck shown. The load is supported by a 2½-in. high-carbon-steel axle held to the frame by two heavy U-bolts. The wheels are supported on the axle by dustproof ball bearings which take the radial weight of the load and the thrust strain. Heavy double tires mounted on 16-in. diameter wheels 8½ in. wide insure strength as well as lack of vibration and noise

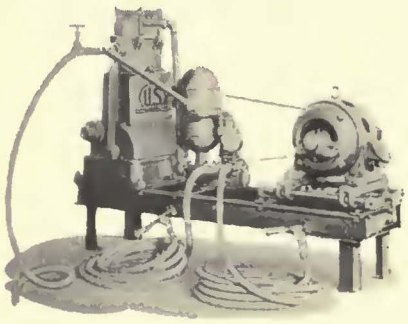


when towing. The cast-steel yoke which supports the load turns on a pivot, permitting guidance by the tongue. Interchangeability of saddles permits of center variation from 19¼ in. to 28¾ in. This truck can be readily attached to rear or front axle. The pole is of telescoping design and its length can be adjusted from 7 to 13 ft.

High-Pressure Washing Machine

UNITED STATES AIR COMPRESSOR COMPANY
Cleveland, Ohio

SEVERAL models of this washing machine are built. The one shown is a two-gun unit. Other models developed are the AW-Jr., which is a one-gun machine, and the AW-4, a four-gun machine. The equipment is capable of increasing the normal city water pressure of about 40 lb. to more than 300 lb. continuous pressure with the gun wide open. It is said that this pressure will remove the most stubborn



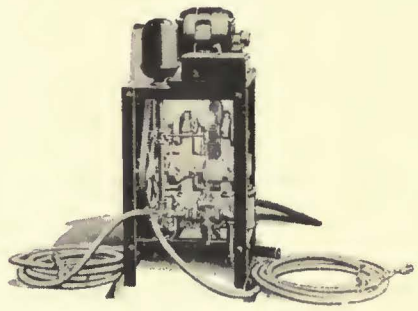
caked grease and crusted dirt. By a slight turn of the valve on the special U. S. pistol grip gun a soft, penetrating mist can be obtained for soaking and washing the body. A feature of these units is the fact that they can be connected directly to the city water supply line for both hot and cold water without danger of the high pressure backing up into the plumbing system and causing damage. This is made possible by a vacuum breaker valve supplied with the equipment. A double suction connection permits drawing a soap solution from a barrel or tank if desired. The pump of this machine is totally inclosed and all moving parts are continually bathed in oil.

Two-Gun Auto Washer

MANLEY MANUFACTURING COMPANY
York, Pa.

IN BUILDING the machine shown the Worthington Triplex pump was selected as most suitable. This pump has three cylinders 120 deg. apart on the crankshaft so the flow of water is continuous with a maximum pressure. The pump has a single casting and no cup washers or leather buckets are used. The valves are bronze, wing guided in a vertical position on bronze seats. The crankshaft of the pump is drop forged, having babbitt connecting rods with cap screw connections for taking up the wear. The pump is driven by a silent chain from the motor on the top of the steel framework. Suitable sheet steel guards over the chain and gear protect them from water.

The unit is vertical with the motor at the top, so that it occupies small floor space. The reduction gear is of

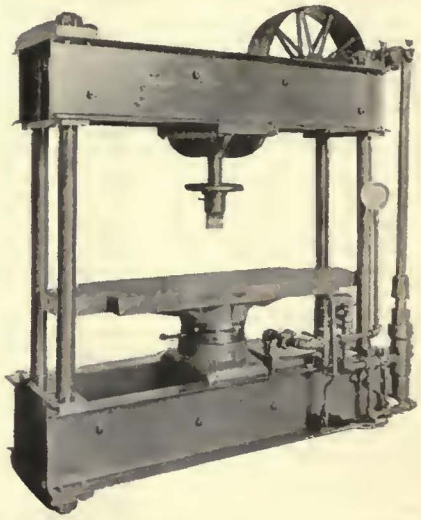


extremely wide face, coarse pitch and machined cut teeth. A feature is an automatic control valve furnished with the machine. It unloads the pump as soon as the system is up to pressure. This adds life to the pump and reduces the energy consumption. If for any reason the machine is overloaded, the safety valve discharges the water and relieves the machine of strain. The suction line contains a three-way valve so that city water can be pumped, or when thrown in another position the suction hose can be used in connection with a barrel of soap solution, etc. Automatic ring oilers are used on the motor, whereas all other parts of the pump are lubricated by the alemite system. The guns can be adjusted from a fine mist to a hard stream of any volume. The height over all is 46 in. The floor space occupied is 24x30 in. The size of the water fitting is ¾ in. The washer is furnished complete with triplex pump, safety guards, silent chain drive, 6 ft. of suction hose, two 25-ft. lengths of pressure hose, two guns, automatic pressure control, pressure gage and motor.

Hydraulic Straightening Press

LOURIE MANUFACTURING COMPANY
Springfield, Ill.

STRUCTURAL steel construction is used in this press for straightening such parts as automobile axles, crankshafts and camshafts. It is furnished with one differential piston pump, which gives a rapid movement of the ram

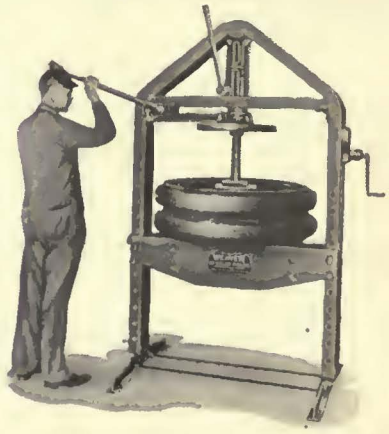


under low pressure and automatically slows down under heavy pressure. One additional piston can be furnished if desired which will give double the ram speed. It is operated by pedal control valve, which permits the operator to have free use of both hands. The machine shown occupies a floor space of 16 in. x 60 in.

60-Ton High-Speed Press

WEAVER MANUFACTURING COMPANY
Springfield, Ill.

MORE powerful, quicker and more easily operated, and said to be capable of handling any job, is this 60-ton press. The ball-bearing construction, combined with the steep pitch screw, insures greater power and speed with less effort. These are considered outstanding features. It affords two distinct leverages for light or heavy work, either of which can be used without changing the position of the work. Three leverages are available for heavy



pressure. The safety bolster is easily raised or lowered by a crank to bring the work in direct contact with the screw. Vertical operation of the lever makes it unnecessary to bolt the press to the floor.

Association News & Discussions

Motor Coach Maintenance*

Proper Layout for the Garage Is Important to Obtain Greatest Efficiency from Shop Forces—Tool Equipment Need Not Be Elaborate but Should Be Chosen to Meet Requirements

By H. P. McDonald
Superintendent of Automotive Equipment
East St. Louis & Suburban Railway, East St. Louis, Ill.

HOW large should an operator build his garage? Based on experience, the width should be not less than 100 ft. and the length, of course, would depend on the present size of the fleet and the probable future purchases of additional coaches. In using a minimum width of 100 ft., I am going on the basis that the garage, when built, will have no obstructions, such as columns or posts. This width permits coaches to be backed in along each side wall so as to leave an aisle in the center. Any particular coach can then be pulled out without having to move four or five other coaches. When the fleet is so large that center aisle storage becomes necessary, the 100-ft. minimum width still permits the greatest economic use of space. Coaches that are first out in the morning should be the ones stored in the aisles. In storing coaches along the side walls, the distance between coaches should be not less than 12 in., with 2-ft. wall clearance at the rear. This space provides proper access to night men to grease and clean the vehicles properly.

The last two items are very essential because a sanitary and clean coach attracts passengers and the ultimate achievement of low operating cost cannot be secured unless there is proper lubrication. The spacing also provides ample room for extinguishing possible fires.

In these days of rapidly changing conditions, a ceiling or truss height of 16 ft. should be a minimum. This gives plenty of ventilation and also provides for possible future purchase of double-deck equipment. Low-cost constructed garages are dangerous, as carbon monoxide gas causes men working on coaches to develop serious headaches.

Wash Rack Location Important

The wash rack should be located just inside the main entrance door, its length depending upon the size of the fleet. The gas and oil pumps should be located at the inner end of this rack. This enables the largest part of the night's program to be completed at this point and all operations can be observed closely. Coaches coming in off their runs go over the wash rack for cleaning, then are filled with gas, oil and water, and, if not due for any inspection, would be immediately stored along the sides. If due for inspection, they would take their turn in going over the pits. Alongside the wash rack small pits should be provided in the floor, in which water hose and nozzles can be kept ready for use. The number of inspection pits depends upon the mileage of fleet over a 30-day period and the mileage basis adopted for periodical inspection. The tool room, stock room, and work benches should be located as near the pits as practicable, in order to save time in obtaining supplies. Plenty of room should be left between the work benches and the edges of the pits so that floor cranes for handling engines and other heavy apparatus can be readily used.

Motor coaches of today are being built lower and lower and there may be some possibility of making them still lower. Pits, therefore, are a necessity to speed up the work that has to be done underneath a motor coach. They enable the men to use their full efforts in the maintenance of the coaches. The pits should be well lighted and ventilated and should have a sewer connection so that they can be washed out occasionally and kept in a sanitary condition. The size of the pits will vary with the size of the vehicle, but their length should be such that any unit on the chassis can be inspected and serviced readily. Ample general illumination by means of ceiling lights should be provided, and there should also be frequent drop or portable light wall connection sockets. Of the latter at least two should be on each side of each pit and they should also be located not more than 20 ft. apart along all sides of the garage.

There are several methods of heating garages. Based on experience, it appears the use of radiators along the walls is the best. This enables you, in cold weather, to head your coaches in toward the wall so that the engines are close to the radiators and thus kept warm. This makes starting easier, keeps the oil at proper temperature and enables it to function when the engine is started, thus ultimately reducing maintenance costs.

Training of Drivers

In order to have low maintenance cost, drivers must be properly instructed and trained. They must first be impressed with the fact that motor coaches are to be operated primarily for the comfort and convenience of the passengers. They should be started easily and smoothly and stops should be made in the same manner. While this provides comfort and convenience to passengers, it also, in the end, results in lower maintenance cost and less abuse of equipment. Drivers should be instructed to check oil and gas on leaving the garage and to make two or three checks during their day's run and, when they are relieved on the road, the relief crew should be instructed to do the same. This prevents running out of gas on the road, which may cause loss of patronage, due to irritation of passengers, and also prevents oil getting low, which may completely ruin a motor in a short time.

Drivers should also be impressed with the importance of reporting any and all unfamiliar noises which may develop during a day's run, and where obvious defects occur they should be required to report them on proper forms when they turn in to the maintenance department. We quite often find defective motor coaches sent out on the road just because drivers have failed to make the necessary reports so that the mechanical department can make repairs. Proper operation of motor coaches with low maintenance cost is just as much the business of the transportation department as it is of the mechanical department, and unless

*Abstract of paper presented at the Illinois Electric Railway Association convention, Springfield, Ill., March 17-18.

COMING MEETINGS OF *Electric Railway and Allied Associations*

March 24—New England Street Railway Club, annual meeting and banquet, Copley-Plaza Hotel, Boston, Mass.

April 1—American Electric Railway Association, Metropolitan Section, Engineering Societies Building, New York City, 8 p.m.

April 26-29—Southwestern Public Service Association, convention, New Orleans, La.

May 31—June 1-2—Canadian Electric Railway Association, annual convention, Winnipeg, Man.

June 6-8—American Association of Engineers, annual convention, Tulsa, Okla.

June 24-25—New York Electric Railway Association, annual meeting, Hotel Champlain, Bluff Point, N. Y.

July 27-29—Association of Equipment Men, Southern Properties, 12th semi-annual meeting, Atlanta, Ga.

Oct. 3-7—American Electric Railway Association, annual convention and exhibit, Public Auditorium, Cleveland, Ohio.

there is close co-operation between these departments proper maintenance with consequent increase in reliability cannot be secured.

Good Lubrication Essential

Maintenance on high-class automotive equipment can be conservatively stated to consist of 90 per cent lubrication and 10 per cent adjustment and replacement. If the lubrication is neglected the necessity for adjustments and replacement will increase all out of proportion to the lack of proper lubrication because, taking into account the quantities used, the highest priced lubrication is vastly cheaper than labor and repair parts. When the maintenance department realizes that the cost of lubrication represents a very small percentage of the total operating cost, the reliability of the coaches under their charge will increase and the cost of maintenance decrease.

Only the highest grade of lubricants should be used. In my opinion, there is no standard by which it may be gaged by laymen. Buying automotive oil on specifications doesn't mean anything, as we find several oils have the same flash, fire, viscosity and specific gravity tests and yet they may have different lubricating qualities. Therefore, the safest plan is to buy your oil from a reliable firm with an excellent standing in the industry and, within reason, accept the recommendation of that firm as to the grade and type of lubricant best suited to your needs.

General overhauling instruction sheets should be supplied so as to give the men a definite list of the work to be done. In our case printed instructions are placed on the left side and all gas and oil averages next to them; then the list of the mechanical defects that are reported from one inspection to another shows which of the various units on the coach have given the most trouble and need special attention. The record of gas and oil averages show readily the condition of the engine. The operator should analyze defects carefully that come up and if a particular type of defect recurs, he should notify the manufacturer so that a remedy can be found and applied in future production. In this manner all future purchasers of the particular type of coach equipment are benefited.

The printed instructions on the general overhaul sheets should be divided into different classes of work and in this way it is possible to develop the ordinary type of man into a valuable worker. Men can be developed from the ranks and promotion made from one grade to another, as performing these various operations day by day develops where an operator has an assortment of equipment. These instructions should be made to cover operations on all makes of coaches. Training of mechanics to do efficient work is a serious problem and the cost is great. Care should be used in selecting these men so that the turnover will be at a minimum.

Electrical work should not be tampered with by the ordinary mechanic. An automotive electrician should be the only man to look after electrical units, with the exception, of course, of changing lamp bulbs or changing an entire generator or magneto unit.

Provision of sufficient tools, blocks, jacks, etc., and satisfactory working conditions should be given careful consideration. In our case, we personally give shop men ten minutes in the morning at 10 o'clock and in the afternoon at 3 o'clock in the hot summer months for a smoke and recess. Of course, any smoking done around the garage is done on the outside and not inside the building. We feel that by doing this, it freshens up the men and causes a friendlier feeling toward the company and the departmental head in charge. Lockers, ample washroom facilities and a place for the men to eat their lunches should be provided.

Few Machine Tools Needed

Men engaged in general overhaul operation do not require many machine tools, as the system does not call for actual repair of the units. It mainly consists of complete lubrication, complete adjustments and replacements of such units as are necessary. A drill press, bench grinder and arbor press are about all that are needed, and these only in emergency cases. We do not approve of furnishing mechanics with ordinary tools, such as wrenches, pliers, hammers and screw drivers as our experience has been that they are careless with company tools and let them lie around so that when they do need them they have to spend time to find the particular tool or wrench they want. If each mechanic is required to furnish his own tools of this character, he will not, as a rule, let them lie around and lose them. Large tools and other necessary shop tools should be furnished by the company and passed out on a check system, which makes the man taking it out responsible. Ample spare units should be kept on hand to speed up general overhauling work, so that the coach will not be tied up for a considerable length of time in order that the unit may be repaired.

Units which have been removed under general overhaul operations should be repaired in a special department, which gives better efficiency and enables the man in charge to hold the men working on those units responsible for improper repairs. Each unit should be numbered and a change slip made out when a unit is changed. A record should be kept of change slips and the reasons for such changes, so that when a particular defect shows up continually the cause of the defect can be analyzed and remedied. Except in emergencies temporary repairs should be avoided, as these are merely a makeshift and are apt to cause trouble and expense later. All major repairs should be made by the day force, leaving for the night force the running defects that are written up by the coach drivers on report cards. The latter usually consists of inspecting fan belts, setting up spark plugs, and checking up on brakes, etc. If the small defects are handled thoroughly at night, it will be found that road calls and involuntary stops will be materially decreased, as experience shows that road calls in general can be divided approximately 90 per cent to neglect, 5 per cent for flat tires and 5 per cent for defective materials and causes beyond control.

The success of motor coach operation depends on the thoroughness of the general overhaul or inspection, which must be done thoroughly in order to keep the vehicle at as near 100 per cent condition as is practical at all times. General overhauls or inspections should be carried out at such periods of from, say, 2,500 to 4,000 miles, in order to give satisfaction. In our opinion, 3,000 miles is the proper figure. If some program, such as the above, is not carried out, it will cause delays on the road, with consequent disruption of schedules and cause the public to lose confidence and stop riding, so that it may take months to get them back as customers. The man in charge of maintenance is held responsible for the mechanical condition of the coaches and if the transportation department does not allow him to keep the coaches over pits long enough to give them full inspection, best results cannot be secured. It must be remembered that a motor coach of proved merit costs from $8,000 to $12,000, and if it is not properly maintained its life will be short and the owner suffer a loss.

American Association News

Subjects and Meetings

MEMBERSHIP of the committee on subjects and meetings of the American Association has just been announced by President Sawyer. The complete personnel follows:

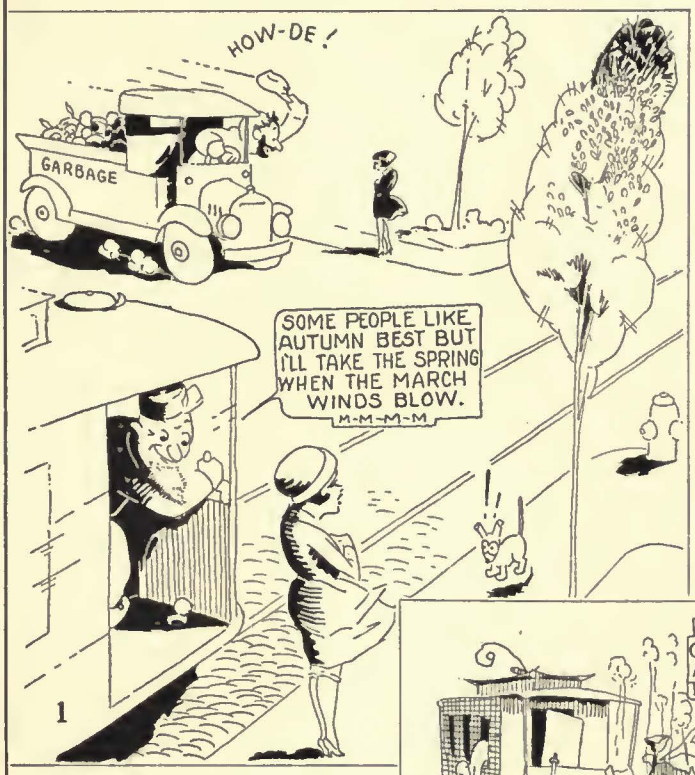
Harry L. Brown, secretary Ohio Brass Company, Mansfield, Ohio, chairman.

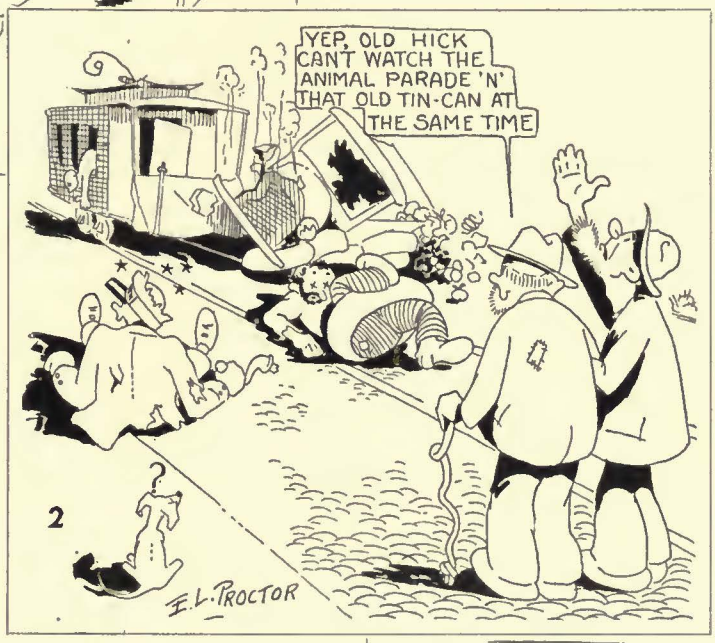
Edward Dana, general manager Boston Elevated Railway, Boston, Mass., vice-chairman.

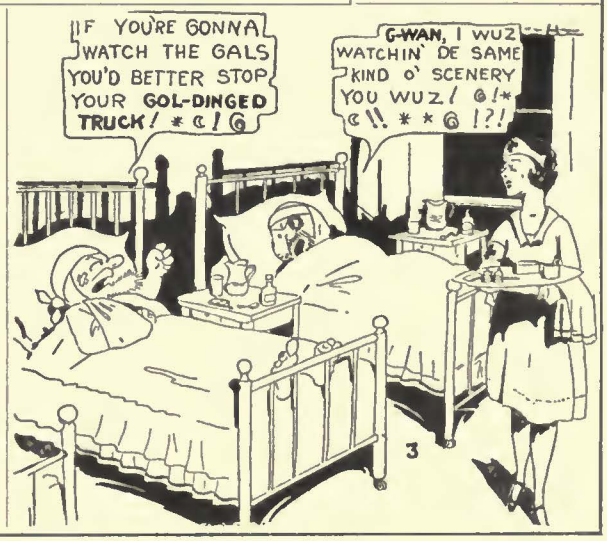
James P. Barnes, Louisville, Ky.
F. G. Buffe, Kansas City, Mo.
F. L. Butler, Atlanta, Ga.
H. C. Clark, Newark, N. J.
Thomas Conway, Jr., Philadelphia, Pa.
L. J. DeLamarter, Grand Rapids, Mich.
F. W. Doolittle, New York, N. Y.
W. A. Draper, Cincinnati, Ohio.
R. W. Emerson, Cleveland, Ohio.
Thomas Fitzgerald, Pittsburgh, Pa.
J. R. Fitzpatrick, Chicago, Ill.
George Frey, Philadelphia, Pa.
Charles Gordon, New York, N. Y.
D. W. Harvey, Toronto, Ont., Canada.
W. W. Holden, San Antonio, Tex.
M. B. Lambert, New York, N. Y.
W. H. Lines, Portland, Ore.
E. B. Meissner, St. Louis, Mo.
Dudley Montgomery, Madison, Wis.
C. E. Morgan, Brooklyn, N. Y.
A. T. Perkins, St. Louis, Mo.
J. S. Pevear, Birmingham, Ala.
H. B. Potter, Baltimore, Md.
J. K. Punderford, New Haven, Conn.
G. A. Richardson, Chicago, Ill.
H. S. Robertson, Denver, Col.
E. J. Speh, Cleveland, Ohio.
E. P. Waller, Schenectady, N. Y.
E. A. West, Salt Lake City, Utah.
H. R. Whitney, Worcester, Mass.

Adventures of Old Man Trouble *on the* Hicksville Railway

Watching the "Scenery" Instead of the Traffic Causes Accidents







Accidents are avoided by assuming that the other fellow is going to be careless. Keep your eyes and mind on the traffic. The greatest asset a street railway has is an employee who guards the safety of those intrusted to his care and lets the "scenery" go by without distracting his attention from essential duties.

ELECTRIC RAILWAY JOURNAL will be glad to furnish press proofs of this page free of charge for posting on bulletin boards and will supply electrotypes of this series at cost for use in company publications.

J. M. ZIMMERMAN AND E. L. PROCTOR

The News of the Industry

One-Man Car Case Decided

Iowa Supreme Court Refuses to Enjoin Union from Enforcing Two-Man Car Requirement.

All hope of instituting one-man car service as an economy measure by the Des Moines City Railway, Des Moines, Iowa, appears to have been banished in an opinion handed down on March 15 by the Iowa Supreme Court affirming Judge Joseph Meyer of the Polk County District Court and refusing to enjoin Local 441 of the Amalgamated Association from enforcing a 25-year contract calling for the operation of street cars by a motorman and a conductor.

COURT QUOTES WORDING OF THE 1916 FRANCHISE

The high court failed to rule directly upon the contention of the company that the contract was against public policy in that it prevented the introduction of economies which would, if instituted, result in the reduction of fares to the residents of Des Moines. The court disposed of this question by pointing out that the franchise ordinance of 1916 contains the provision that "in the operation of its railway by electricity each motor passenger car shall be in control of a motorman and a conductor."

This is practically the wording of the contract between the company and the association, the opinion states, and goes on to say that, "so long as this ordinance of the city of Des Moines exists all parties are bound thereby, and there is no ground for equitable intervention."

In a similar manner the court refused to assume jurisdiction in the question raised by the company over the validity of the check-off. The opinion says:

> The company has a clear, speedy and adequate remedy at law for the very thing about which it complains. It is true that the evidence shows that certain of the employees did so notify the company (to refuse to pay the check-off of officers of local 441), but such employees are not specifically named as defendants herein.

On the third main point raised by the company, which alleged that the contract was "invalid because it was in violation of the constitution and by-laws of the International Association," the court held that this was a matter wholly between the local and the international. On this point the ruling said:

> So long as no complaint is being made by the international against the local for non-compliance, it does not lie with third parties to raise such a question.

MATTER OF PUBLIC POLICY DISCUSSED

The company's charge that the contract has the effect of unionizing an entire industry and is therefore against public policy brought forth the comment from the court that "if it is true that the contract contravenes public policy, as between the parties thereto, both are *part delecto*, or, in other words, both are equally at fault."

The contract which the traction company sought to enjoin the union from enforcing was signed in 1915 and has thirteen years to run. The company has been operating under a 10-cent cash fare and selling weekly passes at $1.25, but has shown monthly deficits regularly for nearly a year with the exception of December, 1926, and January, 1927. The debit to the stabilizing fund as of Jan. 31 this year was $24,243. F. C. Chambers, president of the company, estimated that the institution of one-man cars would have meant a saving of more than $200,000 annually and a reduction of fares under the present service-at-cost franchise.

J. G. Gamble, attorney for the railway, announced that he will ask for a rehearing.

Dr. A. A. Mitten Made Chairman of Philadelphia Committee

Thomas E. Mitten, for sixteen years chairman of the executive committee of the Philadelphia Rapid Transit Com-Company, Philadelphia, Pa., relinquished his post on March 16 in favor of his son, Dr. A. A. Mitten. The elder Mitten will continue as chairman of the board of directors, but will shift much of the burden of active management to the son, it is understood.

Coleman J. Joyce, counsel, and Leon Jewell, vice-president in charge of traffic, resigned from the board of directors. They were succeeded by J. A. Queeney and Ralph T. Senter, respectively.

Terminable Permit Legislation in Illinois Unlikely

The long-delayed report on terminable permits for public utilities in Illinois has been presented to the state Senate by Senator Richard J. Barr, chairman of the joint commission which spent two years studying the subject.

The recommendation of the commission urges the adoption of terminable permits as the franchise scheme in the state. It does not suggest what agency shall issue the permit, nor the terms, nor under what conditions a permit shall be terminated. The recommendation does not go farther than urge that the terminable permit method be adopted.

The failure of the House and Senate to present a report in a formal way is said to have injured the chances of any terminable permit legislation at this session. Senate and House members predict that no act will pass the present session of the General Assembly. The recommendations contained in the report were reviewed in the ELECTRIC RAILWAY JOURNAL for Jan. 8, page 92.

Amends Fare Petition

New Plan Advanced by Pacific Electric Includes Reduction in One-Way and Round-Trip Fares

A supplemental application to its recent request for a hearing on the petition for a general increase in fares has been forwarded by the Pacific Electric Railway, Los Angeles, Cal., to the California Railroad Commission. The new application asks for an entirely new set of fares to be established temporarily on certain lines. The plan contemplates a material reduction in one-way and round-trip fares, but an increase in the present form of daily commutation tickets. It is proposed to provide only one form of commutation ticket, namely, the 30-ride family ticket with a limit of 90 days from the date of sale, which will be at a lower rate than the cost of the same ticket at the present time, yet will be higher than the present daily commutation ticket. In the new schedule of fares contained in the supplemental application only one-way fares and 30-ride commutation ticket fares are provided. The round trip will be double the one-way fare. According to the supplemental application these are to be tried out during the investigation by the Railroad Commission with the understanding that if a trial of these fares for a reasonable length of time proves that they are unsuccessful in materially increasing traffic volume, the company has permission to restore the present fares without delay.

The original application for a general fare increase asked to advance the fares 14 per cent over the present rate. At the present time the Pacific Electric is operating two distinct classes of services, a local and city service and an interurban service. The proposed set-up contemplates three classes of fares and service—the local or city service as it is at present; a scale of fares for suburban service extending to surrounding points of metropolitan district, and the interurban service to more distant points.

In commenting upon the new application, D. W. Pontius, vice-president and general manager, said that the purpose of the original application for an approximate average increase of 14 per cent was to provide sufficient additional revenue to meet operating expenses and fixed charges. As set forth he claimed these had been far below a reasonable return on the investment. He said that residents in communities near Los Angeles and chambers of commerce there had expressed the belief that a reduction instead of an increase in the one-way and round-trip fares would produce a material increase in travel volume and a like increase in revenue because of such volume. It was his contention that

operating results had been so discouraging that the company was willing to experiment with the lower fares for a reasonable length of time, although it might lose in revenue, but with a view to the possibility of working some plan in the way of increased fares that would be of benefit not only to the railway but to the community served.

Jersey Legislature Passes Paving Bill

The New Jersey Assembly passed on March 15 the bill introduced by Senator Abell of Morris County to relieve electric railways of a part of their street paving obligations. The vote was 36 to 20. Governor Moore is expected to veto the measure.

The Board of Freeholders at Newark, N. J., has taken its fight against the electric railway paving bill direct to the people in paid advertisements in newspapers, a step which is believed to be without known precedent.

The Freeholders analyze the paving bill, present their arguments against it and wind up by repeating that a non-partisan commission should be appointed to study the paving problem. They say in part:

> The Board of Freeholders of the County of Essex, in the interest of taxpayers, has consistently opposed for several years the repeated efforts of the traction interests to get from under their obligations in this manner, and the board has been continuously aided in its efforts by the State Association of Freeholders, the State League of Municipalities and representative civic bodies.
>
> The Board of Freeholders and these bodies have always advocated the study of the franchise, contractual and other financial relations between traction companies and municipalities and counties before any such sweeping legislation is enacted. We have requested our representatives in the present legislation to propose and further in the Legislature the creation of an impartial commission for the purpose of such study.

Each section of the measure is numbered and discussed by the Freeholders in an adjoining column in the "ad" itself. Traction company "sales talk" is the way the first section is described.

Henry L. Doherty Out of Routine Work

Henry L. Doherty, president of the Cities Service Company, New York, has addressed a letter to stockholders of his companies describing the condition of his health and announcing that he never expects again "to take an active part in the routine work" of the business.

He insisted that his organization had been so perfected that it would function perfectly without him. He intimated that on account of his health it had become necessary for him virtually to retire from active business and said that he was "still unable to conduct business in the ordinary way." Among other things he said:

> At all times my business affairs have been provided for by will and by provision for trustees. If anything should happen to me now, or at any other time, there is no reason why it should lessen the intrinsic value of the securities of the Cities Service Company by a single dollar. I have taken no part in the routine work of the Cities Service Company since the United States got into the World War, and never expect again to take an active part in the routine.

Wage Demands in New York State

Employees of the New York State Railways are drafting their demands for a wage increase and other concessions in their yearly agreement. The old agreement expires on May 1. While no formal demands have yet been presented to the railway, union officials make no secret of the fact that the men in Utica, Rochester and Syracuse will ask an increase in wages of 10 cents an hour, placing of two-man and one-man car operators on the same scale and a six-day week.

The present wage scale is 60 cents an hour for operators of one-man cars; 55 cents an hour for two-man car operators and 57 cents for interurban employees. The 10-cent increase has been filed in every proposal of the union since 1923. It is expected that 70 cents an hour flat scale for one-man and two-man car operators will be asked.

The union leaders base their plea for a pay increase on the fact that fares have been raised in all three cities, although very recently in Utica and Syracuse. Fares in Rochester were raised to 8 cents in January, 1925. Officials of the railway point to the increased costs of operation and the short tenure of the fare boost.

All proposals are submitted to joint vote of the workers in the three up-state cities. While the contract expires on May 1, any agreement reached after that date becomes retroactive. The contract provides for arbitration and there is a joint conference board made up of the presidents and business agents of the divisions of the Amalgamated Association in the three cities.

Disqualification Proceedings in Seattle

The United States Circuit Court of Appeals in San Francisco has denied a petition of John G. Von Herberg, a taxpayer of Seattle, Wash., to disqualify United States Judge E. E. Cushman from hearing a taxation action involving the city of Seattle and the Puget Sound Power & Light Company. Mr. Von Herberg has filed in the trial court an affidavit of prejudice and bias on the part of Judge Cushman. Judge Cushman certified to the Circuit Court the fact that such affidavit had been filed. In his petition to the Circuit Court Mr. Von Herberg, through counsel, contended that Judge Cushman in so certifying had automatically disqualified himself, and asked for an order selecting another judge. The court held that it lacked jurisdiction.

The Circuit Court of Appeals also has under advisement the matter of disqualification of Federal Judge Jeremiah Neterer in the Seattle Municipal Street Railway litigation and also a motion by J. Ambler Newton, assistant corporation counsel in Seattle, to dismiss all actions pending in federal court against the Washington municipality in the railway litigation. Attorneys for the Puget Sound Power & Light Company appeared before the court and argued to have Judge Neterer disqualified on the grounds that he is a Seattle taxpayer and therefore would be prejudiced.

Attorneys for the city of Seattle declared that the city is not a party to any disqualification proceedings and urged that the higher court dismiss the litigation.

Home Rule Referendum at Chicago's Mayoralty Election

Managers of the local Democratic organization have succeeded in collecting approximately 260,000 signatures on a petition for a referendum on the question of whether Chicago shall come from under the state public utilities act and restore to the city substantial control over its public utilities.

By virtue of the filing of this petition with the county election board on March 6 the question is automatically placed on the ballot at the Mayoralty election April 5. A minimum of 184,000 names was required by state law in order to submit the proposition to the voters. If the referendum is passed at that time, control of all local utilities will be taken from the hands of the Illinois Commerce Commission and vested either directly in the Chicago City Council or in a local commission created by the Council. This would take place as soon as the city clerk formally notifies the state commission of the outcome of the vote.

Under the state public utilities act, which created the Illinois Commerce Commission, it is provided that any city desiring to withdraw from the rule of the commission and set up one of its own selection may do so by agreement of a majority of the voters at a Mayoralty election. The acts of a city commission are, however, subject to review on appeal by the state commission. There is now pending before the Legislature, however, an amendment known as the McCluggage bill, which would bring appeals directly to the courts.

East St. Louis Goes to Church

The "return pass" system to increase Sunday traffic on its street cars and bus lines has been temporarily adopted by the East St. Louis & Suburban Railway. Residents of East St. Louis, Belleville and Alton, Ill., will have an opportunity to use the plan during all of the Sundays of the Lenten season. The special plan became effective on Sunday, March 6, and on the first day 380 persons availed themselves of the reduced rate and much publicity for the railway was won. The passes, at first good only between the hours of 5 a.m. and 1 p.m., are now effective between 4 a.m. and 1 p.m. and between 6 p.m. and 10 p.m.

The cut rate was advertised by the company as a special inducement to residents along its lines to "go to church." Advertising cards have been placed in all of the street cars and buses operated by the company advising the patrons to take advantage of the reduced rates and "Go to Church During Lent." Under the pass system a passenger pays 10 cents and receives a coupon valued at 10 cents when applied toward the cost of the return trip. Residents of Belleville who wish to attend church services in East St. Louis can save 10 cents on the round trip.

New Fare Schedule on Massachusetts Interurban

An increased schedule of fares for the occasional rider went into effect on the Boston & Worcester Street Railway, Framingham, Mass., on Feb. 15. Zone tickets are still sold at 66 for $2.50 and there has been no change in the zones. The fare on the Marlboro cross-town line has been increased from 5 to 6 cents. The former basis of fare for the occasional rider was 10 cents for any two continuous fare sections and 5 cents for each additional fare section. The new basis is 10 cents within one fare section, or 6 cents a fare section. An exception is made on buses operating between Park Square, Boston, and Salem Square, Worcester, by way of Watertown and other places.

The former rate for pupils' tickets has been increased from eighteen zone coupons for 45 cents to twenty tickets for 60 cents. The old schedule of round-trip tickets from Chestnut Hill to Natick and thence to Worcester remains unchanged. The provision that each fare section is approximately 1⅞ miles is left out of the new schedule. A tariff rate for special buses filed with the State Department of Public Utilities is 50 cents a mile from point of origin to point of destination plus 30 cents a mile for dead mileage, plus operator's hourly rate for all time held.

Operation of Rochester Subway Railroad Urged

All indications point to operation of the municipally owned subway railroad in the bed of the abandoned Erie Canal in Rochester, N. Y., by the New York State Railways, Rochester lines. At a public hearing no serious opposition to leasing the line to the railways for a three-year trial operation was voiced. Previously Mayor O'Neil had intimated he was considering municipal operation if there were enough public and official sentiment for it.

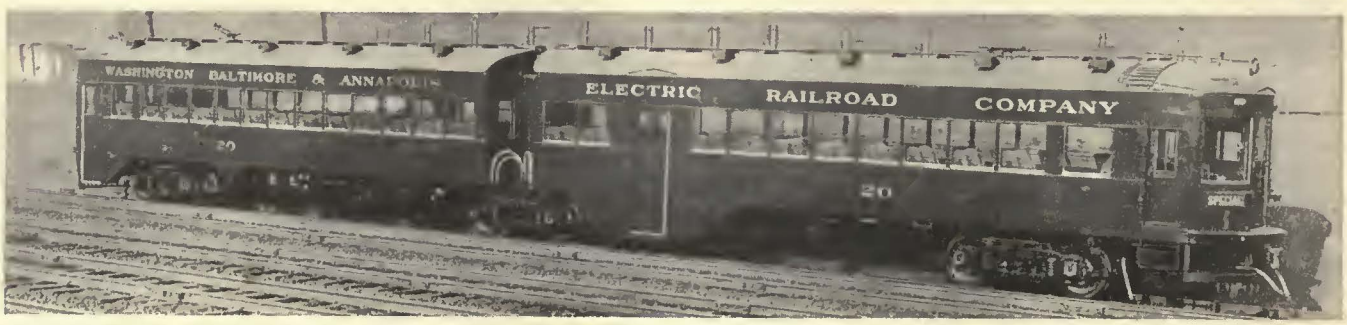
Members of the Mayor's official family and of the city municipal research bureau, however, have gone on record as being in favor of turning the operation of the railroad over to the transportation company, which is the only agency with the equipment, experience and men to take it over at once. The Mayor has arranged conferences with city and transportation officials, from which is expected to evolve a new contract for operation by the railways under service at cost. Pressure of business interests will, it is believed, force early action by the municipal authorities. The line is nearly completed, the cost to the city has been heavy and leading industries and business houses are demanding that a plan of operation be speedily worked out.

New Articulated Cars Between Baltimore and Washington

The new Pullman type cars to be placed in operation by the Washington, Baltimore & Annapolis Railroad were inspected officially on March 11. Utility commissioners and operators from Cleveland, Washington and Baltimore asserted that the luxury of the new cars constituted an effective reply by interurban electric lines to the rapidly increasing competition of buses. The first of the two-car units to reach Baltimore was run over the line from Washington to Baltimore.

J. J. Doyle, president of the Washington, Baltimore & Annapolis, was in charge of the inspection party. Visitors present were J. H. Alexander, president; Charles H. Clark, maintenance engineer; Terence Scullen, master mechanic, and Paul E. Wilson, vice-president, all of the Cleveland Railway; Samuel Bole, engineer of the J. G. Brill Company; H. B. Potter, general manager; S. E. Emmons, assistant to the president, and Adrian Hughes, United Railways, Baltimore, and A. S. Wentworth, Westinghouse Electric & Manufacturing Company.

Six new units are now being placed in operation. The four others will be delivered the latter part of this month. Mr. Doyle has said that the early test trips were very satisfactory. He believes that the improvements in riding quality and in comfort attained by the articulated effect, the luxurious revolving seats and the other fine appointments are going to answer satisfactorily the demand for luxury on the part of the high-grade clientele.



First of Ten High-Speed Articulated Cars to Be Delivered to the Washington, Baltimore & Annapolis from the Philadelphia Plant of the J. G. Brill Company

February Safety Banner in Rochester Awarded

The safety banner for February on the lines of the New York State Railways, Rochester lines, went to the Main Street East division, which operated 8,932 miles per accident; second in line was the Portland division with a record of 6,713 miles per accident. Reports showed that the one-man cars operated more miles with fewer accidents than the two-man trolleys. This competition is part of the campaign under Safety Director Leon R. Brown.

Improvements on Skokie Valley Route in Effect

Operation of all except two through trains between Chicago and Milwaukee over the new Skokie Valley route, installation of a new fast service between downtown Waukegan and the Chicago Loop over the Skokie Valley line and the addition of several more stops made by certain limited trains were simultaneously effected by the Chicago, North Shore & Milwaukee Railroad on Feb. 20. The new schedule of operation over the Skokie Valley route centralizes all high-speed operations on this new stretch of private right-of-way. The new station stops scheduled for several of the Chicago-Milwaukee limiteds are North Chicago, Waukegan, Zion, Kenosha and Racine.

Phoenix Voters Will Pass on Rehabilitation Plan

April 30 has been set by the City Commission as the date for special election on the proposed $750,000 bond issue for the complete rehabilitation of the Phoenix Street Railway, Phoenix, Ariz. Mayor Frank E. Jefferson asked if it might not be feasible to submit also an alternate proposition to the voters on April 30 to provide for rehabilitation of only certain portions of the railway system at less cost. It was pointed out by City Attorney W. L. Barnum that the dominating issue was to determine whether the city was within its constitutional rights in incurring indebtedness for the rehabilitation of the system.

"Zero Hours" in Atlanta

During the month of February, 24 "zero hours" were posted for the trainmen of the Georgia Power Company, Atlanta, Ga., in which time only one accident occurred traceable to the negligence of a street railway employee. The "zero hour" idea was originated by W. J. Rountree, safety director for the company. Every day one hour is taken as "zero hour." The hour so chosen each day is posted on all of the transfer boxes of the company, and during that hour every precaution is taken by motormen and conductors to keep a clean record. The psychological effect of the "zero hour" has been to show train crews how easily accidents can be prevented if only a little thought and care are employed. Later it is planned to extend the "zero" period for a complete "zero" day.

Rate Increase Sought by Gary Railways

That earnings have never been sufficient properly to support service on the Gary and Valparaiso division was given as the reason for a proposal to increase certain commutation rates between Gary and Valparaiso filed on March 8 with the Indiana Public Service Commission by the Gary Railways.

Commutation rates between Gary and Valparaiso on the company's Valparaiso division are now considerably less than the lowest commutation rate offered by the Pennsylvania Railroad, the only competing line, the petition states. The proposed increase in fare will enable the railway, which operates cars directly to the various mills in Gary, to continue the present schedule between the two communities and to provide better service for the many Gary mill workers residing in Valparaiso, it is pointed out.

The company asks permission to cancel the present 25-ride commutation ticket, which is good for transportation between Valparaiso and any point within the first fare zone in Gary and sells for $7.50, and to issue a ten-ride bearer coupon ticket at the rate of $4. Should the authority be granted by the commission, the new rate will go into effect 30 days after the issuance of the enabling order.

In support of the company's application, the petition points to an extensive program of rehabilitation begun last year to make the Gary-Valparaiso division one of the most efficient interurban lines in the company's system.

Contract for New East River Line Approved

The Board of Estimate of New York City in committee of the whole has voted unanimously to approve the contract for the construction of the tunnel under the East River from the foot of East 53d Street, Manhattan, to Nott Avenue, Long Island City. Formal award of the contract to Patrick McGovern, Inc., for the bid price of $10,631,550 is expected to follow.

The board's action was taken on the recommendation of John H. Delaney, chairman of the Board of Transportation. Mr. Delaney denied the contention of opponents of the construction of the 53d Street subway that the tunnel was unnecessary. One particularly significant remark of his was that unification of the city's rapid transit lines was "inevitable." He did not indicate just how he expected this unification to be accomplished.

Trolleys Over Camden Bridge Assured

The first steps in the running of railway cars over the Delaware Bridge was taken on March 10 when the Camden City Commission passed an ordinance giving the Public Service Corporation of New Jersey the right to lay loop tracks from the Camden bridge plaza to the center of Camden. Since that date the Philadelphia Rapid Transit Company has announced that it would join with the Public Service Corporation of New Jersey in an application to the Delaware River Bridge Commission for trolley operating privileges across the interstate span. Permission to build the loop was given to the Camden Horse Railway, an underlying concern of the Public Service Corporation. Under the plan thousands of people each day will be able to travel in the trolleys of the Philadelphia Rapid Transit over the bridge and then over the Public Service rails to Camden. Details are being worked out by engineers of both companies, which now are operators of a bus service across the bridge.

News Notes

Weekly Pass in Texarkana. — The Southwestern Gas & Electric Company, Texarkana, Ark., is selling weekly passes on its lines for $1.

High Honor for Motorman.—Tal F. Harris, a motorman of the Nashville Railway & Light Company, Nashville, Tenn., was recently presented a handsome gold watch and made the subject of a citation before operators and officials of the company. Attention was directed to his ten years of operating without the semblance of an accident and to his equally notable record for courtesy. The watch presented to Mr. Harris bore an inscription signed by B. C. Edgar, president. It read: "Recognizing a distinguished safety and service record." His record shows approximately 320,000 miles run and 1,825,000 passengers carried.

Amends Fare Request. — The Colorado Springs & Interurban Railway, has asked the City Council of Colorado Springs, Col., to consider the retention of the present 10-cent fare, but abolish the two fares for 15 cents and instead accept tickets at six for 50 cents or fifteen for $1. The City Council had previously declined to approve the ticket-selling idea because it required the purchase of $1 in tokens.

Excursion Trips Offered.—The Union Traction Company of Indiana, Anderson, Ind., has started special excursions over its lines to various points of interest and the response thus far has been good. Each weekend the company offers special rates to certain points. Recently a trip to the Circus City zoölogical gardens, near Peru, was offered. Here the patrons can see one of the largest collections of wild animals in the country.

New Demands in Scranton.—Motormen and conductors of the Scranton Railway, Scranton, Pa., have prepared demands to be embodied in a new agreement replacing the old one which expires on April 1. They ask that the hourly rate be raised from 64 to 74 cents, while one-man operators, now receiving 72 cents, want 89 cents an hour. The men also want an eight-hour day on all runs with time-and-a-half pay on hour-over schedule runs. This stipulation is incorporated in the present working agreement, but the runs are said to vary in time from eight to 9½ hours. More than 600 motormen, conductors, brakemen and trackmen will be affected by whatever changes are made in the agreement.

Would Change Method of Handling Freight.—A change in the method of handling freight shipments on the Illinois Traction System at Champaign, Ill., has been announced with the completion of the "Champaign Belt," on which engineers of the Illinois Traction System have been engaged for about a year. The traction system has electrified approximately 5½ miles of the main lines of the Illinois Central and the Wabash Railroads at Champaign, and in future all freight transported by the Traction will go on the new belt line, hauled by electric locomotives.

Mutual Track Arrangement to Improve Service.—Residents of East Boston, Mass., have lost their fight to prevent the Eastern Massachusetts Street Railway from operating through cars over the lines of the Boston Elevated to Maverick station in order to improve the service to Revere. The public utilities department has issued an order providing for the through service, stipulating, however, that not more than six cars an hour shall be so operated. The department in its order referred to the contention of the trustees of both companies that this arrangement would effect a saving in operating expenses over that obtaining at the present time and would improve the service both for the people of Revere and the people of East Boston.

Conductor Punished for Theft.—Delbert Kraft, conductor on the Jackson lines of the Michigan Electric Railway, was sentenced on March 11 to serve from six months to five years in prison for pilfering fares. The court recommended that he serve six months. Conductor Kraft pleaded guilty and said he was driven to the theft by financial straits. Judge Benjamin Williams declared that he could not place Conductor Kraft on probation because there were 2,400 conductors in Michigan who might be tempted to take the funds of their companies if they thought that they could escape. The offender was not required, however, to pay any cost or fine or to refund any money to the company. He was $300 short in his returns.

Employees Enter Contest. — An essay contest for railway employees, arranged by W. J. Rountree, safety director for the Georgia Power Company, on the subject of "What Do We Owe the Passenger for His Fare?" resulted in the submission of approximately 100 essays of high quality. C. H. Strong, assistant to the manager of the railway department; B. K. Godfrey, manager of the compensation department, and L. K. Starr, publicity director for the Georgia Power Company, were judges. W. C. Alsobrooks, a conductor, was winner of the first prize, with C. H. Varn, a motorman, in second place and S. J. Steele, also a motorman, in third position. The first three essays are to be printed in full and distributed to the 1,500 trainmen in the railway department, as it is believed the essays, written by members of the crew, will go much further toward developing a spirit of courtesy among employees than any number of memos from headquarters.

Recent Bus Developments

Bus Activities in Springfield Planned

Sidney H. Sayles, superintendent of the Springfield Street Railway at Palmer, Mass., has announced that bus service will supersede railway service on the Three Rivers, Bondsville, Ware and Monson lines shortly after May 1. H. M. Flanders, general manager of the company, has applied to the Selectmen of the towns for the necessary licenses to operate buses. The railway was granted licenses to operate bus service in the territories mentioned one year ago and these licenses expire May 1. The Springfield company never attempted to make use of the privilege last year, but Mr. Flanders was assured that the licenses would be renewed. The company has also applied for licenses to operate buses between the Palmer-Wilbraham and the Palmer-Brimfield boundaries. The railway lines operating between Palmer and Worcester are to be abandoned. This will clear the way for a through line of buses between Springfield and Worcester. De luxe buses will be operated.

High Point Awaits Bus Operation

A bus system to be placed in operation in High Point, N. C., some time this spring will mark the discontinuance of railway service. An agreement to this effect was reached by the City Council, officials of a bus company and officials of the North Carolina Public Service Company, the railway operator. The latter company waived its carrying rights in favor of the buses. The buses will be operated by the Carolina Transit Company, Columbia, but if they do not meet the needs of the city, the North Carolina Public Service Company has agreed to re-establish railway service.

Ten new buses are to be started, covering about three times as much territory and serving several times as many people as the street cars at the present time. One line will extend to High Point College and the other will go to the baseball park.

Missouri Bus Bill Passes Senate

The Missouri Senate on March 9 by a vote of 25 to 5 passed Senator A. L. McCawley's bus control bill. It places all bus lines in the state outside of Kansas City under the jurisdiction of the Missouri Public Service Commission. The bill provides special taxes of from $60 to $1,000 per bus and limits the bus to not more than 25 ft. in length nor 84 in. in width. St. Louis buses will not have to pay the extra state tax, but will continue to give the city a percentage of their gross receipts for the use of its streets. The highways committee of the Missouri House of Representatives on March 8 voted to report favorably a bill placing control of bus lines using state highways and streets under the supervision of the Missouri Public Service Commission. The measure also provides for special license fees to be paid by the bus companies.

Bus Subsidiary of West Chester Street Railway Reorganized

Reorganization of the Peoples Transportation Corporation, a suburban bus subsidiary of the West Chester Street Railway, West Chester, Pa., was effected on March 4. The two companies operate under the route name of "The Chester Valley Lines." During the proceedings, participated in by representatives of fifty creditors with aggregate liability accounts of $500,000, the following were elected officers to handle the affairs of the company: C. B. Cooke, Jr., Philadelphia, president; F. G. Wilson, Chicago, treasurer and general manager, and Eric H. Biddle, Philadelphia, secretary.

Under the plan of reorganization, sufficient security and credit were offered to offset the unsecured liabilities of $102,000, which represented indebtedness to local supply houses, in addition to the amount owed the Yellow Truck & Coach Manufacturing Company for buses. The assets of the company, exclusive of value of franchise rights, before the reorganization plan was effected were almost equal to the liabilities. Secured loans from the parent company total approximately $300,000, and liabilities of $250,000 included in creditors' statements have been offset by a like amount in equivalent values.

The Peoples Transportation Corporation operates 40 buses through the Chester and the Schuylkill Valleys. Its lines connect Reading, Pottstown, Norristown, West Chester, Chester and Wilmington, and Media and Oxford. The West Chester Street Railway owns all of the outstanding stock of the Peoples Transportation Corporation.

More Plans Matured at Worcester

The Worcester Consolidated Street Railway, Worcester, Mass., has asked the Department of Public Utilities for permission to extend its June Street-Tatnuck bus line. The Consolidated plans a terminus at Dawson Road, a mile north of Tatnuck Square. At the start trips will be made at night, noon and morning to accommodate workers. The bus service in this section the company believes is desirable because of the growth of the neighborhood.

The company has started bus service between Worcester and Clinton, Mass., by way of Boylston. The Worcester terminal is the Union station and the Clinton terminal the railroad station in that town. The fare between the two places is 50 cents. The buses are express part of the way.

Bus Brings Increase in Riding.—The six months experiment in the substitution of bus service for city railway service at Manitowoc, Wis., by the Wisconsin Public Service Corporation has met with a certain measure of success. During December, 1926, there was an increase of 43.4 per cent in revenue passengers compared with December, 1925, when the railway cars were still in use. January, 1927, showed a further increase, with 46.1 per cent more passengers riding than in the similar month of 1926.

Would Extend Bus Service. — The Connecticut Company is planning further extension to its bus service and has applied to the Public Utilities Commission for permission to operate between Hartford and West Hartford, Conn., as an amendment to its present charter.

Bus Bill Favors Portland Company. —A bill to permit the Portland Railroad, Portland, Me., to operate buses as it may see fit has been passed by the Legislature. An attempt to amend the bill so as to prevent the railway from taking up any of its tracks or discontinuing operation of cars when bus operation is started was lost.

Bus Line Now Serves Oklahoma City Addition.—The Oklahoma Railway established a new bus line from the downtown section of Oklahoma City to the Crestwood addition in the northwest part of the city on March 1. Buses are being operated on a twenty-minute schedule. Several new buses of the latest design have been installed.

Another Motor Coach Route in Pittsburgh.—The Pittsburgh Motor Coach Company, Pittsburgh, Pa., has been granted a franchise to operate a fifth motor coach route beginning March 21 between Union Station and the intersection of Lebanon Boulevard and Washington Road in the high-grade South Hills suburbs. The distance is 7 miles and the expected running time 32 minutes. Limousine coaches each seating nineteen persons will be operated at intervals of twenty minutes off-peak and twelve minutes peak. As on the other routes of this company, the fare will be 25 cents.

Oppose Bus Operation.—Petitions of the Sandston Electric Railway for authority to abandon the 2¼-mile stretch of tracks and to operate bus service between Richmond and Highland Springs, via Seven Pines and Sandston, have been dismissed without prejudice by the Virginia Corporation Commission, following a hearing at which considerable opposition was voiced to both petitions. The company is owned by the Richmond-Fairfield Railway, Richmond. The petitions were dismissed at the request of S. W. Zimmer, counsel for the railway, who said the opposition was "unexpected," and that he wished to consult with Oliver J. Sands, president of the railway and prominent Richmond bank president, now out of the city, before taking further steps. John Randolph Tucker, counsel for minority stockholders and for persons living along the line, explained that his clients feared that operation of a bus line would make the electric railway so unremunerative it might be abandoned.

Financial and Corporate

Day & Zimmermann Buy National Public Service

With Their Associates Acquire Controlling Interest from A. E. Fitkin—Mr. Zimmermann to Be President

Day & Zimmermann, Philadelphia, and their associates have acquired from A. E. Fitkin the controlling interest in the National Public Service Corporation. Mr. Zimmermann will be president of the company and Floyd W. Woodcock will be vice-president. No change in the operating personnel of the company is contemplated, but the company will have the benefit of the long experience of Mr. Zimmermann and his organization in the public utility field. The National Public Service Corporation with gross receipts of more than $27,000,000 has been built up by Mr. Fitkin, who remains on the board. The gross receipts of the Day & Zimmermann properties prior to this addition were about $12,000,000.

The most important properties controlled by the company are situated in the states of New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, Georgia and Florida, and serve an aggregate population of more than 2,000,000.

The principal companies controlled by National Public Service Corporation include Jersey Central Power & Light Company, Virginia Public Service Company, Tidewater Power Company, Florida Power Corporation, Eastern Shore Gas & Electric Company and the Municipal Service Company.

Mr. Fitkin in confirming the sale stated that he is surrendering the control and supervision of the affairs of the company because of his desire to devote all of his time and attention to his western properties known as the Inland Power & Light Corporation system.

The trackage of the railway properties included in the National Public Service Corporation totals 356 miles. Statistics of these properties follow:

	1926	1925
Transportation Department:		
No. of car-miles	12,206,733	12,218,198
No. of bus-miles	1,702,006	1,809,639
Total vehicle-miles	13,908,739	14,027,837
Passengers carried:		
Street railway	80,609,958	82,221,883
Bus	3,982,043	3,568,171
Communities served:		
Street railway	96	103
Bus	47	43
Population served:		
Street railway	772,980	755,000
Bus	686,844	683,000

Of the total earnings of $27,788,680 the receipts from transportation were $5,761,704, or 20.7 per cent.

The Tidewater Power Company operates the electric railway in Wilmington, N. C., and surrounding territory. The Municipal Service Company operates an interurban railway in Ohio known as the Youngstown & Suburban, the railway properties in York and Oil City, Pa., and controls the Keystone Public Service Corporation, which in turn, through its subsidiaries, operates the electric railway and bus lines in and around Scranton and Altoona, Pa.

Voters Disapprove Rainier Purchase

The Seattle & Rainier Valley Railway purchase was voted down in Seattle, Wash., by the people on March 8. The public showed by a large vote their disapproval of the purchase for $1,200,000 of the only privately owned car line remaining in the city.

Would Purchase Railway Bonds

The Massachusetts State Department of Public Utilities has received a petition from the New York, New Haven & Hartford Railroad for permission to purchase $330,000 in bonds of the Springfield Street Railway, Springfield, Mass. It is explained that there are now outstanding an equal amount of bonds of the Springfield & Eastern Street Railway maturing on Jan. 1 next. These are held by the New Haven and in order to refund them the Springfield company is to issue new bonds. As the terms said to have been offered by the bankers for the bonds are said not to have been considered sufficiently liberal by the New Haven, that company desires to take the entire issue in exchange for the maturing bonds at 6 per cent paying par.

1,574,969,902 Ride Surface Lines

Residue Receipts of $13,302,112 in Chicago Show an Increase of $1,144,438 or 9.41 Per Cent, the Highest Except 1922, the Year of an Eight-Cent Fare

THE fiscal year Feb. 1, 1926, to Jan. 31, 1927, covered by the report of the Chicago Surface Lines, although the last under the 1907 and 1913 ordinances, was the most remarkable from the standpoint of service, traffic and earnings in the history of the companies comprising the Chicago Surface Lines. Gross earnings for the year were $61,173,601, an increase of $2,387,720, or 4.06 per cent, as compared with the previous year. This total was the highest in the history of the companies. Operating expenses including taxes were $47,871,490, an increase of $1,243,283, or 2.67 per cent. Residue receipts were $13,302,112, an increase of $1,144,438, or 9.41 per cent. This was the highest with the exception of 1922, the year of an 8-cent fare. The city's share of divisible receipts was $2,620,326, an increase of $498,273, or 23.48 per cent over the preceding year. The purchase price of the properties was increased $237,632, making the total of $163,745,856 as of Feb. 1, 1927.

Each month of the year showed an increase in traffic over the corresponding month of the previous year and the impressive total of 1,574,969,902 rides is an increase of 57,459,241 rides, or 3.79 per cent. Revenue passengers totaled 876,249,663, an increase of 34,048,210, or 4.04 per cent. To provide service for this great increase in traffic there were added during the year more than 4,000,000 passenger car-miles.

The daily average of revenue passengers during December—2,505,338—was the highest for any month in the history of the companies. The peak of the previous twelve months was exceeded seven times during the year. The biggest day of the year and the greatest in the history of the companies, both in earnings and in traffic, was Saturday, Dec. 18, passenger receipts being $201,337, revenue passengers 2,934,771, and total rides 5,126,731. Revenue passengers on an average Saturday during the year numbered 2,668,342. On an average Sunday or holiday there were 1,632,844 revenue rides, an increase of 18,021 in two years. This is particularly interesting as most companies have experienced a decrease in Sunday and holiday business. There were 287 revenue passengers (or 517 rides including transfers) on surface cars during the year for every Chicagoan.

The Eucharistic Congress, from June 20 to June 24, inclusive, established new records for surface car riding in Chicago—the total rides for the three heaviest days being 15,069,000. Transportation of this immense throng with expedition and safety brought expres-

EARNINGS, EXPENSES AND DIVISION OF RESIDUE RECEIPTS OF THE CHICAGO SURFACE LINES FOR YEAR ENDED JAN. 31, 1927, COMPARED WITH PREVIOUS YEAR

	1927	1926
Earnings:		
Passenger cars	$60,436,705	$58,076,487
Chartered cars	5,347	6,337
Newspaper cars	16,276	14,989
Freight earnings	5,039	4,867
Hospital car service	3,742	3,790
Advertising	281,837	274,480
Rents of buildings, etc.	160,885	165,150
Sale of power	108,210	104,097
Interest on deposits	132,366	120,682
Miscellaneous	23,188	14,997
Gross earnings	$61,173,601	$58,785,880
Expenses:		
Way and structures	$2,984,484	$2,830,649
Equipment	4,188,633	3,984,635
Renewals	4,893,888	4,702,870
Power—Maintenance	386,086	394,620
Power—Operation	3,638,283	3,465,460
Conducting transportation—Trainmen	21,485,750	20,741,205
Conducting transportation—Other	3,214,031	3,172,423
Traffic	123,433	109,973
General and miscellaneous—Damages	1,936,202	2,469,007
General and miscellaneous—Other	1,620,696	1,697,361
Taxes	3,400,000	3,060,000
Total expenses	$47,871,489	$46,628,206
Residue receipts	*$13,302,111	*$12,157,674
Divided:		
Chicago Railways — 60 per cent	*$7,981,267	*$7,294,604
South Side Lines—40 per cent	*5,320,844	*4,863,069

* Includes city's 55 per cent of net divisible receipts, as defined by ordinances.

sions of commendation from many sources.

In the period preceding the Christmas holidays, the peak of the year's riding, the companies attained 100 per cent operation. On Dec. 20 all passenger cars (3,639) were in service during the evening rush hours and on each of the three following days only one car was out of service. Henry A. Blair, president, says that better evidence could not be had of the condition of company equipment and the spirit of the men who worked together to accomplish this result.

In anticipation of the large increase in riding, 100 new cars of the multiple-unit type were ordered early in the spring and delivered in time for the pre-Christmas peak. This made a total of 445 new cars added to the service in a little more than three years.

Mr. Blair said it was worthy of note that during the past four years the Chicago Surface Lines have enjoyed a larger percentage of increase in passengers than any other street railway, and during the past year they carried approximately as many revenue passengers as all steam railroads in the country. It is also a fact that in spite of the handicap of expiring franchises, the 42 miles of track reconstruction and 5 miles of new track last year exceed the trackwork of any other surface system so far as available reports indicate.

Comparisons of extent of the Surface Lines' system at the end of the first year of unified operation (Jan. 31, 1915) and at the close of the thirteenth year (Jan. 31, 1927):

Items	1915	1927	Per Cent Increase
Gross earnings	$31,966,049	$61,173,601	91.37
Operating expenses	19,889,276	47,871,490	140.69
Taxes	1,439,279	3,400,000	136.23
Operating wages paid	10,560,039	29,812,518	182.31
Total wages paid	12,379,615	32,564,914	163.05
Revenue passengers carried	627,731,550	876,249,663	39.59
Total rides	1,115,312,129	1,574,969,902	41.21
Average fare per revenue passenger	4.99c	6.90c	38.28
Average fare per ride	2.81c	3.84c	36.65

A total of $107,141,358 has been paid for public benefits by the companies since the adoption of the 1907 ordinances, divided as follows: For cleaning right-of-way, including sprinkling and removal of snow and ice, $10,520,925; street paving, $15,968,578; maintenance paving, $6,094,824; general taxes, $33,572,782 (year 1926 estimated); track and overhead removal and replacement on account of sewer installation, etc., $1,889,378; city's 55 per cent of net earnings, $39,094,870.

In the past two years 2,984 cars, or 84 per cent of the 3,539 cars owned, were put through the shops. Adding to these the 100 new cars in the last few months made it possible successfully to accomplish the task of carrying record-breaking loads in the holiday period. Through co-operation between the transportation and shops and equipment departments, a new record was established also for the small number of cars taken out of service on account of equipment failures—the car mileage per pull-in being increased from 7,100 to 14,389. Each motor car on the system traveled an average of 37,445 miles during the year—another high mark in history. There are now in service 80 one-man cars and 95 trailer trains. The new type of multiple-unit cars, used in 66 trains, is giving entire satisfaction.

Interest of trainmen in the prevention of accidents was kept at a high point throughout the year by a contest among the various divisions which ended on Jan. 31, with North Avenue depot, the largest on the system, the winner, and Lincoln Avenue depot a close second. Results were so satisfactory that another contest has been started for the coming year.

Mr. Blair says that although the number of motor vehicles in the Chicago district increased greatly during the year, improved methods of traffic regulation facilitated the movement of street cars. As Mr. Blair sees it the public has been awakened as never before to an appreciation of the harmful effects of traffic delays. He then refers to the fact that late in the year there was issued under the direction of the street traffic committee of the Chicago Association of Commerce a report covering the local traffic situation and offering suggestions for relief. He says:

> Many recommendations will be helpful to users of street cars if put into effect. Action has already been taken by the City Council, providing for a Greater Chicago Street Traffic Commission and the creation of a division of traffic engineering in the Bureau of Streets. The big problem of automobile parking still awaits a solution. The prohibition of parking within the Loop district during the Eucharistic Congress demonstrated to the satisfaction of the authorities that, notwithstanding the overcrowded condition of the streets, traffic could be handled faster and more safely. Credit should be given to the traffic division of the Police Department for making the best of a difficult situation.

The favorable insurance contracts entered into in October, 1923, expired with the close of the last fiscal year with an unusually low record for losses during the period. Renewal of insurance beginning Feb. 1, 1927, was arranged on a basis which will result in a further saving. All insurable property of the companies, amounting to about $65,000,000, is covered as required by ordinance. This insurance, written at the rate in effect three years ago, would have cost the companies over $145,000 more per year than they are now paying.

On the subject of bus activities Mr. Blair said:

> While all other transportation agencies in the Chicago district showed an increase in traffic last year, the Chicago Motor Coach Company, in spite of additional routes, reported a material decrease in passengers carried. This would indicate that the novelty of bus operation in Chicago is wearing off and that this form of transportation is losing popularity, which may be due in part to the fact that the much heralded special and superior service with the pledge of a seat for every passenger has proved a myth. The bus company is still experimenting with different types of buses, and it has as yet no uniform or standardized equipment. Even with the newest model it is still employing the solid

RESERVE FOR RENEWALS AND SPECIAL RESERVE FOR RENEWALS AND EQUIPMENT BY CHICAGO SURFACE LINES COMPANIES FOR FISCAL YEAR ENDED JAN. 31, 1927

	Chicago Railways	Chicago City Ry.	C.&S.C.Ry.	Total
Reserve for Renewals:				
Balance in reserve at Feb. 1, 1926	$9,091,725	$5,082,143	$331,043	$14,504,912
Sale of unnecessary property and salvage	197,166	41,799	7,417	246,384
Interest earned	279,328	155,013	10,131	444,473
Balance in reserve at Feb. 1, 1927	$9,568,220	$5,278,957	$348,592	$15,195,770
Special Reserve for Renewals and Equipment:				
Balance in special reserve at Feb. 1, 1926	$489,415	$836,735	$768	$1,326,919
8 per cent of gross earnings	2,936,332	1,765,855	193,993	4,896,181
Interest earned	18,076	23,813	655	42,544
Total	$3,443,825	$2,626,403	$195,417	$6,265,646
Less: Expended for renewals	2,399,317	1,410,113	193,807	4,003,237
Expended for special equipment (new passenger cars)	927,934	666,999	.....	1,594,933
Expended for track extensions	3,303	273,422	.....	276,725
Expended for track reconstruction	.....	40,255	1,557	41,812
Total expended	$3,330,555	$2,390,789	$195,364	$5,916,709
Balance in special reserve at Feb. 1, 1927	113,270	235,613	52	348,936
Total of balances at Feb. 1, 1927	$9,681,491	$5,514,570	$348,645	$15,544,707

Under orders of the Public Utilities Commission of Illinois and of its successor, the Illinois Commerce Commission, $7,753,736.09 has been expended since July, 1920, out of the "Special Renewal and Equipment Fund" for new equipment and for track extensions and reconstruction.

Although the property acquired by these expenditures is functioning as part of the operating plant, it does not appear in the Capital Accounts of the companies, inasmuch as the commission orders provided that such expenditures shall not be carried to capital account "unless and until the sum or sums thus expended have been paid into the renewal and depreciation fund."

The balance, $15,544,707, in "Reserve for Renewals" and "Special Reserve for Renewals and Equipment" is a cash balance and is on deposit in various banks.

TABLE OF INCREASE IN RIDING ON CHICAGO SURFACE LINES DURING PAST SIX YEARS

Year Ended	Weekday Average	Saturday Average	Sunday* Average	Total for Year
Jan. 31, 1927	2,521,897	2,668,342	1,632,844	876,249,663
Jan. 31, 1926	2,424,194	2,507,004	1,631,484	842,201,453
Jan. 31, 1925	2,373,114	2,512,121	1,614,823	830,151,540
Jan. 31, 1924	2,354,139	2,521,487	1,623,414	824,850,103
Jan. 31, 1923†	2,204,425	2,356,385	1,563,911	762,629,211
Jan. 31, 1922	2,129,217	2,251,293	1,560,310	750,515,622

* Includes holidays.
† Trainmen's strike Aug. 1 to 6, 1922, inclusive.

CAPITAL EXPENDITURES BY CHICAGO SURFACE LINES FOR THE FISCAL YEAR ENDED JAN. 31, 1927

	Chicago Railways	C. C. Ry.	So. St. Ry.	C. & S. C. Ry.	Total
Purchase price at Feb. 1, 1926....	$94,258,468	$55,819,970	$1,800,900	$11,628,884	$163,508,224
Capital expenditures during year..	299,152	57,438	328	87,185	444,104
15 per cent on same.....	44,872	8,615	49	13,077	66,615
Increase in fluctuating assets.....	*156,050	*104,033	.....	.....	*260,084
5 per cent on same.....	*7,802	*5,201	.....	.....	*13,004
Purchase price at Feb. 1, 1927..	$94,438,640	$55,776,788	$1,801,278	$11,729,148	$163,745,856

* Decrease..

STATISTICAL DATA OF CHICAGO SURFACE LINES FOR THE FISCAL YEARS ENDED JAN. 31

	1923	1924	1925	1926	1927
Rate of fare.....	8 cents 2-1-1922 to 6-14-1922	7c-6¼ cents	7c-6¼cents	7c-6¼cents	7c-6¼ cents
	7c-6¼ cents 6-15-1922 to 1-31-1923				
Revenue passengers.....	762,629,211	824,850,103	830,151,540	842,201,453	876,249,663
Passenger receipts.....	$55,495,310	$56,986,687	$57,284,602	$58,076,487	$60,436,705
Total earnings.....	56,103,061	57,655,169	58,081,678	58,785,880	61,173,601
Operating wages.....	27,163,996	27,458,736	29,246,390	29,012,641	29,812,518
Other operating expenses and taxes.....	17,252,072	17,381,016	17,328,569	17,615,564	18,058,971
Residue receipts.....	11,686,992	12,815,416	11,506,717	12,157,674	13,302,111
Less: Joint account expenses.....	620,000	885,000	450,000	130,297	363,934
	$11,066,992	$11,930,416	$11,056,717	$12,027,376	$12,938,176
5 per cent on purchase price.....	8,039,343	8,076,569	8,127,158	8,169,099	8,173,918
55 per cent to city.....	1,665,206	2,119,615	1,611,257	2,122,052	2,620,325
45 per cent to companies.....	1,362,442	1,734,231	1,318,301	1,736,224	2,143,902

tire, of which there is growing complaint not only from riders but from the owners and occupants of buildings along the bus routes, and from taxpayers who are charged with renewal of pavement.

The recent proposal of the Chicago Motor Coach Company to substitute buses for the street railways has excited little interest and has not been taken seriously by the general public.

In the last year that company was permitted to make an extension of its Marquette Road route along the north side of Marquette Park and also an extension of its South Park Boulevard line from 60th Street to 79th Street.

A hearing has been had by the Illinois Commerce Commission on the application of the Chicago Motor Coach Company for authority to establish additional routes in the north division of the city. In this case there is squarely presented for decision the question whether the Chicago Motor Coach Company shall be permitted to depart from its original plan and policy of boulevard and parkway operation and to establish a general motor bus service throughout the city in direct competition with the surface and elevated railways.

On Nov. 18, the commission entered an order authorizing and directing the Chicago Railways to operate an auxiliary or supplementary motor bus line on Diversey Avenue. The Chicago Motor Coach Company intervened in opposition to this order and is now seeking a review by the courts. There is still pending in the Illinois Supreme Court for decision the case in which the city is attacking the right of the Chicago Motor Coach Company to operate on city streets without first obtaining a grant of permission or authority from the city.

Interstate bus operation from adjacent cities in Indiana into Chicago continues, and no substantial change in this situation can be expected until Congress enacts a law for the regulation of this class of carriers.

A plan for the solution of the local transportation problem of Chicago was submitted to the Mayor and City Council on Jan. 8, 1927. It proposes the development of a complete rapid transit system, utilizing elevated and subway structures; the unification of the surface lines, rapid transit lines and feeder buses on the basis of one fare with transfers from one class of service to the other, and the development of this unified system with a view to the future needs of Chicago. The plan, which is worked out in elaborate detail, calls for a total investment in local transportation of $1,000,000,000 by 1950 and would give Chicago the best local transportation system in the world.

Mr. Blair says that contrary to experience in other cities, where the expiration of franchises has resulted in slackened maintenance, curtailment of service and loss of business, these properties approached the crisis in the best of condition physically and operating at a high degree of efficiency. He says that this remarkable showing has attracted attention in the industry everywhere and quotes from articles in both *Aera* and the ELECTRIC RAILWAY JOURNAL, to indicate the wide interest manifested in the Chicago situation.

Mr. Blair says that in the twenty years under the franchise that expired recently the properties have been completely rehabilitated. The roadbed has been rebuilt and 486 miles of single track added. There are now 35 miles of track per 100,000 population as compared with 27 miles in 1907. Old and small cars have been replaced by larger cars, and much additional equipment has been purchased. Seat miles (car miles multiplied by the average number of seats in the cars) are more than double the number in 1907, although the population has increased only 45 per cent, and the service improvement is even greater than this indicates because, by careful scheduling, cars are being operated where and when needed. According to Mr. Blair these facts show forcibly the remarkable improvement in service. In accomplishing it the companies have put $107,971,000 in new capital and $7,753,736 from the Special Renewal and Equipment Fund into the properties.

Although wage rates of employees have increased upwards of 175 per cent since 1907, the average fare per revenue passenger is only 39 per cent higher and the average fare per ride but 28 per cent higher.

During the thirteen-year period of unification the companies have constructed 119 miles of new extensions (single track equivalent) at a cost of $6,220,693 and reconstructed 476 miles of single track at a cost of $27,642,318, of which $19,666,967 was paid out of the renewal funds and $7,975,350 was new capital.

Statement of Track Mileage of Companies Included in Chicago Surface Lines System

	Total Miles Single Track 1-31-26	Extensions 1926	Abandoned 1926	Net Extensions 1926	Miles Single Track 1-31-27	*Reconstructed 1926
Chicago Railways.....	594.34	0.90	0.44	0.46	594.80	28.17
Chicago City Railway.....	335.97	3.67	0.04	3.63	339.60	12.15
Calumet & South Chicago Railway.....	127.21	0.80	0.04	0.76	127.97	1.90
Southern Street Railway.....	17.45	....	....	....	17.45	....
	1,074.97	5.37	0.52	4.85	1,079.82	42.22

* Includes track taken up and replaced account of sewers, special straight track renewals, etc.

Union of Washington Lines Goes Over to Next Session

One of the first problems to be studied at the next session of the United States Congress will be the merger of the railway lines in Washington, D. C. Chairman Capper said that with the work of creating the new Public Utilities Commission completed the committee would be in a position to concentrate on the question of the merger at the next session. The possible merger in the capital was one of the measures left unacted upon at the recently concluded session of Congress.

Columbia System Suspends

Railway service at Columbia, S. C., was indefinitely suspended on March 11 by the Columbia Railway, Gas & Electric Company largely because business has fallen off to a point where the expenditures needed to be made to the physical property to put it into proper operating condition would not be justified. Columbia is a city of more than 35,000 population. The railway system included 32 miles of line.

Ten-cent jitneys, operated at the whim of the owner, covering no particular territory but picking up passengers any and everywhere and taking them direct to their destinations—be it home or office—cut heavily into the patronage of the trolleys. They were considered quicker, the fare was the same as that charged by the street cars, and while they were often unsightly and in bad repair, their service seemed to appeal to popular tastes. Moreover, the street cars have met with sharp competition from two other systems of transportation. The Carolina Transit Company began the operation of about a score of 19-passenger buses some months ago, covering territory not touched directly by the railway lines, and as rapidly as the street cars would curtail their service, the bus company would expand, so as to serve, in a measure, the territory abandoned by the railway. By an arrangement between the two companies transfers from one system to the other were granted, but this arrangement did not seem to lessen materially the distress of the railway.

Months ago railway officials made known the straits to which they were reduced. One non-paying line after another was discontinued until only a few were left. Last month, on all lines in the city, not more than an average of 600 to 700 passengers a day rode the cars.

Personal Items

J. E. Wilmot Becomes Traffic Solicitor at Buffalo

J. E. Wilmot, formerly general manager of the Western New York Motor Lines, has been appointed general traffic solicitor for the International Railway and International Bus Corporation, according to a recent announcement issued by the company. He will devote his efforts to the stimulation of business throughout the Niagara frontier, including the Buffalo-Niagara Falls high-speed line, Niagara Great Gorge trip, the Falls View Bridge, the Queenston-Lewiston Suspension Bridge and Buffalo-Niagara Falls, Ltd., motorbus service.

Mr. Wilmot is a native of New York City, but is well known in Buffalo and vicinity because of his former connection with the Western New York bus lines, of which he was general manager. Under his direction the Rochester-Buffalo bus service was installed and operated. Mr. Wilmot has had five years experience with the White Company and three with the Mack.

J. E. Wilmot

F. J. Brennan New Brooklyn Division Superintendent

Francis J. Brennan, formerly superintendent of maintenance and operation of the Staten Island Railways, Department of Plant and Structures, New York City, has been appointed division superintendent at Maspeth Depot of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y.

Mr. Brennan was born in Brooklyn and was graduated from Erasmus Hall High School and Pratt Institute. In January, 1905, he was appointed a motorman at the 58th Street depot in Brooklyn. In December of the same year he resigned but returned two years later in the same capacity at the same depot. After several promotions he went with the Public Service Commission but returned to Brooklyn as supervisor of headways in the surface transportation department. He held that position until May, 1924, when he was placed in charge of operation of the bus subsidiary of the B.-M. T.

In March, 1925, Mr. Brennan resigned his position with the B.-M. T. and was appointed superintendent of maintenance and operation of the municipal railway lines on Staten Island.

G. S. Wills Resigns at East Liverpool

Gerry S. Wills, superintendent of the Steubenville, East Liverpool & Beaver Valley Traction Company, East Liverpool, Ohio, will resign on March 31.

Mr. Wills went to East Liverpool in September, 1925, from Wheeling, W. Va., where he had been general manager of the Wheeling Traction Company. For thirteen years he was in the employ of the West Penn Company, by which the Wheeling Company was controlled. In the fall of 1920 he went to Wheeling as assistant to C. P. Billings, vice-president and general manager, and on Jan. 1, 1922, was appointed general manager to fill the vacancy caused by the transfer of Mr. Billings to Pittsburgh.

As a young man Mr. Wills was employed by the Oneonta & Mohawk Valley Railway, Oneonta, N. Y., with which he remained from 1905 to 1906, when he secured a place as an apprentice in electrical engineering with the General Electric Company at Schenectady, N. Y. In 1907 Mr. Wills went with the Metropolitan Street Railway, New York City, as general carhouse electrician. His work there was supplemented by a two-year course in applied electricity at Pratt Institute.

Mr. Wills showed predilection for the railway business, however, for after two and a half years in the copper mining district of Arizona he returned East and entered the transportation department of the Citizens Traction Company at Oil City, Pa. In a short time he was made superintendent of the Franklin division. In 1916 he became affiliated with the West Penn interests at Pittsburgh, first with the general sales manager, as light salesman, then as power salesman and finally as assistant to the vice-president in charge of the commercial department. Mr. Wills was born in Norfolk, Va., in 1884. His activities and splendid results in public relations work in Wheeling were referred to in a review of Mr. Wills' career in the ELECTRIC RAILWAY JOURNAL, issue of Aug. 8, 1925. To him properly belongs a large part of the credit for the successful rehabilitation of the property at East Liverpool, described in detail in the ELECTRIC RAILWAY JOURNAL, issues of June 26, 1926; July 3, 1926, and July 31, 1926. It is said that Mr. Wills will engage in the brokerage business in Norfolk, Va.

C. L. Wilson Heads Radial Department at Toronto

Charles Lewis Wilson has been appointed superintendent of the radial department of the Toronto Transportation Commission, Toronto, Canada. Mr. Wilson's contacts in railway management extend over a period of 30 years. His experience acquired in his recent position as superintendent of the Toronto and York District of the Ontario Hydro-Electric Railways will be of invaluable assistance to the Toronto Transportation Commission, which took over these lines on Jan. 11.

The new head of the radial department started his railway career with the Grand Trunk Railway, Montreal, in 1891. In 1892 he moved to Toronto to take a position with the Toronto Railway. After twelve years service in various capacities he was made traffic manager of the Toronto & York Radial Railway, then under the same ownership as the Toronto Railway.

C. L. Wilson

Later he was promoted to assistant manager and when the city of Toronto bought the radial lines in 1922 and placed them under the management of the Ontario Hydro-Electric Power Commission Mr. Wilson was made superintendent of the three lines, which now constitute the radial department of the Toronto Transportation Commission.

His long association with the radial lines and the warm friendships he has formed are among the valuable assets of the most recent addition to the Toronto Transportation Commission services. Mr. Wilson was born in Boston, Mass., of Canadian parents in 1871.

Charles H. Bucher, for a number of years with the Northern Texas Traction Company, which operates the Dallas-Fort Worth Interurban, has been made district representative of the company. He will be stationed at Grand Prairie.

G. R. G. Conway has succeeded R. C. Brown as president of the Mexican Tramways, Mexico City, Mexico, which is controlled by English capital and has its main office in Toronto, Canada. Mr. Brown remains a director, a vice-president and in a consulting capacity.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Brill Gets First Motors for Philadelphia Subway Cars

Actual operation of Philadelphia's new $100,000,000 North Broad Street subway was brought a step closer March 15 with the arrival at the J. G. Brill plant of the driving motors, electrical controls and other equipment for the first of the 150 passenger cars ordered by the city and to be built by the Brill company. When completed these cars, of all steel construction, will embody every conceivable safety device, including automatic stop controls. Their total cost will approximate $6,000,000.

The equipment was shipped from the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company, this company having been awarded the contract for all the motive equipment, including controls, as well as 750 especially designed electric fans for the ventilation of the new cars.

The cars, with 210-hp. motors, will be 67 ft. long, 10 ft. wide and have a total height from the rails to the roof of 12 ft. 3 in. They will seat 75 passengers. There will be longitudinal seats for 25 passengers and transverse seats for 50 passengers. The cars are being equipped with canvas-lined rattan seats with cone springs.

Milwaukee Electric Starts Interurban Cut-Off Work

Favored by mild weather, the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has already started construction work on the new $175,000 East Troy-Burlington interurban line cut-off which will connect West Junction on the rapid transit line with Fruitland station on the Burlington-East Troy line. The cut-off will permit trains to enter Milwaukee directly from the west instead of through West Allis, as at present. Completion of the connection will cut the running time between these cities and Milwaukee fully twenty minutes. Two trestles will be built, one of wood 450 ft. long and 40 ft. high and another of steel carrying the new line over parallel tracks of the Milwaukee Electric Railway & Light Company and the Northwestern Railway. An embankment of earth estimated at 54,000 cu.ft. will be included in the project.

Writ of Certiorari Denied in Resale Case

The Federal Trade Commission was defeated in another of its efforts to restrict enforcement of resale prices by manufacturers when the United States Supreme Court on March 14 declined to grant a writ of certiorari sought by the commission to review a decision of the Circuit Court of Appeals for the second circuit enjoining an order of the commission against Harriet Hubbard Ayer, Inc.

The commission had ordered the Ayer company to desist from certain practices to maintain observance of retail prices. The Circuit Court of Appeals, to which the company appealed, held that in order to establish unlawful price maintenance there must be a tendency to monopolize a line of commodities or an unreasonable restraint of trade; that there must be proved a general system of contracts between the manufacturer and all dealers, and that the practices must be characterized by fraud. The proof showed that the Ayer company refused to sell to only a few dealers because of price cutting and that most of its dealers maintained the resale price of the cosmetics sold by the company voluntarily.

Union Switch & Signal Gets Big Boston Contract

The city of Boston transit department has contracted with the Union Switch & Signal Company, Swissvale, Pa., to furnish all necessary automatic block signaling materials for the Dorchester rapid transit extension, involving an automatic block signaling system for the protection of train movements over 3½ miles of double track, 2½ miles of which is in the open and the remainder within the subway. Direct current at 550 to 600 volts is used for propulsion and the entire signal system, including the track circuits, will operate on 25-cycle alternating current fed to the transformers at 550 volts a.c. The signals will be of the color light type (indicating red, yellow and green), the work involving 38 light signals with instrument cases, 52 automatic stop layouts, 114 a.c. relays, 113 transformers, 91 Keystone insulated rail joints with track resistors, switch circuit controllers, etc.

Conference on Steel Cars Called in New York

THE New York Transit Commission on March 11 invited railway men and others to a conference on the subject of lighter steel cars to replace the present wooden cars in operation on the elevated structures in New York City. The meeting will be held on March 29 at the office of the commission at 270 Madison Avenue. Those invited to the conference are Frank Hedley, president of the Interborough; William S. Menden, president of the B.-M. T.; William H. Woodin, president of the American Car & Foundry Company; F. N. Hoffstet, president of the Pressed Steel Car Company; D. A. Crawford, president of the Pullman Company, and John H. Delaney, chairman of the city Board of Transportation.

For some months the commission, through its engineering force, has been conducting an investigation into the possibility of the development of a steel car sufficiently light in weight to be operated on the elevated structures of Manhattan, Brooklyn, the Bronx and across the Brooklyn Bridge.

The studies of its engineers have now reached a point where the commission feels that a conference is warranted, but it fixed an advance date to allow engineers time within which to gather their data on the present condition and weight capacity of the elevated structures and the experts of both the railroads and the car builders to formulate plans for the construction of modern steel cars light enough in weight to operate on the structures to which specific reference is made.

Where elevated structures are of insufficient strength to make possible the operation thereon of steel cars of the present design, the Transit Commission has pointed out that either these structures must be reinforced or a steel car of lighter weight must be designed. As the commission sees it, to reinforce the elevated structures so that they could bear the weight of the present steel cars would cost millions of dollars and would doubtless fail to have the approval of that portion of the public which is opposed to the indefinite retention of elevated structures. The commission says:

> Some time ago the Transit Commisssion's engineers began to plan for a lighter steel car for operation on the present elevated structures. These plans have progressed to such an extent that it was thought advisable to call the conference referred to.
>
> Steel cars for rapid transit operation were not developed until 1904. Up to that time all rapid transit operation was by means of wooden cars. Subsequent to the development of the steel car in 1904 more wooden cars came into operation because of the inability of the elevated structures to carry the new steel cars.
>
> The Transit Commission's engineers believe that recent progress in metallurgy and modern methods of steel rolling have made possible the designing of a steel car of lighter weight than, but of equal tensile strength to, the present steel cars.

Bradley and Wason Companies May Get $700,000 Car Order

Osgood-Bradley Car Company of Worcester, Mass., and Wason Manufacturing Company, Springfield, Mass., are expected to get the contracts for the new cars which the Worcester Consolidated Street Railway and the Springfield Street Railway plan to buy under the New York, New Haven & Hartford Railroad rehabilitation program. The Worcester company will build 50 cars for the Worcester Consolidated and the Wason company the 50 cars for the Springfield company. The cost of the cars is estimated at $700,000. Notice of the probable placing of this order was made in the JOURNAL for Feb. 19.

$800,000 Trackwork for Milwaukee if Council Consents

Application has been filed with the Common Council of Milwaukee, Wis., by the Milwaukee Electric Railway & Light Company for the necessary franchises which are needed to carry out several major street railway construction projects estimated to cost $800,000. Among these proposed improvements is the relocation and grade separation of the Milwaukee - Waukesha - Watertown rapid transit line for a distance of ten blocks within the Milwaukee city limits, a project which is regarded as one of the most important steps made in recent years toward improving transportation facilities. If approved by the city it will open the way for rapid transit service to a large and growing section and a vast area directly in line for annexation to Milwaukee. Plans call for the line to be relocated for a block south on a private right-of-way instead of running along Fairview Avenue. Grades will be separated at all crossings, and 61st and 62d Streets will be closed.

Another improvement proposed is the extension, within 90 days, of the Eighth-Muskego Avenue line along Teutonia Avenue from Nash Street to Lake Avenue and later to Atkinson Avenue. As soon as street improvements are completed on Atkinson Avenue a connection will be made between the Milwaukee Northern line tracks and those of the Eighth-Muskego Avenue line at Teutonia and Atkinson Avenues.

In order to provide a more direct connection between Wauwatosa and West Allis, which is another step toward the solution of the problem of rapid transit between those cities and Milwaukee, a crosstown line is to be built on 68th Street between Wells Street and the relocated rapid transit tracks, subject to later negotiations with the city of Wauwatosa. Upon completion of the 68th Street connection the company will seek permission to discontinue service over the private right-of-way near 51st Street between Wells Street and the rapid transit tracks.

St. Louis Car Company Issues New City Car Catalog

Designed especially to feature developments in the light-weight city type car, the St. Louis Car Company is mailing out a handsome 44-page catalog which contains, among other interesting features, general dimensions and a brief description of car orders filled in recent months. The text matter is profusely illustrated with exterior and interior views, and with floor plans of the various type cars. There is also a full list of details which the company considers essential in order to expedite delivery.

Commerce Department Warns Against Fake Publicity

Through Julius Klein, its director, the Department of Commerce, Bureau of Foreign and Domestic Commerce, has just issued the following letter warning American manufacturers against a gold brick publicity scheme that has originated with certain publishers abroad.

Certain foreign publishing concerns, or parties purporting to be publishers, have approached a large number of American manufacturers by correspondence, offering to prepare and publish, without charge, in their trade publications articles of public interest respecting the business organizations of American concerns. An exchange of correspondence usually leads to the preparation of the article and finally to an exorbitant debit against the American concern involved for halftone cuts. The charges have varied between $100 and $600. Inasmuch as our investigations have developed that the publications have no circulation or standing and that an indication of fraud is very evident, it is suggested that you avoid direct dealings with any such publishers until after adequate investigation has been made.

If approached in this way it would be well, before responding, to consult responsible American advertising agencies or this bureau. If you submit the name of the publication and the publisher to the specialties division of the bureau you will be informed whether these names are already known in connection with cases where other firms have been victimized. If you have had past experience with this class of solicitation, you will increase the effectiveness of our efforts to safeguard American industries by making the details available for the confidential use of this bureau.

Rolling Stock

Houston Electric Company, Houston, Tex., has placed an order for twenty new cars and ten buses, according to a recent announcement made by C. J. Kirk, Public Works Commissioner.

Mack Truck, Inc., New York City, reports the following bus sales to street car companies during the last few weeks: Boise Street Car Company, Boise, Idaho; Houston Electric Company, Houston, Tex.; Third Avenue Railway, New York City; Connecticut Company, New Haven, Conn., and the Utah-Idaho Central Railway, Ogden, Utah.

American Car Company, St. Louis, Mo., has been awarded a contract for seven 45-ft. 6-in., single-end passenger and smoking motor bodies by the Rockford Public Service Company, Rockford, Ill., which is part of Rockford & Interurban Railway, recently reorganized. Notice of the expected placing of this contract was carried in the JOURNAL of Feb. 19. The new bodies will be mounted on Brill 177-E trucks.

Track and Line

Arkansas Central Power Company, Little Rock, Ark., will lay new steel and permanent paving between its rails on Prospect Avenue from Lee Avenue to St. Mary's Academy, if plans to be submitted to the City Council are approved. The improvement, entailing a cost of approximately $150,000, will be one of the major construction jobs of the 1927 program of the concern, and will be the first work done under the 1927 budget. Rails of heavier section will replace the present 70-lb. rails now employed on the Pulaski Heights line. Work has been started on laying new tracks along Main Street from the north approach of the Main Street viaduct to 22d Street. All of the old rails have been removed and the new rails will be laid before work of paving the street is started.

Indiana Service Corporation, Fort Wayne, Ind., plans to extend during the coming summer its car lines in Fort Wayne. Such a project was discussed at the last meeting of the Board of Public Works. No definite arrangements were made, although President Feustel said more tracks would be needed badly before the summer was over.

ELECTRIC RAILWAY MATERIAL PRICES—March 15, 1927

Metals—New York

Copper, electrolytic, cents per lb.	13.075
Lead, cents per lb.	7.65
Nickel, cents per lb.	35.00
Zinc, cents per lb.	7.05
Tin, Straits, cents per lb.	69.375
Aluminum, 98 or 99 per cent, cents per lb.	26.00
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	61.00
General service	31.50

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads	$4.575
Somerset mine run, Boston	1.95
Pittsburgh mine run, Pittsburgh	1.85
Franklin, Ill., screenings, Chicago	2.625
Central, Ill., screenings, Chicago	1.875
Kansas screenings, Kansas City	2.50

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive, $\frac{5}{8}$ in. and larger, cents per lb.	2.90
Tie plates (flat type), cents per lb.	2.35
Angle bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	4.20
Steel bars, cents per lb.	1.90
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	$1.45

Hardware—Pittsburgh

Wire nails, base per keg	2.55
Sheet iron (24 gage), cents per lb.	2.75
Sheet iron, galvanized (24 gage), cents per lb.	3 65
Galvanized barbed wire, cents per lo.	3.25
Galvanized wire, ordinary, cents per lb.	2.40

Waste—New York

Waste, wool, cents per lb.	12–18
Waste, cotton (100 lb. bale), cents per lb.:	
White	13–17.50
Colored	10–14

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	18.80
White lead in oil (100 lb. keg), cents per lb.	14.50
Turpentine (bbl. lots), per gal.	$0.78
Putty, 100 lb. tins, cents per lb.	5.25–5.50

Wire—New York

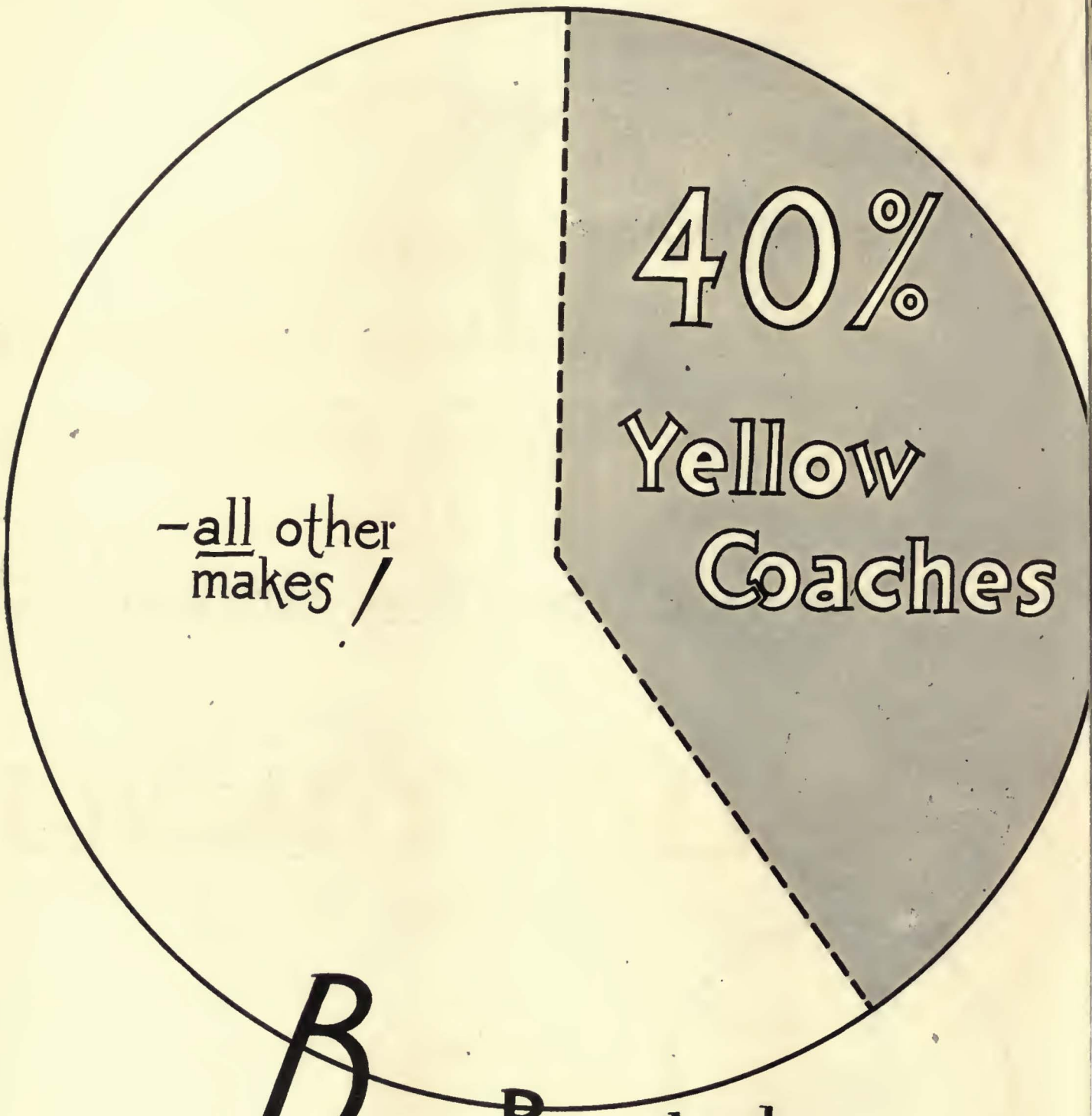
Copper wire, cents per lb.	15 25
Rubber-covered wire, No. 14, per 1,000 ft.	$5.50
Weatherproof wire base, cents per lb.	16.75

Paving Materials

Paving stone, granite, 5 in. New York—Grade I, per thousand	$130–$142
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd.	$2.70
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots	51.00
Paving brick 3x8½x4 N.Y., per 1,000 in carload lots	45.00
Crushed stone, ½-in., carload lots, N. Y., per cu.yd.	1.94
Cement, Chicago consumers' net prices, without bags	2 05
Gravel, ½-in., cu.yd., f.o.b. N. Y.	1.75
Sand, cu.yd., f.o.b. N Y	1 00

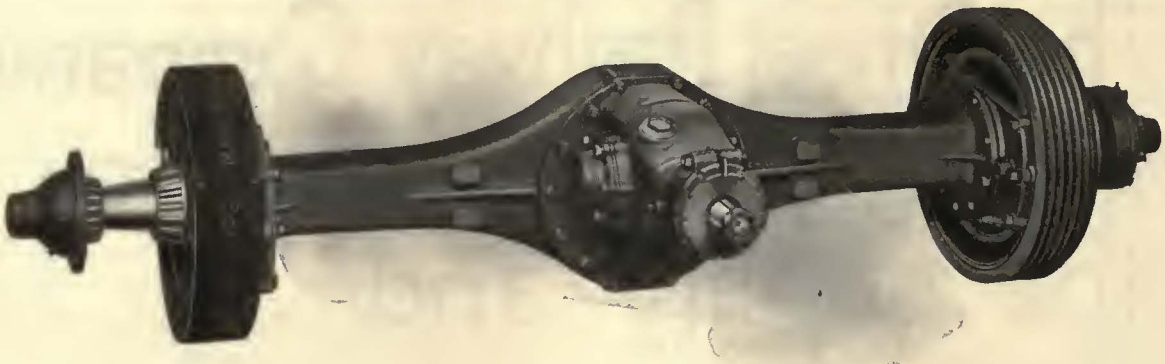
Old Metals—New York and Chicago

Heavy copper, cents per lb.	11.00
Light copper, cents per lb.	9.50
Heavy brass, cents per lb.	7.125
Zinc, old scrap, cents per lb.	4.25
Lead, cents per lb. (heavy)	6.375
Steel car axles, Chicago, net ton	$17.25
Cast iron car wheels, Chicago, gross ton	15.25
Rails (short), Chicago, gross ton	16.75
Rails, (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton	7.50



Buses Bought by Street Railway Companies in 1926

WISCONSIN AXLES

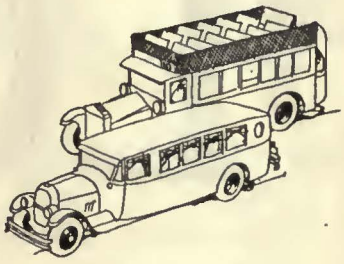


ITS rugged appearance appeals to motor truck and motor coach buyers. They know instinctively that Wisconsin one piece housing and gear carrier construction will keep gears, differential and bearings in perfect alignment—that safety is assured by powerful oversize brakes.

Wisconsin Axles are produced for trucks rated from 1 to 7 tons—for buses seating 15 to 60 passengers.

Special designs are available for rail-cars, gas-electrics and tractors.

Wisconsin Parts Company - Oshkosh, Wis.



A wheel may look good on paper. It may show up well in laboratory service. But it's mighty important to know what it has done *under actual fire.*

That's the test.

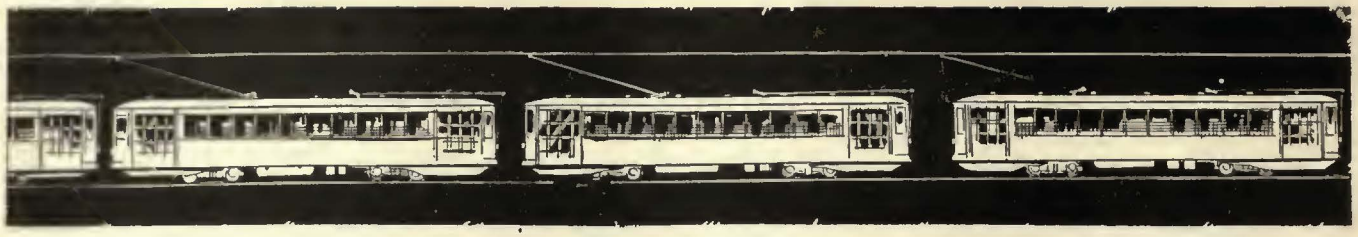
What Budd-Michelin has done in the past has put it on every heavy bus in operation. What it is doing today is *keeping* it there.

That's the thing to go by.

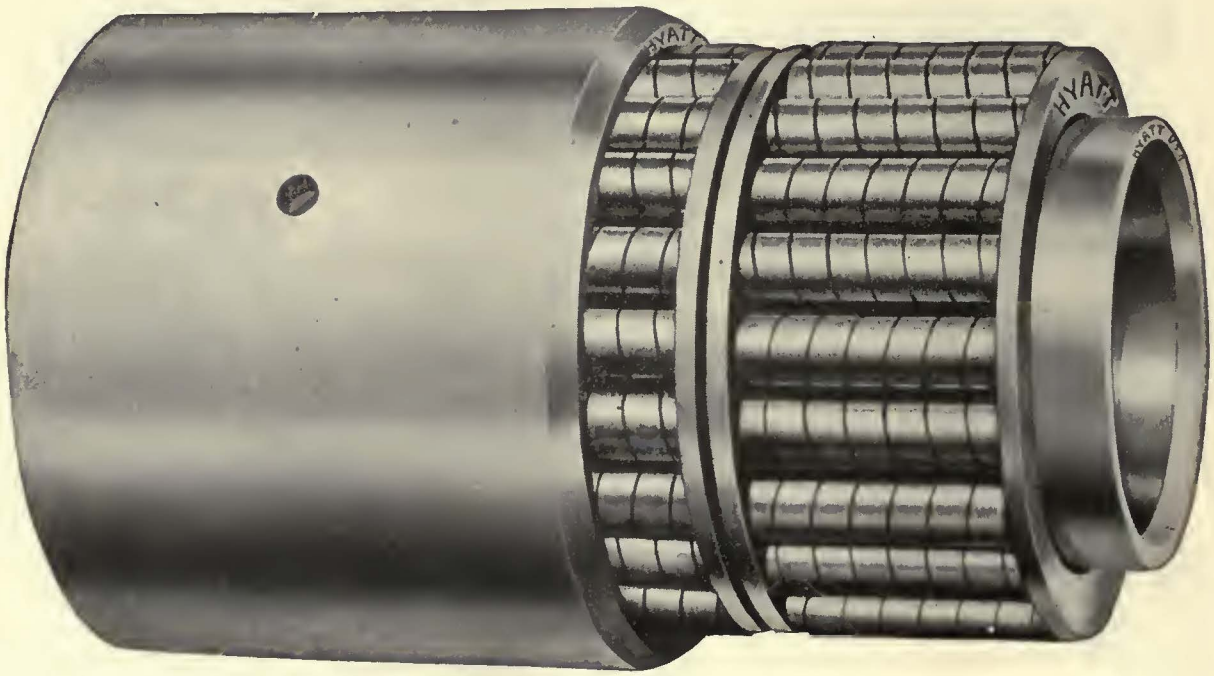
BUDD

WHEEL COMPANY

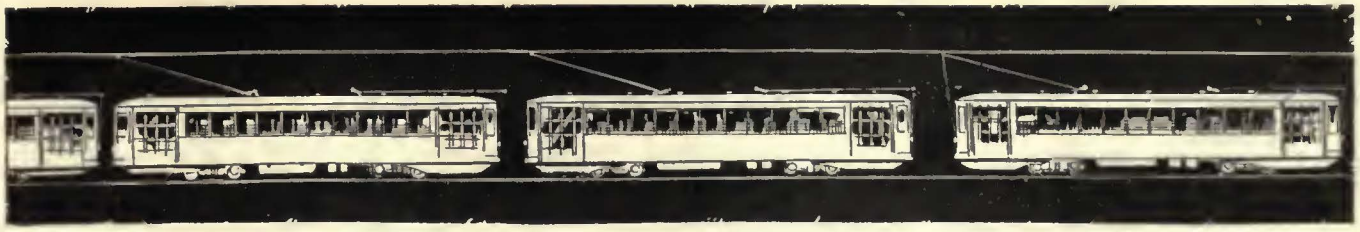
Detroit



HYATTS are



The advantages and economies of Hyatt Roller Bearings are worth investigating. Every A. R. E. A. requirement for standard equipment or replacement is met.



easier on the car
—*and its passengers*

Jerky starts and the power-wasting drag of friction bearings when running are banished forever with the use of Hyatt Roller Bearings in car journals.

Smooth starts, rapid pick-ups and quick, cushioned operation are Hyatt contributions to greater car comfort and punctual railway service.

Hyatt bearings are practically frictionless. The sturdy rollers rotate with the wheels in a natural, easy motion—reducing friction and wear, and cutting power costs appreciably.

The only attention Hyatts require is three or four lubrications a year. Bearing repairs and replacements are unheard of. Hyatts keep the cars busy earning profits instead of wasting time in repair shops.

HYATT ROLLER BEARING COMPANY
NEWARK, N. J.

HYATT

QUIET ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

The Canadian Fairbanks-Morse Company, Ltd., Distributors of Hyatt Railway Bearings in Canada

WHITE ENTERS LOW PRICE LIGHT DELIVERY FIELD

Announcing Reduced Prices Placing WHITE Transportation within the Reach of Everyone

Model 15 ¾-1 TON CHASSIS		Model 20 1½ TON CHASSIS
$2150 NET	← OLD PRICES →	$2950 NET
$1545 F.O.B. FACTORY	← NEW PRICES →	$2125 F.O.B. FACTORY
$605	← SAVING →	$825

WHITE transportation is today within the reach of every field of business and industry. Because of the increasing demand for quality truck performance, The White Company announces a broadening of its merchandising policy resulting in reductions in the prices of two models of four-speed light delivery trucks.

White is extending its area of transportation service—entering a wider field of fast, light delivery and establishing a complete range of truck capacity and price never before equaled by any high-grade truck manufacturer.

The name and reputation of White is insurance of continued high quality. These are the same high-grade White Trucks—at lower prices—the same standard specifications. For years the four speed White Model 15 and Model 20 have been the outstanding quality trucks in the light delivery field. No truck of the same size or capacity (¾-ton, 1-ton and 1½-ton) compares with them in dependable, low-cost transportation over hundreds of thousands of miles.

Throughout the chassis construction of the White Model 15 and Model 20 you will find inbuilt quality, ruggedness and exclusive White mechanical features that are not duplicated in any other light delivery truck at any price.

THE WHITE COMPANY, CLEVELAND
Please send me complete specifications, etc., covering White Light Delivery Trucks at reduced prices.

NAME .....
FIRM .....
STREET .....
CITY .....
Electric Railway Journal

Terms—Operators wishing to buy trucks on terms can do so

THE WHITE COMPANY, CLEVELAND

WHITE TRUCKS

and WHITE BUSSES

One of the Goodyear-equipped fleet of buses operated by the Yasemite Park and Curry Co.

GOODYEAR

Now SUPERTWIST Makes A Better Goodyear Bus Tire

You know what rugged strength and long life have always been built into Goodyear Pneumatic Bus Tires.

Now you may confidently expect even greater service from Goodyears in motorbus service, because Goodyear Pneumatic Bus Tires are now made with SUPERTWIST.

SUPERTWIST is the extra elastic, extra enduring new material specially developed by Goodyear for balloon tire, motorbus and heavy duty cord tires.

It far outstretches ordinary cotton cord, and has a maximum flexing power that yields under impact, protecting the tire from rupture, stone bruise and other injuries. It thus insures virtually *double* the *carcass* life of the tire.

Other features of the Goodyear Pneumatic Tire construction for motorbus service are: (1) the new Goodyear band-building method; (2) the new Goodyear breaker; (3) the new Goodyear bead—patent applied for; (4) the famous All-Weather Tread.

These advantages you get only in Goodyear Pneumatic Bus Tires—the only motorbus tires made of SUPERTWIST.

They are real advantages, because they result in the utmost durability, tractive power, road safety, riding comfort, and long, trouble-free mileage at low cost.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service

BUS TIRES

Made with SUPERTWIST

The *Silent* Worm—

its users look upon it as the ideal final drive; for its rugged simplicity, long-lived economy, and noiseless efficiency.

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.

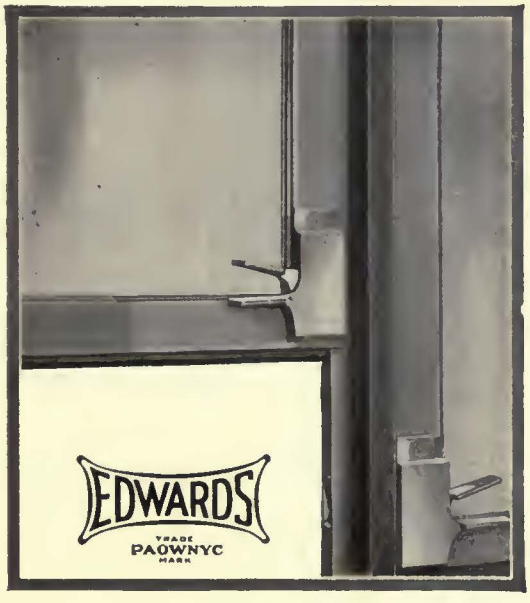
TIMKEN AXLES

Windows DO MAKE A DIFFERENCE

in the *convenience* of the bus

Bus for New York State Railways using Edwards Metal Sash. Bender Body on White Chassis.

Shall we send you our catalog? Describes and illustrates various types. Gives list of users.



BUS windows that are easy to open and close, that never stick and never rattle—

Bus windows that are practically "all glass", with a minimum of post and rail—

Such windows surely help make a bus convenient.

Edwards Metal Sash insures this convenience in bus windows.

Plus comfort, and quiet, and excellent appearance.

O. M. EDWARDS CO.

New York Syracuse, N. Y. Chicago

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

Edwards Metal Sash

AIR—and air *alone* can absorb and thus practically eliminate road shocks and vibration.

These two destructive forces cost truck and bus operators who ignore them hundreds of thousands of dollars every year in unnecessary maintenance expense and repair bills——

GRÜSS
Sleeve Type
AIR SPRING

WESTINGHOUSE
Piston Type
AIR SPRING

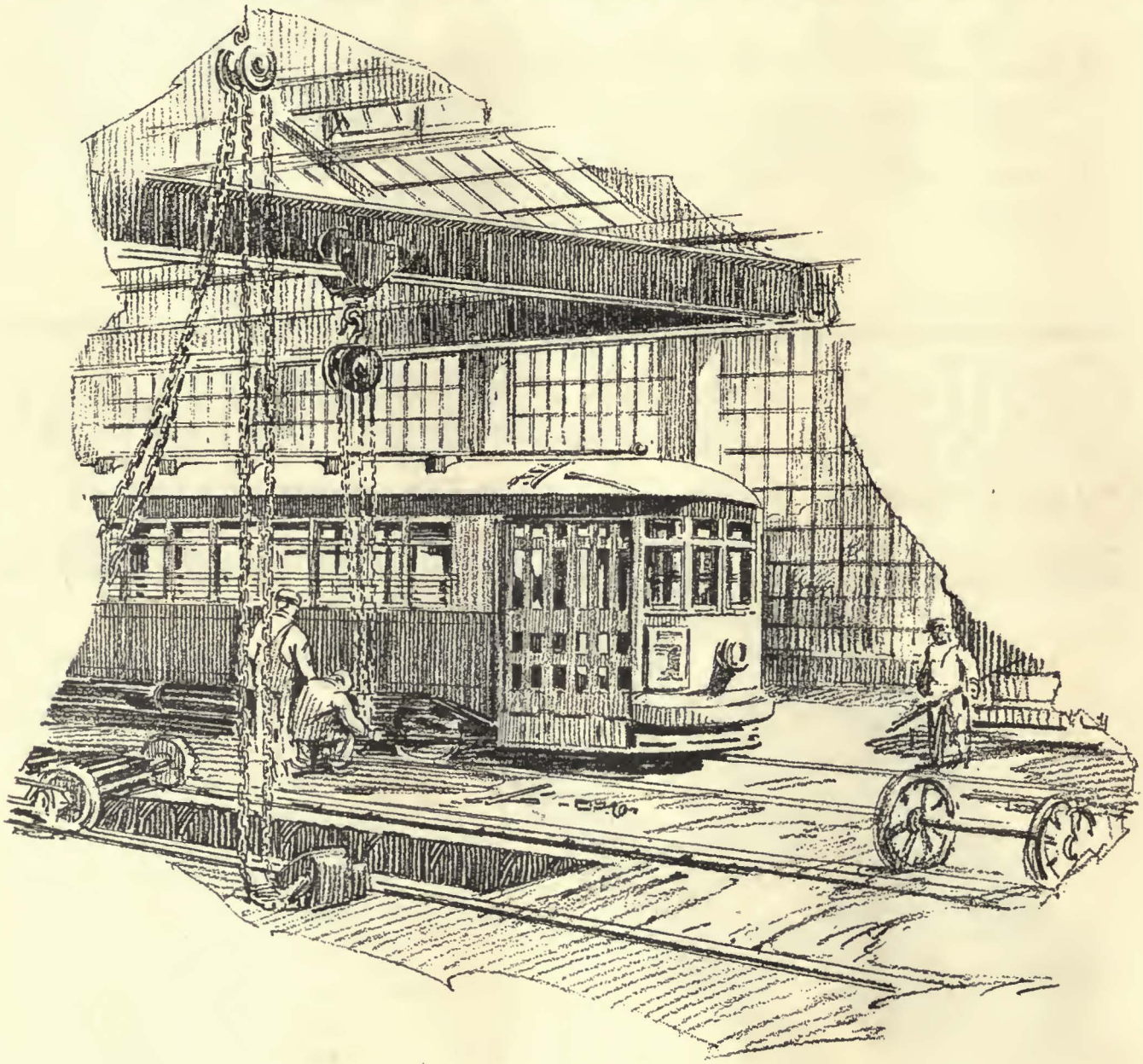
THE SHOCK ELIMINATORS FOR TRUCKS-BUSSES-PASSENGER CARS

AIR Springs float the bus or truck chassis on cushions of air. These air cushions absorb road shocks and vibration, prevent twisting and wrenching of frame, eliminate shifting of load and damage to cargo, insure supreme riding comfort regardless of road conditions.

Thousands of truck and bus operators in all parts of the world have found the savings thus effected make air springs the greatest dividend payer they have in connection. with their equipment.

The CLEVELAND PNEUMATIC TOOL COMPANY
Cleveland, Ohio

Maintenance—



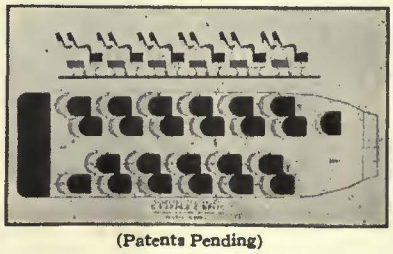
Car Card Almost

International Harvester Coach equipped with chairs designed and built by S. Karpen & Bros.

Karpen chairs equip the most comfortable motor coaches

Comfort is the point of greatest distinction in modern motor coach construction. The traveling public, accustomed to the luxury of private motors, creates keen competition among operators by a demand for equal comfort in public coaches.

For nearly half a century Karpen has been designing and building high grade seating equipment for homes and public buildings; for steamships and railroad club and observation cars. And now this experience makes it a leader in the manufacture of chairs of various types for motor coach equipment.



(Patents Pending)

All Karpen coach chairs are built of indestructible fibre, with steel reinforcement in every upright stake. Climate and temperature have no effect on it. The Karpen "Staggard" seating method is the only arrangement which gives the comfort and privacy so much appreciated by passengers, without reducing the seating capacity.

All buyers of transportation seating equipment are cordially invited to consult our experts. Address Transportation Seating Department, General offices, Chicago.

Karpen

KARPEN Guaranteed Construction FURNITURE

FURNITURE

S. KARPEN & BROS.

General Offices, 636-678 West 22nd Street

CHICAGO

New York Salesroom
37th Street and Broadway

San Francisco Salesroom
180 New Montgomery Street

Chicago Salesroom
801-811 So. Wabash Avenue

MEDIUM CAPACITY

and DEPENDABLE

Ruggedly Built for

The 21-Passenger Street Car Type is recognized as the unit of greatest utility. With Graham Brothers Motor Coaches of this type operators can give more frequent service. They haul fewer empty seats when traffic is light and they can operate more units to take care of traffic peaks.

Graham Brothers huge production makes initial cost low. Skillful design makes operating cost low. Rugged construction, which has made Graham Brothers dependability an accepted fact, keeps maintenance cost low.

GRAHAM BROTHERS

SOLD BY DODGE BROTHERS

Gruelling Service!

Graham Brothers Motor Coaches—Because of Fine Material, Skillful Workmanship and Correct Design — Are Sturdy and Dependable Without Excess Weight—

Experience has taught motor coach operators that great size and great weight of equipment are not necessary. The trend continues towards the medium capacity coach.

Graham Brothers 21-Passenger street car type motor coaches are designed and built to meet the exacting conditions of motor coach operation. They are built ruggedly, powered adequately, designed for beauty and comfort—*and they stand up.*

Mile after mile, trip after trip, day after day, year after year—their performance is consistently dependable. Operators benefit by their low operating and maintenance costs with no sacrifice whatever in the power, stamina or reliability of their equipment.

There is invitation in the appearance of Graham Brothers coaches and that assurance of comfort and safety that fosters the coach-riding habit.

PRICES—*Standard 21-Passenger Street Car Type, complete, $3815; 12-Passenger Parlor Coach, complete, $3750; f. o. b. Detroit*

MOTOR COACHES

DEALERS EVERYWHERE

CONFIDENCE

Operators of Graham Brothers Motor Coaches enjoy a three-fold confidence — confidence in the equipment itself, confidence in the Dodge Brothers Dealer who sells and services it, confidence in the stability of Graham Brothers, a division of Dodge Brothers, Inc.

They know that their coaches are built of the finest materials by skilled workers to the specifications of engineers experienced in motor coach operation.

They know that the Dodge Brothers Dealer is a sound, substantial business man who will be right there where they bought their motor coaches whenever he is wanted—that he has trained mechanics and an adequate stock of repair parts.

They know that the reputation of Graham Brothers is behind their motor coaches—and that Graham Brothers reputation is a tremendous asset carefully guarded. These operators know, too, that the magnitude of Graham Brothers production made possible the exceptionally low price at which they were able to purchase their splendid equipment.

GRAHAM BROTHERS

EVANSVILLE — DETROIT — STOCKTON

A DIVISION OF DODGE BROTHERS, INC.

GRAHAM BROTHERS (CANADA) LIMITED, TORONTO, ONTARIO

ECONOMY IS SKIN DEEP!

This is the first of a series of "SKIN DEEP" advertisements on leather upholstery for electric railway cars and buses. The second will appear in an early issue.

In the endeavor to decrease maintenance costs in transportation equipment the outside factors are too often put ahead of the inside factors. The inside of your cars or buses is what most concerns the passenger.

Cleveland Tanning Company Leather used in upholstering the seats of your cars or buses contributes directly to increased operating profits. It brings comfort and attractiveness to your passengers, and it costs less per mile in the long run. This opportunity to better your service and increase your profits—with lower maintenance costs—cannot be over-emphasized.

Supplied as complete hides, or cut to any pattern; five famous grades: Hyaline Grains, Alpha Grains, Hand Buffs, Machine Buffs and Special Machine Buffs. Color and finish according to your specifications. We will be pleased to send you samples.

NOTHING TAKES THE PLACE OF LEATHER

HYALINE

The Cleveland Tanning Co.
Dennison Ave. and Jennings Rd., Cleveland, O.

Western Representotives:
Midgeley & Borrowdale
McCormick Bldg., Chicago

Eastern Representatives:
Sisson Supply Co.,
1845 Grand Central Terminal, New York

Keeping upkeep down

In the racking strains of rough going, through the icy blasts of winter and under the scorching heat of summer, Fitzjohn bodies keep going, building patronage.

Such performance means just this. That Fitzjohn understands the problems confronted by the bus body builders and applies this knowledge in the design and production of quality bus bodies which stand up in service.

Sheer clean-cut beauty belies the enduring strength of Fitzjohn bodies. Thus has Fitzjohn combined revenue producing attractiveness with a construction inherently free from time loss for costly maintenance.

For pay-enter service or de luxe transportation, on any chassis, Fitzjohn offers low upkeep, profitable passenger miles.

FitzJohn

FITZJOHN MANUFACTURING CO.
Exclusive Bus Body Builders
MUSKEGON, MICH.

Put Railroad Brakes

AUTOMOTIVE vehicles have outgrown automotive braking. Two-wheel brakes have grown into four-wheel brakes. Ordinary brakes have been reinforced with power pressure—but you cannot get away from the fact that a brake is only as good as the friction which can be maintained between the drum and the brake shoe, and if this friction is nullified by the tremendous heats generated something has to be done about it.

That something has been discovered, as might be expected, by the company which stands in the forefront of railroad braking practice—The American Brake Shoe and Foundry Company—operating in the automotive field through its subsidiary—American Brake Materials Corporation.

The solution of the problem came not in larger drums; not in greater pressure; to all of which there are mechanical limitations. It came in applying the railroad principle of braking to automotive vehicles—dispensing with linings entirely and putting on in their place American Brakebloks, which are separate segments mounted on the brake head, allowing plenty of room between them for the vital essential—the quick dissipation of heat.

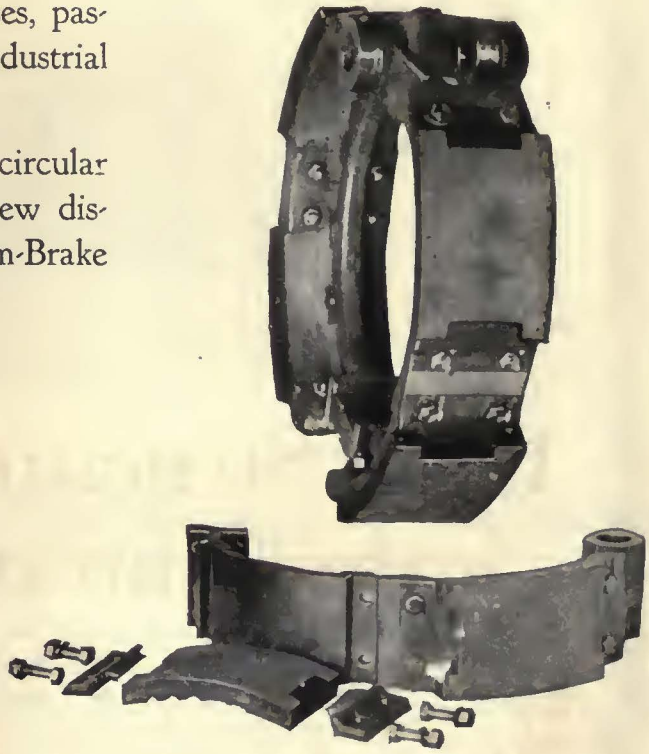
The whole solution depended upon the invention of the material itself—and you will find that this new material has the hardness of 35 carbon steel; will not score brake drums; acts equally well on hot or cold drums; is not affected by oil or water; and will not squeal.

On Your Motor Buses!

Exhaustive tests have been made showing that this material outwears by three or four times any other friction material, that it makes possible the application of any desired pressure; and that it avoids the dissemination of heat to the tires which results in vulcanization and quick blow-outs.

American Brakebloks will be used on buses, passenger cars, trucks, and taxi cabs, and also on industrial machinery. They mean safety and economy.

Submit your problems to us; write for our circular which gives full information regarding this new discovery—"The Last Battle of the Momentum-Brake War."



Here is shown an American Brakeblok assembly, also a demounted view showing bolted method of attachment of Brakebloks. Notice the separate segments allowing apertures for the rapid dissipation of heat.

AMERICAN BRAKEBLOKS

AMERICAN BRAKE MATERIALS CORPORATION
DETROIT

RAILROAD BRAKING PRACTICE — APPLIED TO — MOTOR CARS AND MACHINERY

AMERICAN BRAKEBLOKS

AMERICAN BRAKE MATERIALS CORPORATION, DETROIT
Subsidiary of
THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

Atlas Flour Mill Fire at Milwaukee, Wis., Dec. 10, 1926

A-711-LC

Ask Your Fire Chief

And he will tell you a story of engine endurance and continuously applied real horsepower that no bus or truck engine ever experiences. During the past year many fire pumpers have been built with Waukesha heavy duty six cylinder Bus and Truck engines. The Milwaukee Fire Department used the first one they built at the above fire and pumped 500,000 gallons of water at 165 pounds pressure during a continuous run of 15 hours and 30 minutes.

Paper horsepower soon fades when put to a test like this. Waukesha engines deliver real power and what is more can keep it up. The Ricardo Head, Girder Type Crankcase, "Truncated" Cylinders and huge three and a half inch crankshaft are a few of the reasons why these engines have never failed in a single twelve hour Underwriters Fire Pumper test. They are built in sizes from 70 to 130 Horsepower. If interested—Send for complete literature.

(A-719-LC)

AUTOMOTIVE EQUIPMENT DIVISION

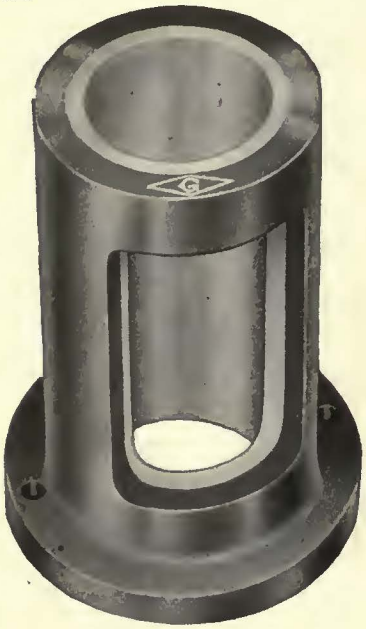
WAUKESHA MOTOR COMPANY

Waukesha **Wisconsin**

Eastern Sales Offices *Aeolian Building, 33 W. 42nd Street* *New York City*

Exclusive Builders of Heavy Duty Automotive Type Engines for Over Twenty Years

Gilbert's Electric Railway products for Economy



Armature Bearings

Gilbert Velox Bronze Armature Bearings for Street Car Motors. Made up in Solid Bronze or lined with "C" Grade Nickel Babbitt. Tests show exceptionally high car mileage. Far superior to anything in the way of a bearing on the market today.

Gilbert "C" Grade Nickel Metal is a tin base metal with nickel, antimony, and copper and is by far the most dependable metal for use under heavy loads and excessive vibration.

THE Gilbert Organization has for years given its complete time and thought to the economical operation of electric cars. Specializing in certain equipment for motors, axles, etc., and for the overhead line, the Gilbert Organization has contributed in a large way to minimizing car maintenance and increasing service efficiency. An increasing demand for Gilbert Specialties fully demonstrates the great appreciation that exists everywhere for Gilbert quality.

Quality Babbitts

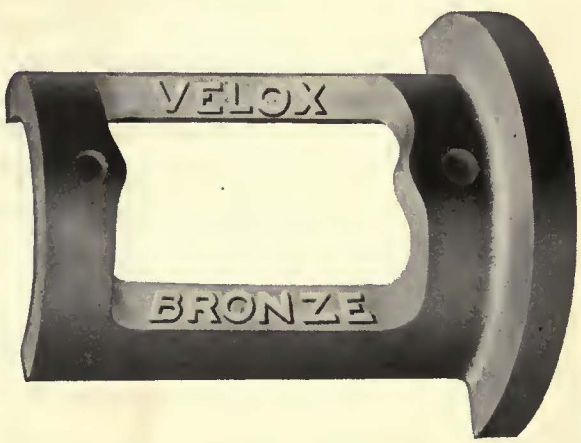
Developed by specialists and made of virgin metals—the positive assurance of a superior bearing metal. Maximum service is resulting wherever Gilbert Babbitts are used.

The metallic compositions of Gilbert's Quality Babbitts—Street Car Armature, axle, and Journal Bearings — Trolley Wheels and Harps—were made our standards after 26 years of engineering and metallurgical experimentation.

Actual tests in every case were conducted to prove the superiority of the various compositions. All this was done with the users viewpoint always the foremost consideration.

Journal Bearing and Check Plates

Made for all types of trucks. Journal Bearings made in VELOX. Check Plates manufactured of Gilbert PHOSPHOR BRONZE.



Axle Bearings in Velox Bronze

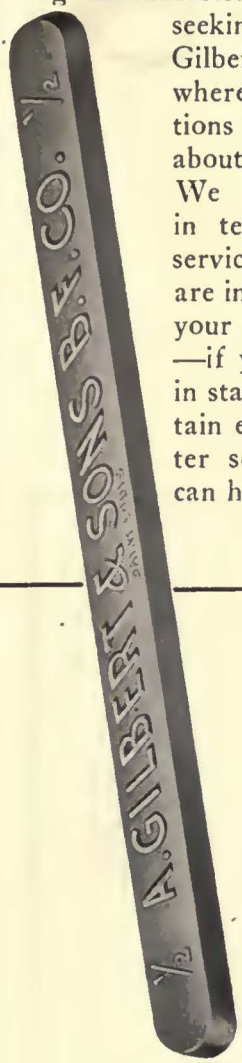
Maximum mileage and satisfactory service in Gilbert Axle Bearings results because bearing alloys used have been proven highest quality thru experimentation. We have developed a means whereby we manufacture axle bearings in exact halves, with the metal equally distributed in both the upper and lower half—accurately finished with as true a fit as is possible.

A. GILBERT & SONS BRASS FOUNDRY CO.

ST. LOUIS, U. S. A.

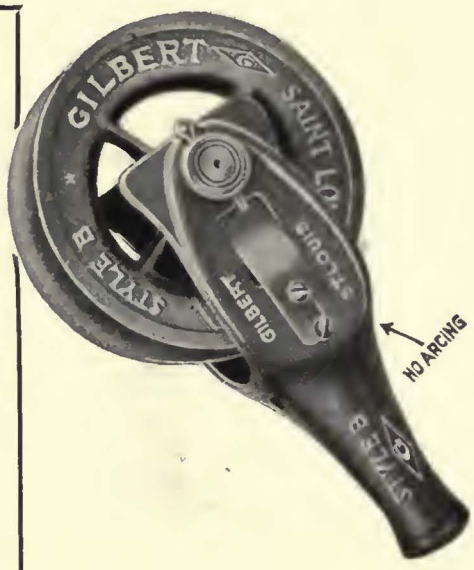
The name Gilbert on Electric Railway products means Service

THE Gilbert plant is equipped with all the latest and up-to-date equipment for correct and uniform production. Our testing laboratories are continually seeking to even better Gilbert developments where service conditions change and bring about new demands. We continually think in terms of customer service economy. If you are interested in cutting your maintenance costs—if you are interested in standardizing on certain equipment for better service results, we can help you.



Gilbert's Solders

All our solders are made from pure straits tin and double refined lead thoroughly refined and purified.



Trolley Wheels and Harps

In purchasing trolley wheels consider seriously these three points—(1) Conductivity, (2) Wear on over-head lines, and (3) Car Mileage. Our engineers long ago experimented with these three points of prime consideration. (1) With proper facts our metallurgical and engineering departments developed an alloy manufactured under a chemical process that retains original copper conductivity and gives the maximum in mileage. (2) The composition used means minimum wear on over-head lines. (3) Gilbert Trolley Wheels are giving exceptional mileage in various services.

Gilbert Replaceable Ear Frogs

Made in 8 to 20 degree angles and with replaceable ears. For all wires.

Gilbert Trolley Ears

Gilbert line material is all designed and made to be most efficient. The Clinch Trolley Ear shown below conforms to A-R-E-A specifications. Lengths, 9, 12, 15 inch, 5/8 boss.

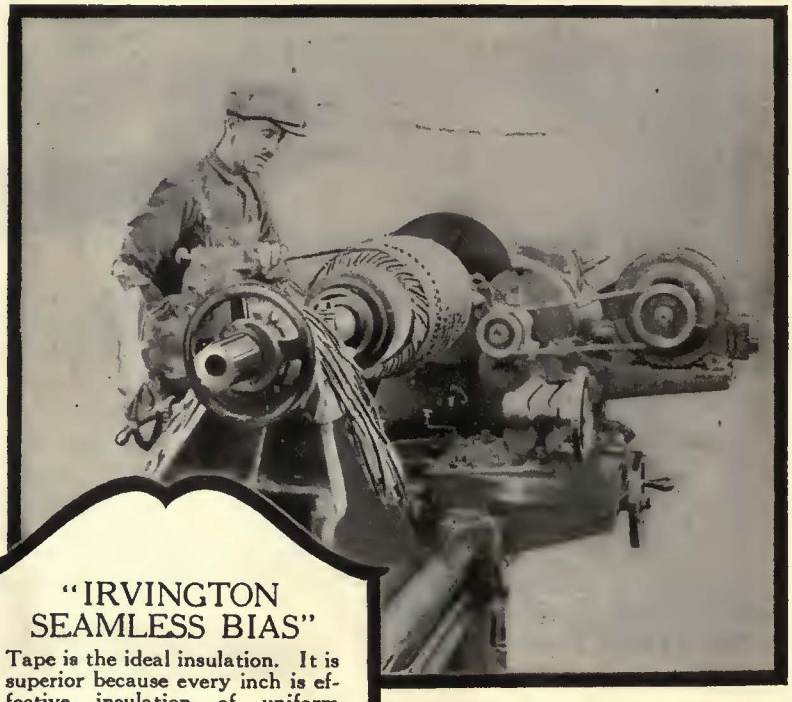
A. GILBERT & SONS BRASS FOUNDRY CO.

ST. LOUIS, U. S. A.

Agua

"IRV-O-SLOT"

is the most economical and convenient type of insulation for armature slots. It is a varniahed cambric insulation duplexed with any atandard thickness of fibroua insulation. The materials are cemented with a flexible binder that permits shaping without separation of the layers. It is supplied in sheets or strips or cut to slot sizes. Saves both labor and material and simplifies the winding job.



"IRVINGTON SEAMLESS BIAS"

Tape is the ideal insulation. It is superior because every inch is effective inaulation of uniform thickness. It gives smooth windings, requires a minimum of impregnating varnish, and eliminates air pockets. It can be applied with taping machines. Furnished in yellow and black .005 to .015 in. thick; ½ in. to 36 in. wide on paper corea 3/8 to 1½ in. hole. with standard rolls of 36 and 72 lineal yards.

rantee of long life

IRVINGTON INSULATION

IRVINGTON INSULATING VARNISHES designed for the requirements of specific apparatus are now offered to the electrical industry. This product is backed by twenty years' leadership in the field of varnished insulation. For the electric railways a varnish particularly suited to the type of motor, varnishing equipment and regional climatic changes can be supplied. *Write for Catalog* 101-*V*.

Many reasons for its Superiority

The experience and background of this company guarantees the user of Irvington Insulation that everything possible has been done to make its products thoroughly reliable. The company has devoted 22 years solely to the manufacture of varnished insulation.

Complete Control of all Processes.

Irvington has the only plant independent of all except raw material markets. A complete unit devoted exclusively to finishing cloth suitably for varnished insulations.

A Thoroughly Fireproofed Plant

Designed in units to assure you a continuous source of supply.

Laboratory Control of Processes

Including chemical, electrical and physical inspection of all products, maintenance of test standards and research to assure constant improvement.

Capacity

Sufficient productive capacity to meet emergency demands and insure prompt delivery.

Result—BALANCED INSULATION

In which every *necessary quality* is present at a *maximum value* without detriment to any other *fundamental requirement.*

IRVINGTON PRODUCTS

Varnished Silk
Varnished Paper
Black and Yellow Varnished Cambric
Straight and Bias Varnished Cambric Tapes
Flexible Varnished Tubing
Transformer Leads
"Cellulak"
Insulating Varnishes and Compounds
"Irv-O-Slot" Insulation
Paper Form Wound Coil Windings.

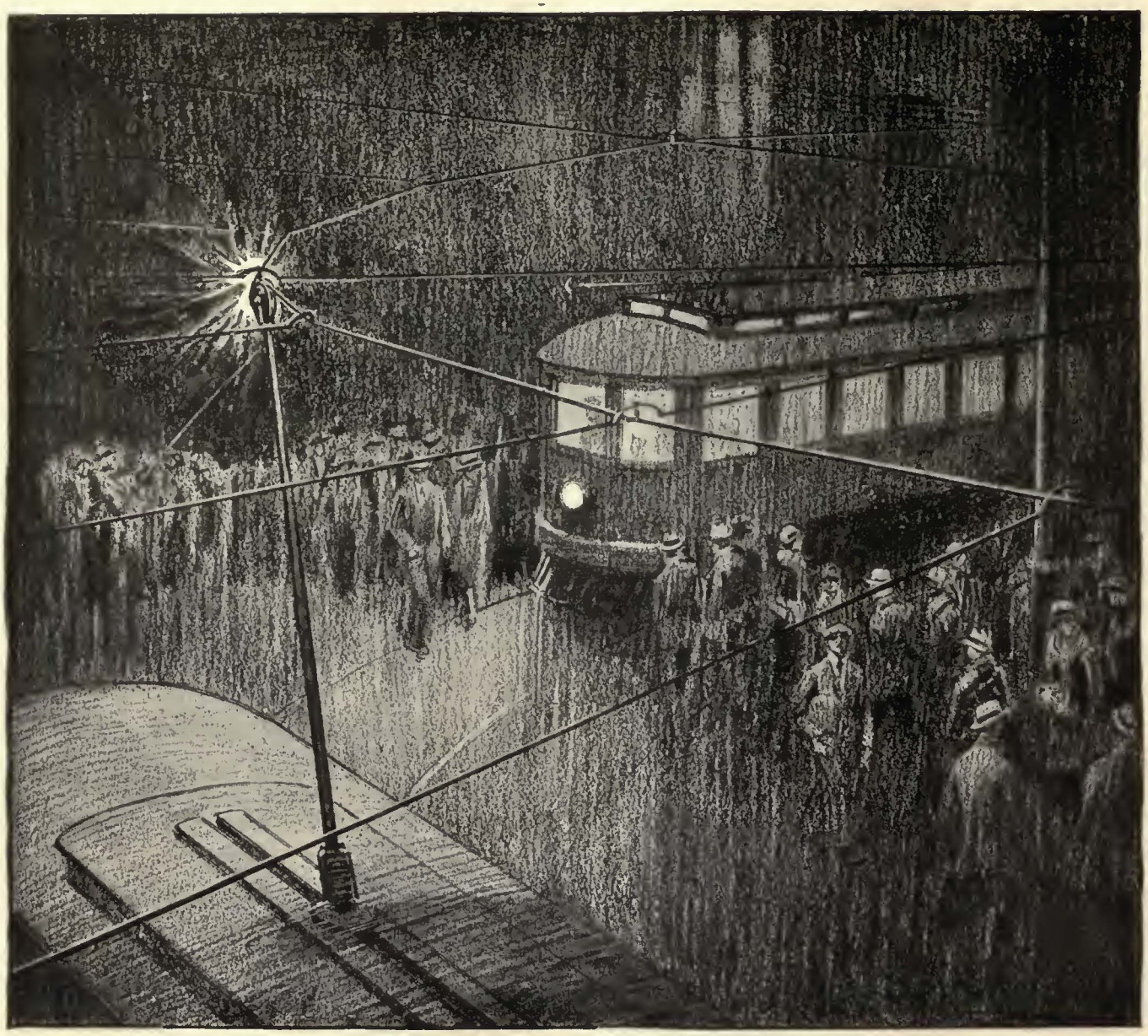
IRVINGTON VARNISH & INSULATOR CO.
Irvington, New Jersey.

Established 1905

Sales Representatives:

Mitchell-Rand Mfg. Co., New York
White Supply Co., St. Louis
E. M. Wolcott, Rochester
Martin Woodard, Seattle
Prehler Bros., Chicago
Consumers Rubber Co., Cleveland
Clapp & La Moree, Los Angeles
A. L. Gillies, Toronto

IRVINGTON INSULATION



Hitenso for Strength

STRENGTH—a minimum of 79,000 pounds per square inch, for 00 size—with the least sacrifice in conductivity is available only in Hitenso.

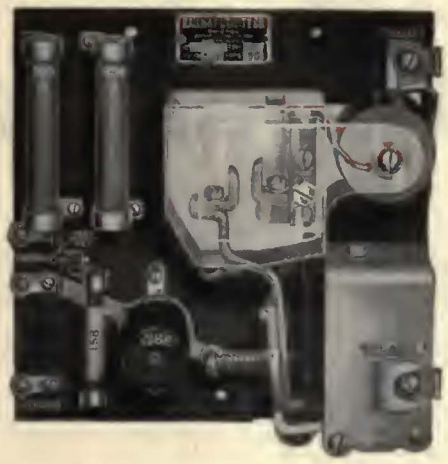
Hitenso "C" meets the strength requirements of the A.S.T.M. specifications for High Strength Bronze and exceeds the conductivity by 15%. Hitenso "A" meets the specifications for Medium Strength Bronze and exceeds the conductivity by 15%. In terms of electrical efficiency Hitenso "C" is 37½% better than High Strength Bronze and Hitenso "A" 23% better than Medium Strength Bronze.

Where operating conditions are severe, Hitenso Trolley Wire, exclusively an Anaconda Product, serves best. Complete imformation upon request.

ANACONDA COPPER MINING CO. THE AMERICAN BRASS COMPANY
Rod, Wire and Cable Products
General Offices: 25 Broadway, New York Chicago Office: 111 W. Washington St.

ANACONDA TROLLEY WIRE

Business Builders

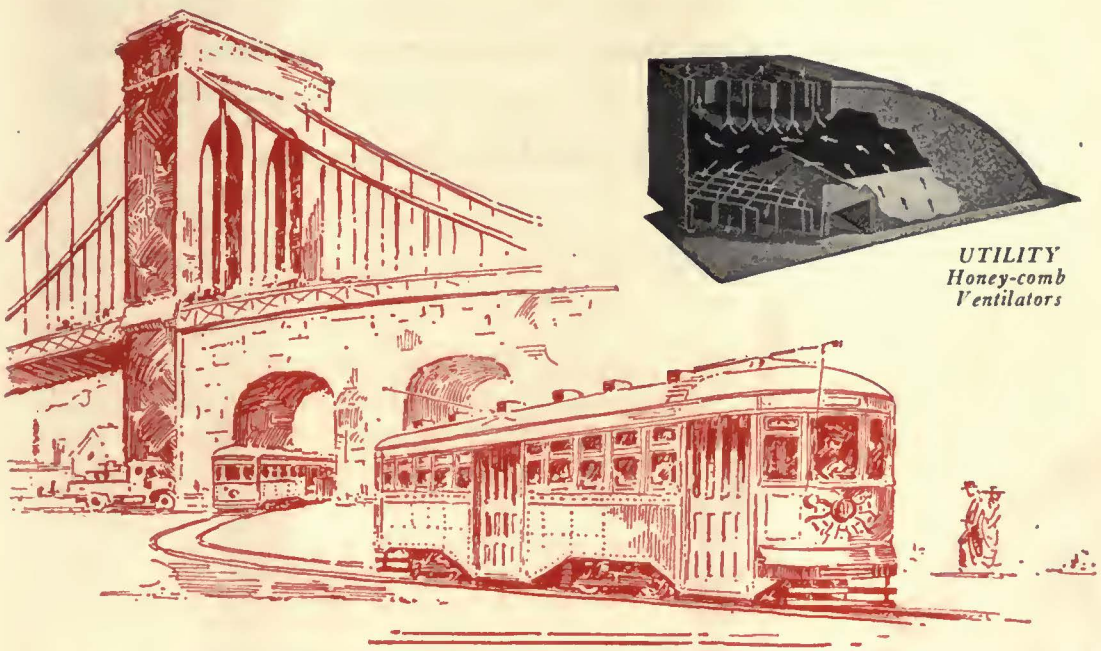


Utility Regulators are positive in action and maintain a uniform temperature within the car.

Proper Heating and Ventilating is a business building asset for any Electric Railway.

Utility car heating and ventilating devices represent the farthest advance made in this line of endeavor. Utility Heaters now employ only genuine Chromalox elements, which can be operated up to 1,400 degrees without the slightest risk of danger or deterioration. They are proof against vibration, overloads, dust, dirt, or moisture, the heaters are so constructed that they can be installed on combustible parts of the car body just as received from the factory, without additional insulating materials of any kind. No shields are required to protect clothing or seats. All Utility Heaters carry the fire underwriters' label.

Utility car Heating and Ventilating Devices are standard equipment for many railroad properties. If you are not using them it will be to your advantage to get detailed information.



UTILITY
Honey-comb
Ventilators

UTILITY
Vestibule Heater

Chromalox Strip Heaters
An Indestructible Electric Heating Unit which is made in various sizes so that it can be installed for replacement in all types of old or new heater cases.

Car Comfort with Utility Heaters Regulators Ventilators

RAILWAY UTILITY COMPANY

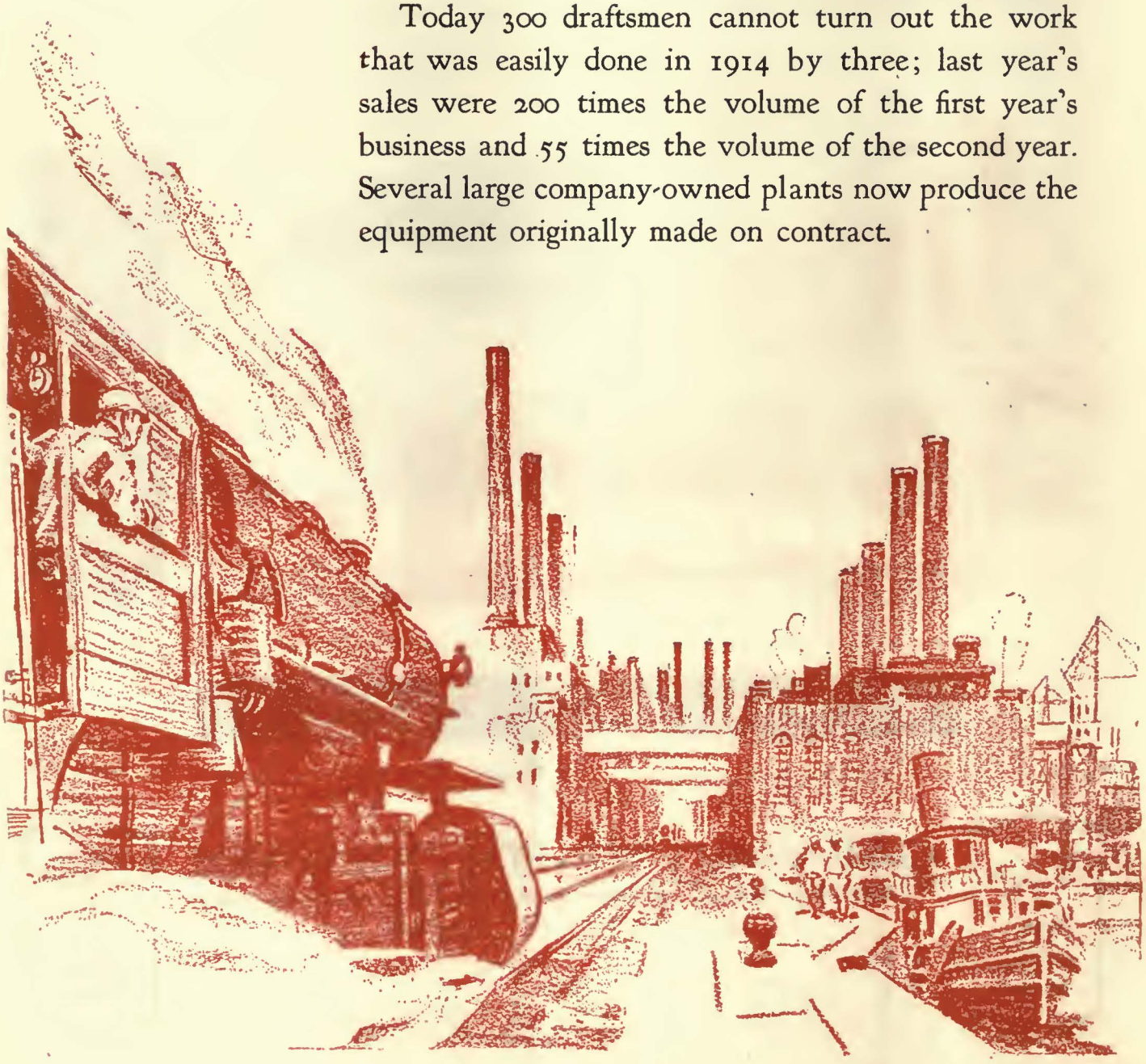
CHICAGO, ILLINOIS

Car Comfort with Utility Heaters Regulators Ventilators

Speeding Industrial

IT seems only yesterday that they were starting out—this engineering equipment corporation that today dominates the field.

Today 300 draftsmen cannot turn out the work that was easily done in 1914 by three; last year's sales were 200 times the volume of the first year's business and 55 times the volume of the second year. Several large company-owned plants now produce the equipment originally made on contract.



the Way to Prestige and Profits

STARTING from scratch—a new name, without prestige—to a position of absolute dominance within a single decade. This actual case is another of those examples of conspicuous achievement which color the pages of American industrial history.

How was it accomplished?

The answer is good products, good engineers and—a sound industrial marketing and advertising procedure in which, according to an officer of the corporation, McGraw-Hill Publications were a major factor.

This Industrial Advertising persistently campaigned for lower operating costs through use of the advertised equipment. Not for the day, but for three years—five years ahead the advertising aimed for business. The pace the advertising set 12 years ago was always increased—never slackened.

And now, having conquered the market, this Industrial Seller depends upon Industrial Advertising for a still more important purpose—to keep command of his leadership. His confidence in Industrial Advertising and his knowledge of Industry's trends are best evidenced by plans to handle a doubled volume of business in 1927.

The case cited shows how Industrial Advertising, based on marketing knowledge, is the direct and effective approach to the Industrial Buyer's interest.

Granting all honor to the leaders who attribute their standing to Age, no Industrial seller wants to wait for Time alone to ripen his prestige. What this manufacturer did is possible for other manufacturers to do, for the basic fundamentals of industrial recognition are charted in the McGraw-Hill Four Principles of Industrial Marketing.

1. Determination of worthwhile markets.
2. Analysis of their buying habits.
3. Determination of direct channels of approach.
4. Study of effective sales appeals.

IN either preliminary or advanced consideration of Industrial Marketing and Advertising problems and possibilities, the complete facilities of the McGraw-Hill organization are available to any Industrial Seller or his advertising agency. Each McGraw-Hill office is fully equipped to serve.

"Industrial Marketing at Work" is a new book soon to be published. It shows how to make a step-by-step application of the McGraw-Hill Four Principles of Industrial Marketing. If Industry is your customer this book will help establish your advertising and selling on a foundation of certainty. You may request the nearest McGraw-Hill office to deliver a copy as soon as it is off the press.

McGRAW-HILL PUBLISHING COMPANY, INC., NEW YORK, CHICAGO, PHILADELPHIA, CLEVELAND, ST. LOUIS, SAN FRANCISCO, LONDON. PUBLISHERS OF

McGRAW-HILL PUBLICATIONS

45,000 ADVERTISING PAGES USED ANNUALLY BY 3,000 MANUFACTURERS TO HELP INDUSTRY BUY MORE EFFECTIVELY

CONSTRUCTION & CIVIL ENGINEERING
ENGINEERING NEWS-RECORD
SUCCESSFUL CONSTRUCTION METHODS

ELECTRICAL
ELECTRICAL WORLD · ELECTRICAL WEST
ELECTRICAL MERCHANDISING

INDUSTRIAL
AMERICAN MACHINIST · INDUSTRIAL ENGINEER
CHEMICAL & METALLURGICAL ENGINEERING
POWER

TRANSPORTATION
ELECTRIC RAILWAY JOURNAL
BUS TRANSPORTATION

RADIO
RADIO RETAILING

MINING
ENGINEERING & MINING JOURNAL
COAL AGE

OVERSEAS
INGENIERA INTERNACIONAL
AMERICAN MACHINIST (EUROPEAN EDITION)

CATALOGS & DIRECTORIES
ELECTRICAL TRADE CATALOG
ELECTRICAL ENGINEERING CATALOG
RADIO TRADE CATALOG
KEYSTONE COAL MINING CATALOG · KEYSTONE CATALOG (METAL-QUARRY EDITION)
KEYSTONE COAL BUYERS CATALOG
CENTRAL STATION DIRECTORY
ELECTRIC RAILWAY DIRECTORY
COAL FIELD DIRECTORY
ANALYSIS OF METALLIC AND NON-METALLIC MINING, QUARRYING AND CEMENT INDUSTRIES

Long distances offer no discomforts to the Bus traveler—when the body is by Lang

LB

The Sterling Mark on Bus Bodies

LANG BODIES

create new passengers

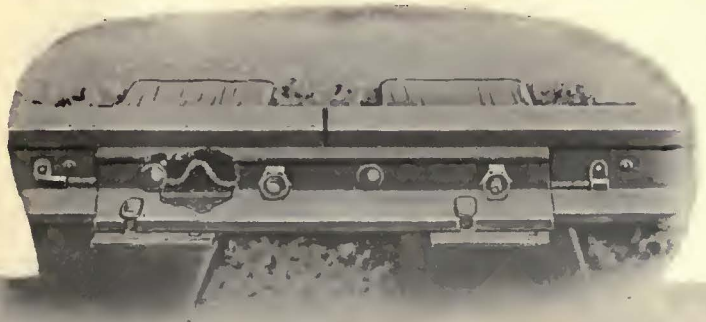
Lang Bodies invite relaxation. Relaxation means comfort. Comfort means a pleasant trip and miles that seem shorter when the distance is long.

Deep-cushioned seats, clear vision, ample leg-room; these and many other carefully studied features contributing to passenger comfort create new passengers —and hold them.

THE LANG BODY COMPANY
CLEVELAND, OHIO

"After all— it's the Setting that counts!"

PIN TERMINAL RAIL BONDS



Showing installation of Pin Terminal Rail Bond: Two 1/0 bonds per joint. Each bond has a separate socket terminal soldered to stub end of bond after threading behind and without removing the slice bars.

View of the Virginian Railway Company power house on the New River, Narrows, Virginia.

American Steel & Wire Company's Pin Terminal Rail Bonds were used throughout on the Roanoke Mullens Electrification of the Virginian Railway.

As all of the bonding had to be done under traffic it was necessary to have a protected type of bond which could be installed without removing the splice bars. It was only after careful study by the engineers that they specified Pin Terminal Rail Bonds.

This type of bond is easy to install, accessible for inspection, and can be replaced readily in case of rail breaks or wrecks.

American Steel & Wire Company's extra high strength Galvanized Steel Strand was used throughout for guying the catenary structures and for cross catenary messengers. Our Multiple Conductor Control Cables and Varnished Cambric Insulated Cables also were used in the power house and shops.

MADE BY

American Steel & Wire Company

SALES OFFICES:

CHICAGO, NEW YORK, BOSTON, CLEVELAND, WORCESTER, PHILADELPHIA, PITTSBURGH, BUFFALO, DETROIT, CINCINNATI, BALTIMORE, WILKES-BARRE, ST. LOUIS, KANSAS CITY, ST. PAUL, OKLAHOMA CITY, BIRMINGHAM, MEMPHIS, DALLAS, ATLANTA, DENVER, SALT LAKE CITY

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

26941

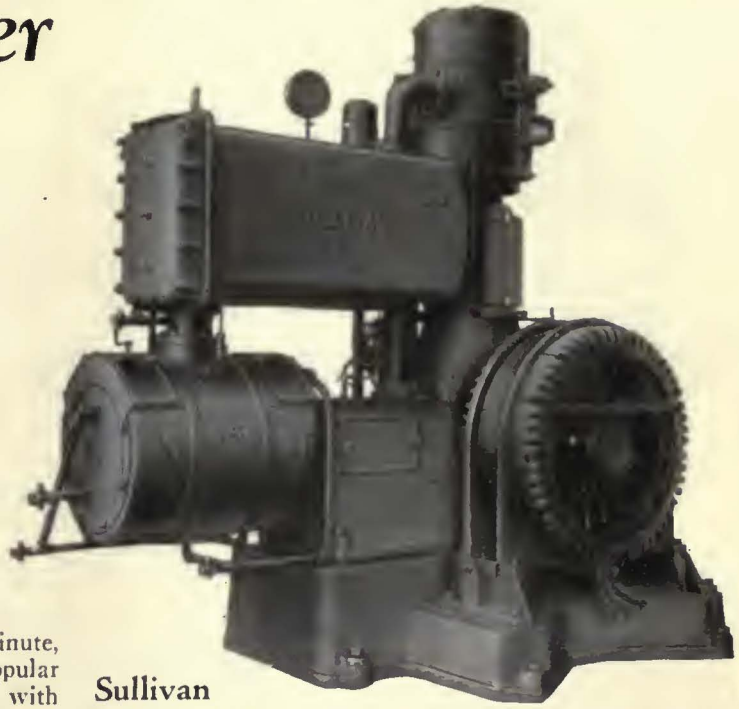
Cheaper Maintenance With Air Power

The economy and versatility of air power have made it popular for the maintenance work of Electric Railway properties. Shop after shop is increasing its use of air, for operating air tools, testing brakes, cleaning, painting, and for operating gas furnaces; and many compressors 1500-cu.-ft. and even larger are being installed.

If your air requirements are greater than 400 cu. ft. you can take advantage of the important economies embodied in Sullivan Angle Compound Compressors. The balanced angle design of these machines saves floor space and foundations, and enables the compressor to run at full speed with no perceptible vibration.

Multi-step load control saves power. "Wafer" valves, positive automatic lubrication, and adaptability to any drive, are other features.

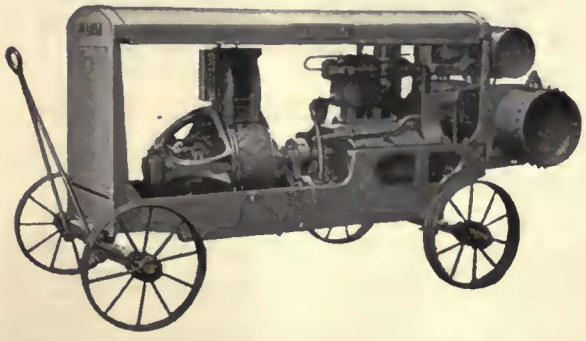
Capacities are 400 to 3700 cu. ft. For full information write for Catalog 3283-A.



Sullivan Balanced Angle Compound Compressor, direct driven from electric motor

For shops requiring from 68 to 500 cu. ft. of air per minute, the Sullivan single stage "WG-6" compressor is a popular machine. It is rugged and compact, and is equipped with "sweep control" unloading system, "Wafer" valves, and automatic lubrication. For full information, write for Catalog 3283-B.

Sullivan Portable Compressors



For repair work out on the tracks, where electric power is readily available, the right compressor for you is the Sullivan electric portable. You can get it in 103 and 206 cu. ft. capacities, mounted on steel wheels, rubber-tired trailer trucks, skids, or on your own truck or car. Motors are of standard make, carefully tested. The 103-ft. compressor will run two concrete breakers, 2 tampers, 4 riveters, 4 clay diggers, or a rock drill. Write for Catalog 3283-E.

Sullivan Portable Compressors run by Buda engines are also available. *See Catalog 3283-D.*

Sullivan Electric Portable Hoists

A compact, automatically lubricated little hoist that will lift a ton on single line, or pull a 50-ton car on level track. Electric and Turbinair models are available in single and two-drum models. *Write for Catalog 3276-G.*

Sullivan Concrete Breakers

Sullivan Busters successfully meet the wide and increasing demand for a one-man compressed air tool that will do quickly and cheaply such work as breaking concrete pavements and cutting asphalt in repairing track. They are available in 48-lb. and 75-lb. models. *Catalog 3281-I.*

Heavy "Buster"

Sullivan Clay Spaders

"Spader"

Sullivan Clay Spaders will cut your labor on clay digging jobs in half. Why use the pick and shovel when only a Spader is needed? *Get Catalog 3281-J.*

Sullivan "Rotator" Rock Drills

Sullivan Rotators are fast rock drillers under any conditions. Seven models are available, including augur and steam models. *Get Catalog 3281-F.*

SULLIVAN MACHINERY COMPANY

150 SOUTH MICHIGAN AVE., CHICAGO, ILLINOIS U.S.A.

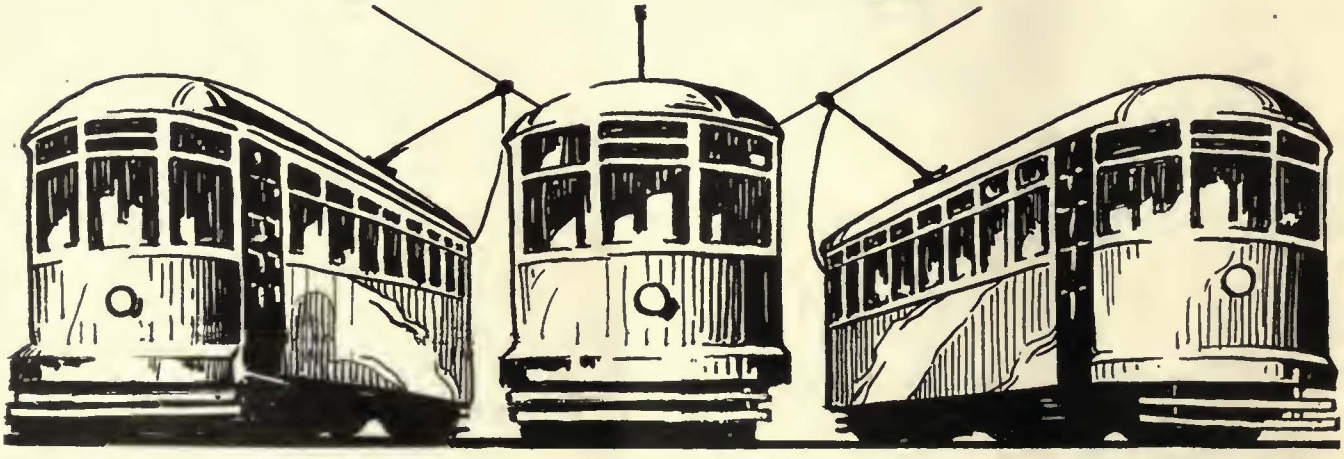
Lower

More-Jones Trolley Wheels

They are finished complete in one operation, thus insuring proper balance.

The metal used is exceedingly tough—an alloy of purest new metal, having maximum conductivity—which provides greater mileage without damage to the overhead lines.

V-K Oil-less Wheels for City and Suburban service and More-Jones lubricated Wheels for high speed requirements insure lowest ultimate cost.



More than 50

Operating Costs—Better Service

Equipment of uncertain quality becomes a barrier to economical traction system operation.

This organization has, for more than a quarter of a century, given traction problems careful study and knows the quality of equipment necessary for the growing needs of modern car operation.

More-Jones Quality Products cut down maintenance requirements, and make better service possible. Net earnings show the value of More-Jones Quality Products. Uniformity is one of the outstanding features of these products.

Let us give you further information and prices.

Prompt shipments always.

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

More-Jones ARMATURE Babbitt Metal

Standard on the majority of Electric Railway Systems in this country.

Specially formulated for the exacting requirement of Electric Railway Armature Bearing maintenance.

Its high heat radiation minimizes friction, even under the most trying circumstances.

A trial is the most conclusive proof of its superior inherent characteristics.

"Tiger" Bronze Axle and Armature Bearings

The Lead content, that we scientifically incorporate into this alloy, minimizes frictional wear, resulting in less frequent replacements. Finished oversize or undersize to a perfect running fit with your shafts.

Expertly machined in strict accordance with your specifications, even to the extent of incorporating special features therein, if so desired.

All Armature Bearings lined with our celebrated ARMATURE Babbitt Metal.

"Tiger" Bronze Axle and Armature Bearings insure maximum service under the hardest operating conditions.

MORE-JONES QUALITY PRODUCTS

years of Service

Creosoted pine ties in good condition--- after 31 years!

CREOSOTED ties are standard on most leading steam roads as a result of many years' experience with such ties, proving conclusively the economy resulting.

The records of electric railway experience with creosoted ties are not yet so exhaustive but such records as are available indicate clearly that the saving is just as important for an electric railway as a steam. For example, the Georgia Railway and Power Company reports creosoted pine ties in good condition after 31 years of service, part of the time in open track and later repaved.*

Amcreco Creosoted Southern Yellow Pine Ties offer the highest available standard of tie economy. Not only do they reduce maintenance charges by cutting the number of tie renewals per year but they greatly reduce expense for tearing up pavement to replace defective ties.

AMERICAN CREOSOTING COMPANY
INCORPORATED

COLONIAL CREOSOTING COMPANY INCORPORATED

AMCREO LOWRY PROCESS CREOSOTED WOOD

GEORGIA CREOSOTING COMPANY INCORPORATED

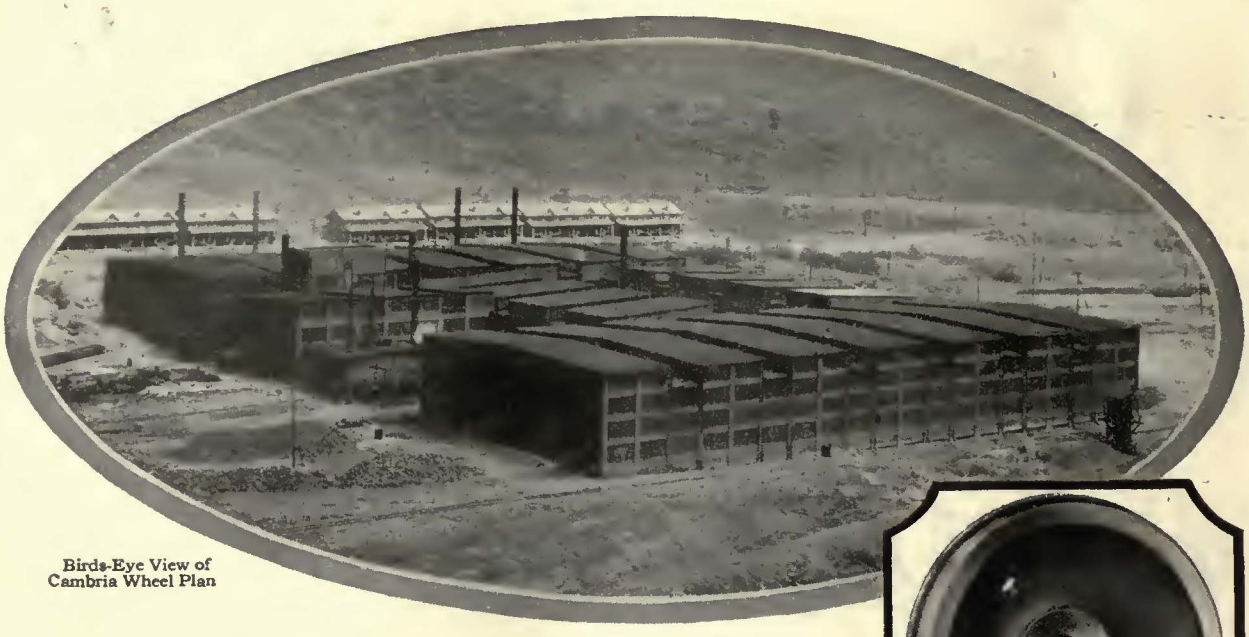
LOUISVILLE ~ KENTUCKY

SALES OFFICES

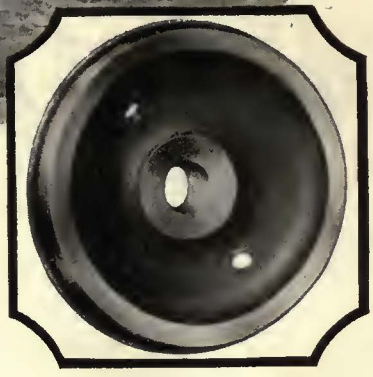
332 So. Michigan Ave. Chicago — 350 Madison Ave. New York City

Brunswick, Ga. — 401 W. Main St. Louisville, Ky. — Bogalusa, La.

* See report of Committee on Wood Preservation A.R.E.A. 1926, pege 98.



Birds-Eye View of Cambria Wheel Plan



CAMBRIA
Rolled Steel Wheels and Forged Steel Axles

CAMBRIA Rolled Steel Wheels and Forged Steel Axles for Electric Railway Service insure the maximum mileage and safety.

A combined forging and rolling process is followed in the manufacture of Cambria Wheels. The forging imparts to the metal strength, toughness and density. The rolling establishes a grained structure in the metal, preventing breakage and crystallization.

The finest selected stock is used in the manufacture of Cambria Forged Steel Axles. They can be supplied rough-turned all over, heat treated, annealed or untreated.

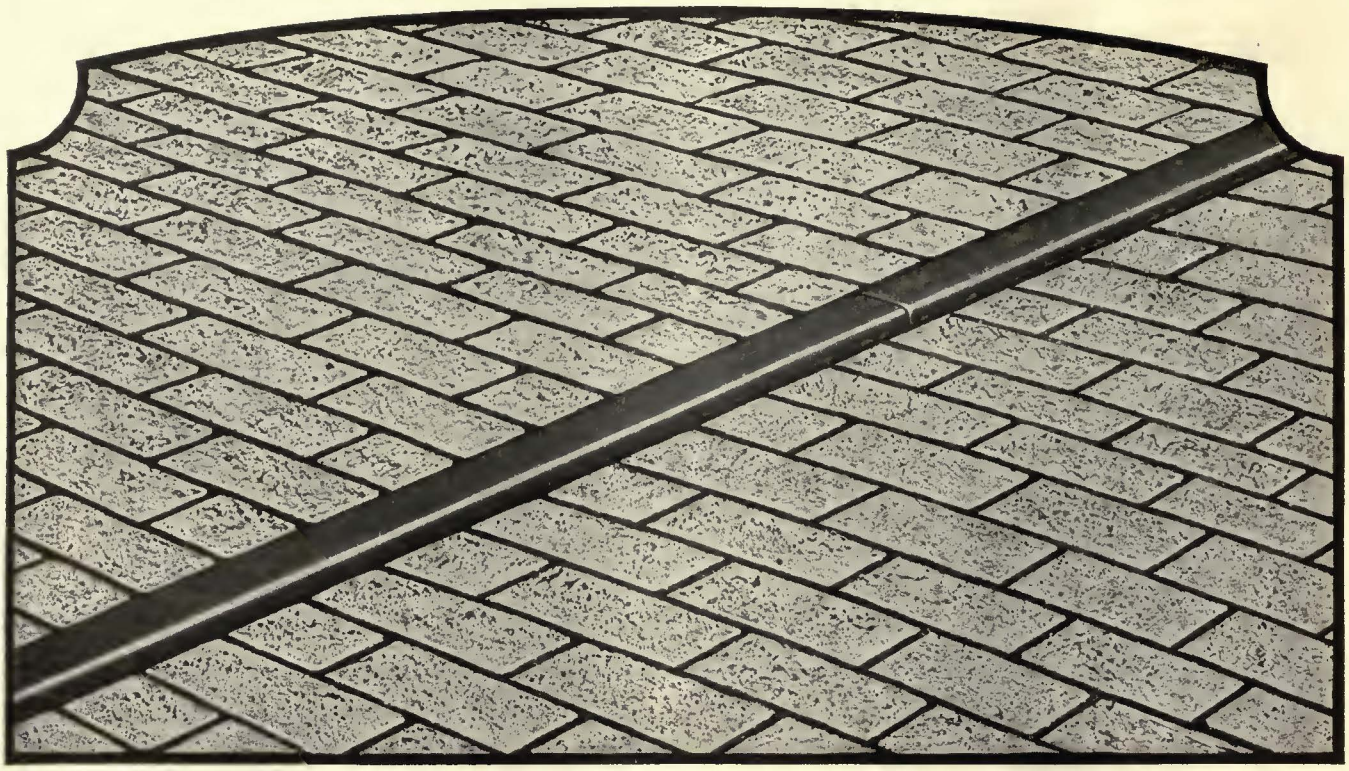
Complete control of every process of manufacture— from ore to finished product— and wide manufacturing experience enable Bethlehem to maintain the splendid quality and wearability of Cambria Wheels and Axles.

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland

Bethlehem Steel Export Corporation, Broadway, 25 New York City, *Sole Exporter of our Commercial Products*

BETHLEHEM



2½ inch brick means enduring pavements at less cost

THE exhaustive government-made test at Arlington establishes beyond all question the complete adequacy of *thin brick pavements* under the most rigorous of modern traffic conditions.

The Six-Point-Service of Vitrified Brick can now be yours at materially lower first cost.

Let us send you a complete reprint of the official government report containing detailed performance figures.

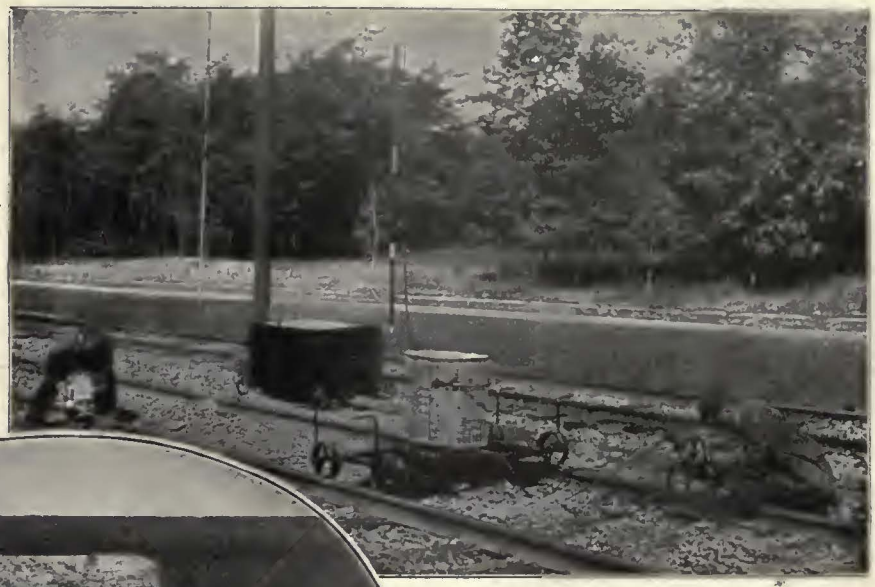
NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION
ENGINEERS BUILDING CLEVELAND, OHIO

VITRIFIED Brick

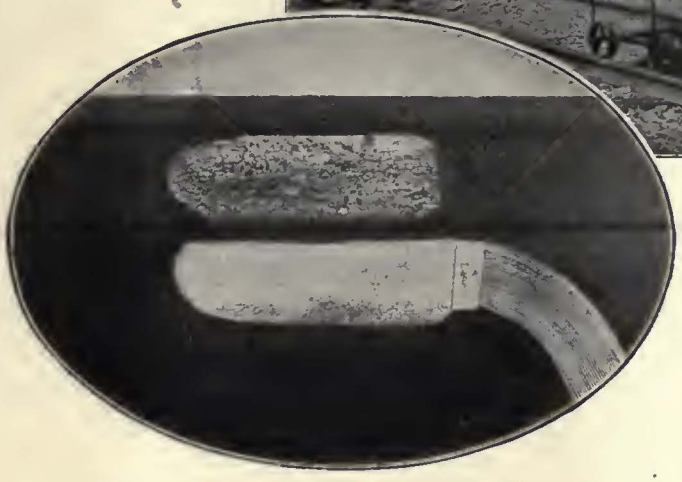
6 point service

1 absorbs impact at rail joints
2 water-seals road-bed and ties
3 allows for contraction and expansion
4 resists heaviest traffic
5 is easily removable
6 has practically 100% salvage value

Every Track Operating Condition Is Covered with Erico Bonds



Brazed Bonding with Type SR Outfit



Type A-2, Steel Arc Weld Bond, Applied

Twenty-five years of active service and development in this particular phase of railway operation has established the name "Erico" among operators.

Such features as perfect return circuit, permanent installation at low cost, elimination of long delays which hamper service, and non-injury to either bond or rail due to method of installation are in a large measure responsible for the increasing demand for Erico rail bonds.

Erico bonds are manufactured in the following types—Patented Brazing type —Copper Weld type—Arc Weld type. Portable equipment for applying any of the above is another part of Erico service.

If interested in bonding equipment that will wear longer and cost less, consult our engineers.

Circulars covering any of the above equipment will be sent upon request.

Type CAE, Copper Weld Bond, Applied

The Electric Railway Improvement Company

2070 East 61st Place Cleveland, Ohio


1 ton or 1000
RAILS
L·B·FOSTER COMPANY
PITTSBURGH CHICAGO NEW YORK

Time Tells The Toncan Story

YEARS and years of maintenance-free service is the story of Toncan Iron culverts.

Easy to handle; no chance of breakage; strength to resist the vibration of passing cars. These are advantages enjoyed by any corrugated culvert.

But Toncan Iron culverts have still another advantage that is true of Toncan alone. The material—iron alloyed with copper and molybdenum—lasts far longer.

Toncan Iron builds up its well-known resistance to corrosion and exposure by the inclusion of copper and molybdenum. These elements give the naturally resistant iron a still further protection against weathering and corrosion.

For permanence at reasonable cost, install Toncan Iron culverts.

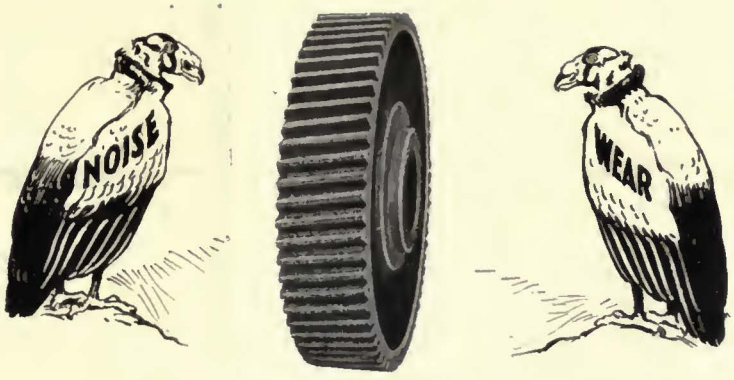
Following are the makers of Toncan Culverts. Write the nearest one:

The Berger Manufacturing Co. Roanoke, Virginia
Tri-State Culvert Mfg. Co. Memphis, Tenn.
The Canton Culvert & Silo Co. Canton, Ohio
The Firman L. Carswell Mfg. Co. Kansas City, Kan.
The Berger Manufacturing Co. Minneapolis, Minn.
The Berger Mfg. Co., of Mass. Boston, Mass.
The Berger Manufacturing Co. Philadelphia, Pa.
The Berger Manufacturing Co. Dallas, Texas
The Berger Manufacturing Co. Jacksonville, Florida,
The Pedlar People Limited, Oshawa, Ontario, Canada

CENTRAL ALLOY STEEL CORPORATION, *Massillon*, OHIO
Makers of Agathon Alloy Steels

Cleveland Detroit Chicago New York St. Louis
Syracuse Philadelphia Los Angeles Tulsa
Cincinnati San Francisco Seattle

TONCAN IRON



Two birds and a single stone to kill them

NUTTALL

Standard Helical

GEARS

Nuttall Standard Helical Gears operate without vibration. Their meshing is smooth, noiseless,—and hence they eliminate one of the basic causes of high motor maintenance, and general car depreciation. Nuttall equipped cars are *quieter* on the road, easier to ride in,—*well* in tune with the most modern ideas of transportation comfort and economy.

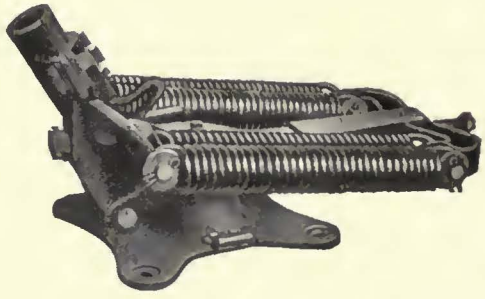
Furthermore Nuttall Standard Helicals undergo the famous B.P. Heat Treatment which adds a guaranteed 300% to their service life as compared with gears of untreated steel. That alone would warrant your using them.

But why not make the test yourself? Next time a car comes in for new gears put on a set of Nuttall Helicals. We'll gladly co-operate. Meanwhile write us for your copy of a very interesting booklet we publish on this subject. It contains a raft of useful service data.

R.D.NUTTALL COMPANY
PITTSBURGH PENNSYLVANIA

All Westinghouse Electric & Mfg. Co. District Offices are Sales Representatives in the United States for the Nuttall Electric Railway and Mine Haulage Products. In Canada: Lyman Tube & Supply Co., Ltd., Montreal and Toronto.

MEMBER AERA 1927

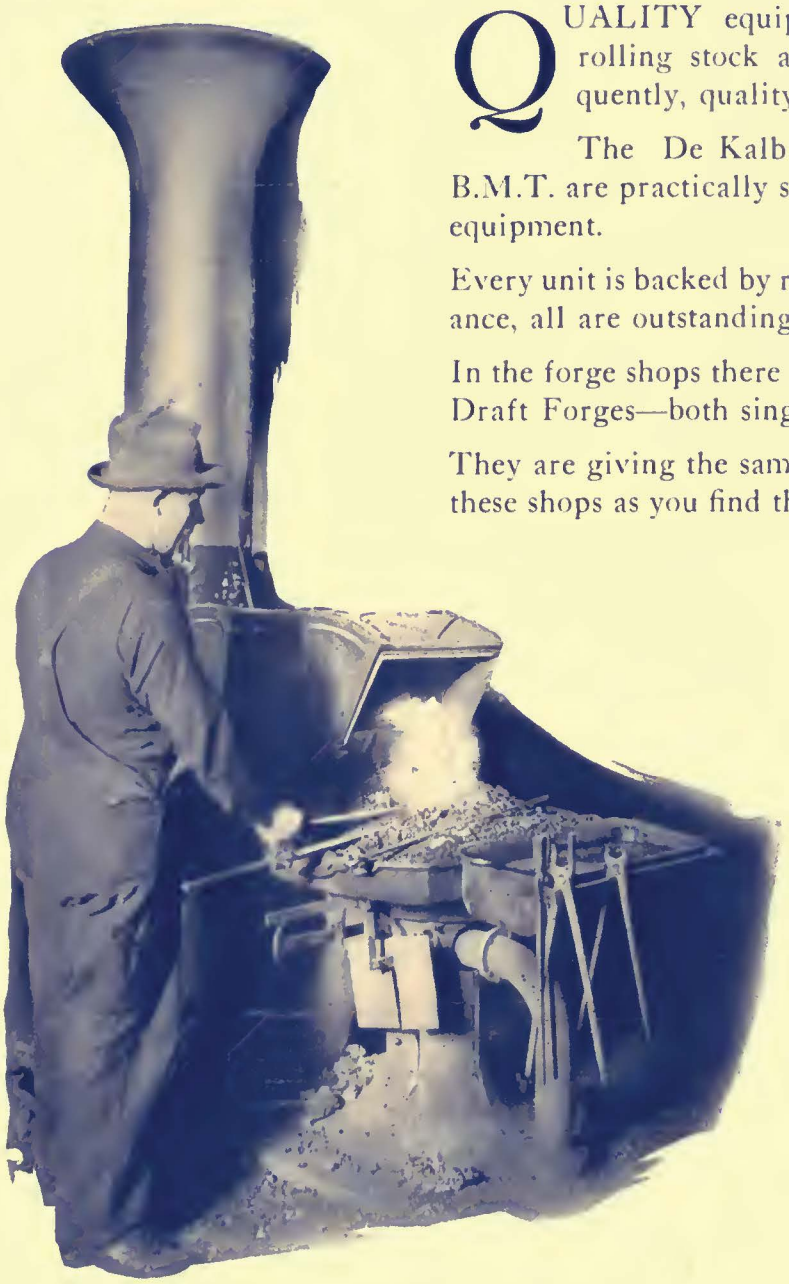


NUTTALL
Timken Equipped
TROLLEY BASE
Form U.S. 20A

A simpler, longer-lived, easier to maintain trolley base, as far in advance of old designs as the modern car is ahead of cars built twenty years ago. Timken has made a special double-race tapered roller bearing for this service, and the base actually hangs on the bearings, not on the center pin; "cocking" strains are evenly distributed; all wearing parts hardened; and lubrication taken care of through a one-in-six-months oiling system.

Nuttall

In railroad shops the world over —



QUALITY equipment insures quality in rolling stock and motive power, consequently, quality service.

The De Kalb Avenue Shops of the B.M.T. are practically show rooms for high grade equipment.

Every unit is backed by records of proven performance, all are outstanding in their respective fields.

In the forge shops there are eight "Buffalo" Down Draft Forges—both single and double types.

They are giving the same satisfaction in service in these shops as you find them doing the world over.

Buffalo Forges are made in both stationary and portable types for every industrial need.

Our new catalog illustrates and describes them, as well as "Buffalo" Punches, Shears, Bar Cutters, Bending Rolls, Blowers and Exhausters of all types.

"Buffalo" Down Draft Forges

Buffalo Forge Company

149 Mortimer St., Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Features of up to date practice in

BMT

the years model street railwa shop

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BMT

the years
model
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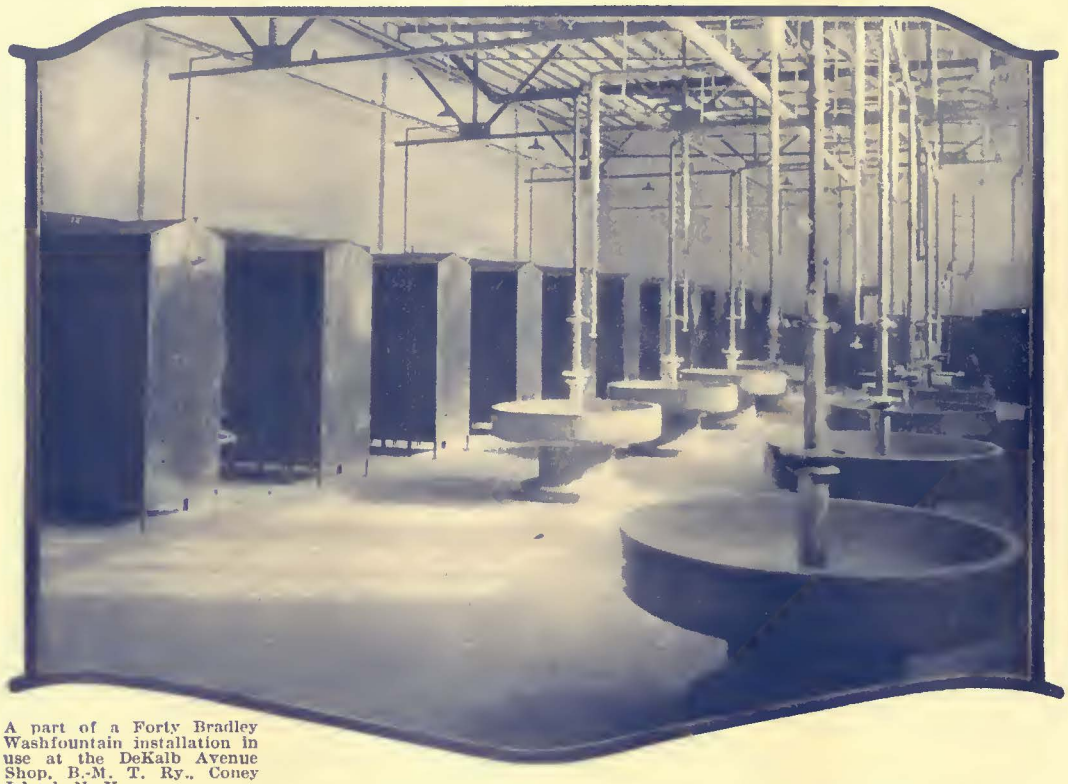
shop



A part of a Forty Bradley Washfountain installation in use at the DeKalb Avenue Shop, B.-M. T. Ry., Coney Island, N. Y.

When the whistle blows in the De Kalb avenue shop

Bradley Washfountains furnish the most approved and modern method of attaining sanitation, convenience and economy.

After using four Bradley Washfountains since August, 1925, at the Coney Island shops of the B.-M. T., 36 more were ordered. At the Brooklyn shops, an initial installation of 10 fountains was followed by the addition of two more.

Other users of Bradley Washfountains:

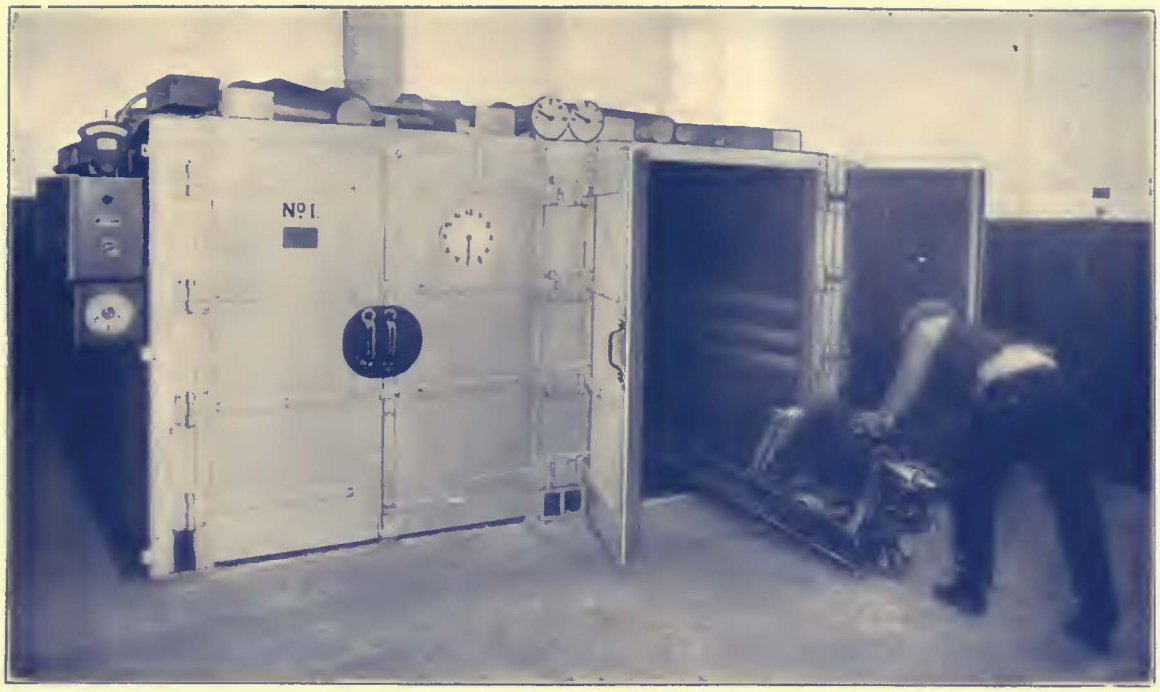
Pennsylvania R.R.
Norfolk & Western R.R.
Florida East Coast Railway
Reading Railroad
Wabash Railway
Richmond, Fredericksburg & Potomac R.R.
Alabama Great Southern R.R.
Atlantic Coast Line R.R.
Baldwin Locomotive Works
Baltimore & Ohio R.R.
Boston Elevated
Carolina, Clinchfield & Ohio R.R.
C. B. & Q. Ry.
Chicago Union Station
Chicago & Northwestern Ry.
Grand Trunk Railway
Georgia Railway & Power Co.
Long Island Railroad
Miami Beach Ry.
Mobile & Ohio Railroad
Monongahela R.R.
Nashville, Chattanooga & St. Louis R.R.
New York Central
Philadelphia Rapid Transit
St. Louis & San Francisco Railroad
Southern Pacific Railroad
Western Pacific Railroad
Westinghouse Air Brake Co.
Westinghouse Electric & Mfg. Co.
General Electric Co.

BRADLEY WASHFOUNTAIN CO.

2211 Michigan St.,

MILWAUKEE, WISCONSIN

OVER 300,000 PERSONS WASH EVERY DAY IN 5,500 BRADLEY WASHFOUNTAINS IN 1000 INSTALLATIONS



DESPATCH ELECTRIC OVENS

and complete Automatic Control Equipment, accurately fitted to the needs of the B.M.T. by the largest exclusive Manufacturer of ovens in the United States . . .

B. M. T. also installed a Peerless Armature Banding and Slotting Machine and Peerless Pinion Pullers.

Our engineering experience in the design and construction of oven equipment goes back more than 24 years.

During this time we have naturally gained a very hroad knowledge of every particular oven requirement for all industries—especially in the baking of coils and armatures and also the baking of japans and enamels.

Furthermore our plant facilities organized on the most modern production basis, enable us to quote very attractive prices for units which we can guarantee in every particular.

Engineering Service on the subject of your oven requirements will incur no obligations. A special Engineering Inquiry Sheet is furnished, with our very complete catalogue, which entitles you to obtain any information, which you might desire, pertaining to ovens. This catalogue, which gives valuable information concerning baking problems and also many illustrations of actual installations, will be gladly mailed to you upon request.

Wherever Despatch Electric Ovens are installed, coils and armatures are actually baked and bring about amazing reductions in the cost of the maintenance of electrical equipment.

DESPATCH OVEN COMPANY

EASTERN DISTRIBUTORS

ELECTRIC SERVICE SUPPLIES CO.

PHILADELPHIA
17th and Cambria Sts.

NEW YORK
50 Church St.

CHICAGO
Illinois Merchants' Bank Bldg.

PITTSBURGH
1123 Bessemer Building

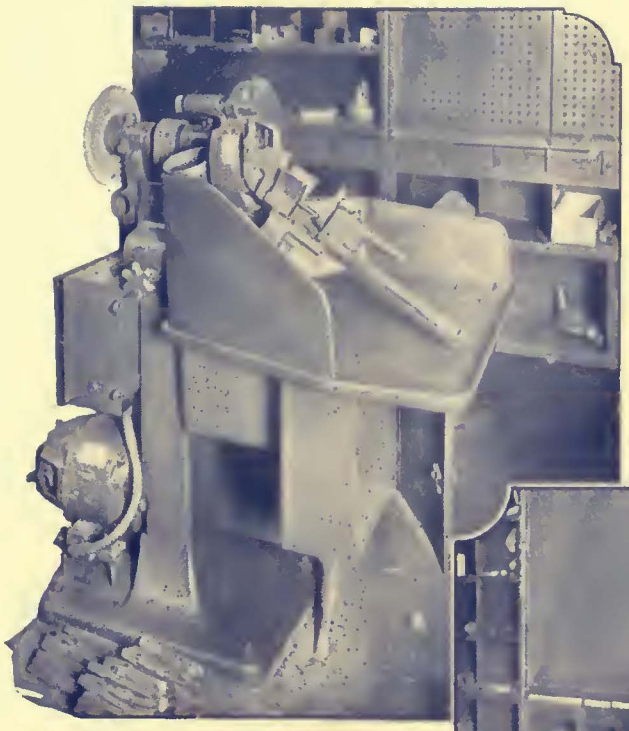
BOSTON
88 Broad St.

SCRANTON
316 N. Washington Ave.

DETROIT
General Motors Bldg.

Lyman Tube & Supply Co., Ltd., Montreal, Toronto, Vancouver

Modern Tool-Room Practice



Above—
Grand Rapids Drill Grinder. Self-contained motor drive.

At the right—
Grand Rapids No. 1 Universal Cutter and tool grinder with internal grinding attachment. Self - contained motor drive.

In a Modern Shop!

Indicative of modern tool-room grinding practice the above illustrations show the methods used by the B.M.T. in its modern De Kalb Avenue shops! Of course the machines shown are

"GRAND RAPIDS GRINDERS"

Most modern tool - rooms are so equipped. They are noted for the quality and quantity of work turned out, convenience of operation, investment and upkeep costs, universal features and small floor space occupied.

We will be pleased to send catalogue giving complete description and specifications of Grand Rapids Grinders, or gladly quote on your requirements.

GALLMEYER & LIVINGSTON COMPANY

300 St. Avenue S.W., Grand Rapids, Michigan

The new DUFF {Genuine Barrett} General Purpose Jack No. 540, as shown above, is of 15-ton capacity, single acting, automatic lowering type. It is equipped with swivel top and hinged base and can be applied in four ways: {1} straight lifting load on head; {2} with chain; {3} with claw; {4} with foot-lift. Double socket lever makes it convenient to operate in cramped quarters.

THINK of DUFF Jacks in terms of lifting service. When you buy a DUFF Jack you are actually buying the ability to lift with safety, definitely known capacities . . . buying a *service* not for today alone, but for next year and for years to come.

Over forty years of engineering experience in meeting the most difficult conditions—modern plant facilities assuring accuracy in workmanship and perfect control of materials—make DUFF Jacks more efficient and easier to operate.

The first cost of perfect lifting service is reasonable with DUFF Jacks— and the absence of expensive upkeep charges year after year, combines with this low initial cost to make them more economical than any other jacks on the market.

DUFF Jacks are GOLD MEDAL JACKS—awarded the Gold Medal—the highest award—at the Sesqui-Centennial Exposition, Philadelphia, 1926; also at St. Louis 1904, Portland, Ore. 1905, and Buenos Aires, 1910—in competition with the world.

Write for detailed literature on jacks in which you are especially interested.

THE DUFF MANUFACTURING COMPANY, Pittsburgh, Pa.

Established 1883 Cable Address "Leverjack"

NEW YORK ST. LOUIS CHICAGO SAN FRANCISCO ATLANTA HOUSTON

DUFF JACKS

Automatic visible, audible and instantaneous registering fare box. Adapted to nickels, dimes, tokens or any combination. Mere dropping of fare in slot operates it.

Passimeter registering number of people handled, giving automatic and accurate Count.

Do your Records include all riders?

Electric railway operating statistics include only the passengers whose fares reach the Company treasurer. Does this include *all* the riders on your system? Does your present fare collection method insure that all fares are reaching your treasurer?

PEREY Automatic Turnstiles and Passimeters

take uncertainty out of fare collection and guess out of the number of passengers handled. Perey equipment, by eliminating the erring human factor, assures automatic protection of passenger revenue.

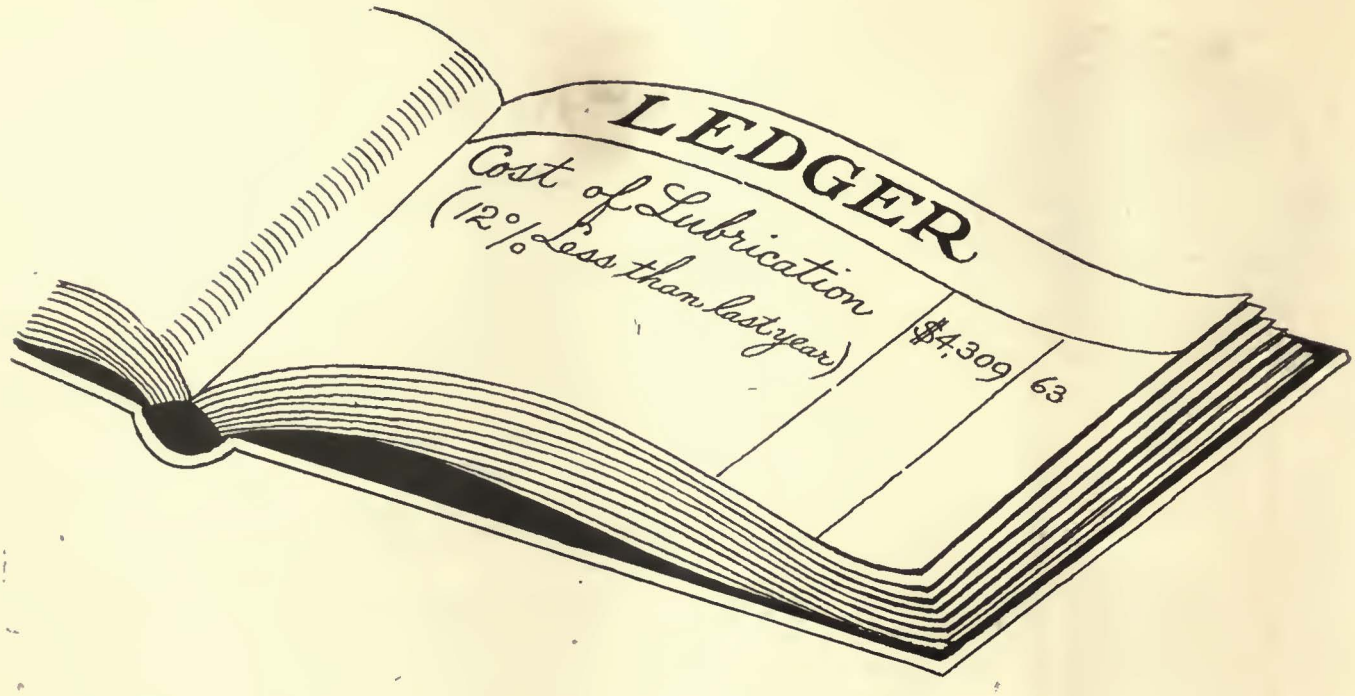
And think of the economy derived from the use of Perey equipment. No attendants are necessary! They are operated by the mere act of the passenger dropping the fare into the slot. Perey equipment is adaptable to nickels, dimes or tokens, or any combination. There is a Perey Turnstile and Passimeter for every purpose.

Write for detailed information.

Perey Manufacturing Co., Inc.

101 Park Avenue, New York City

Battery of electric coin turnstiles, collecting and registering each individual fare and passing individual to train platform. Users—B-M-T, Phil. R. Tr., Pub. Serv. Ry., Boston Elevated.



—But this does not always prove that the Road is saving any money

The ledger is not the place to look for savings.

The right place is to go back to the shops and see what effects lubrication has had on:

Renewal of bearings
Replacement of gears and pinions
Repairing of compressors
Replacement and repair of miscellaneous mechanism.

These are the things that count, and that is the way to judge—by RESULTS of lubrication.

That's logic—and good business.

Good business for the road and good business for TEXACO Lubricants.

For *we* want to be judged by what we do *on the cars.*

What TEXACO Lubricants are doing on the cars for hundreds of millions of car miles is putting them and keeping them on more and more miles all over the country.

* * * * * * * *

If your road is using TEXACO Lubricants you can readily understand the growth of our business.

If you haven't taken up with TEXACO yet, you will appreciate this short statement of what TEXACO stands for:

1- Suitable lubricants sold at a price that is fair to the customer and to us.

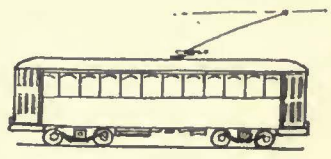
2- Texaco Lubricants are manufactured exclusively at The Texas Company's Refineries and, hence, they can be backed up by a positive assurance of uniformity and efficiency.

3- Prompt delivery of every kind of lubricant used by the Electric Street Railways whether for rolling stock, shop or power plants.

4- Prompt delivery of burning oils, or gasoline, if you need them.

5- Unstinted engineering service through experienced and capable lubricating engineers.

6- A degree of friendly cooperation you never realized until you took up with TEXACO.



We* want to be judged by what we do *on the cars!

We are ready to have you take it up with us

It will put you under no obligation to have a well equipped TEXACO Engineer call and explain why TEXACO doesn't often lose a customer—and, if you wish it, this man will be glad to inspect your property and tell you just what can be accomplished in lower maintenance cost through improved lubrication.

TEXACO

THE TEXAS COMPANY

DEPT. R-J. 17 BATTERY PLACE. NEW YORK CITY

HOUSTON - CHICAGO - NEW YORK

OFFICES IN PRINCIPAL CITIES

TEXACO

From mine to finished product—

we control every step of manufacture

Thus we insure the high quality and unvarying dependability of Micanite.

The raw India mica we use is secured from mines which we own and operate through associate companies. We operate our own amber mica splitting plant in Victoriaville, Canada. In our plants at Schenectady, N. Y. and London, England, Micanite is turned out in its final form.

For 33 years Micanite has been made to one standard—*the highest.* The name MICANITE means *assured* quality.

MICA INSULATOR COMPANY

World's Largest Manufacturers of Mica Insulation

Sole Manufacturers of Micanite, Super-Micanite and Empire Electrical Insulations

New York: 68 Church Street Chicago: 542 So. Dearborn St.
Cleveland Pittsburgh Cincinnati Seattle
San Francisco Los Angeles Victoriaville, Canada

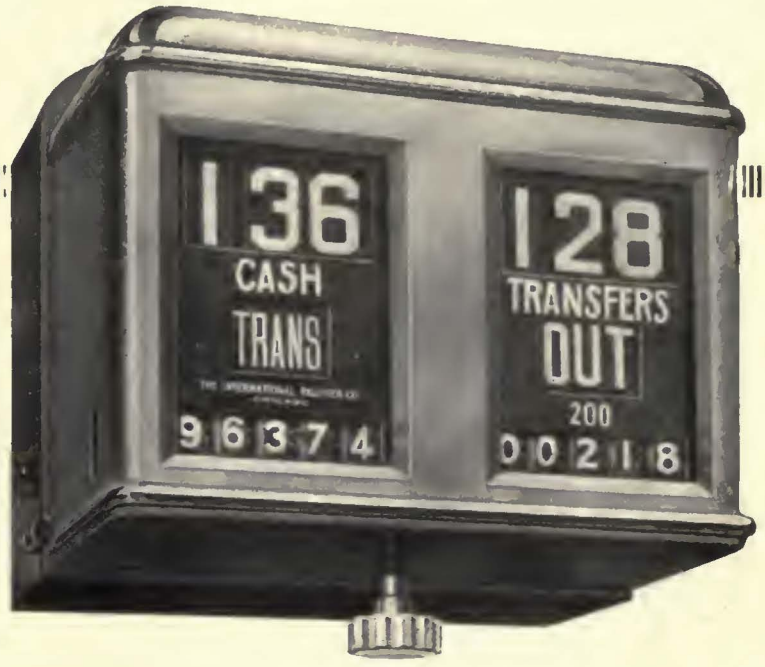
PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

Practical Revenue Protection Is Maintained By Electric Fare Registration



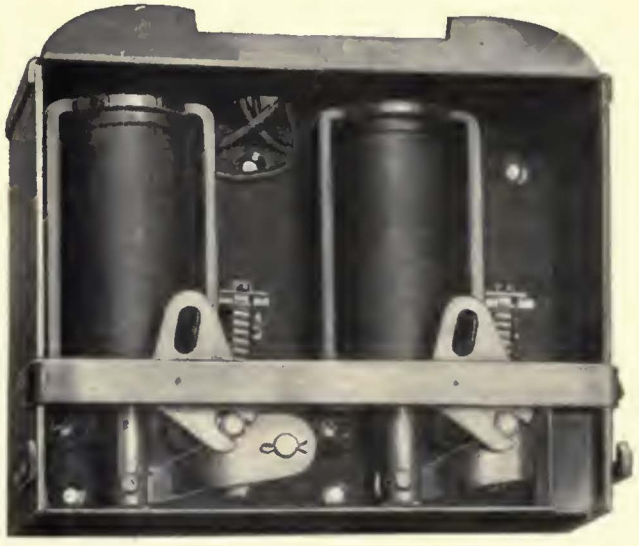
International electrically-operated fare registers are as far superior to all other fare recording devices as modern electric street railways cars are superior to the horse cars of yesterday. The speed, reliability, and simplicity of electric operation is unquestioned. Accuracy of registration for both fares and transfers is assured with the model shown at the right.

INTERNATIONAL Electric Fare Registers require less time and attention and effort to operate from the trainman—materially increasing his efficiency.

These registers operate by means of a foot switch on the platform. Pressure on switch pedal registers fare instantaneously. The record thus made cannot be tampered with.

The electric back of the double register, at right, shows windings to operate on 350—650 volts, D.C. The operating circuit is not broken in the register back.

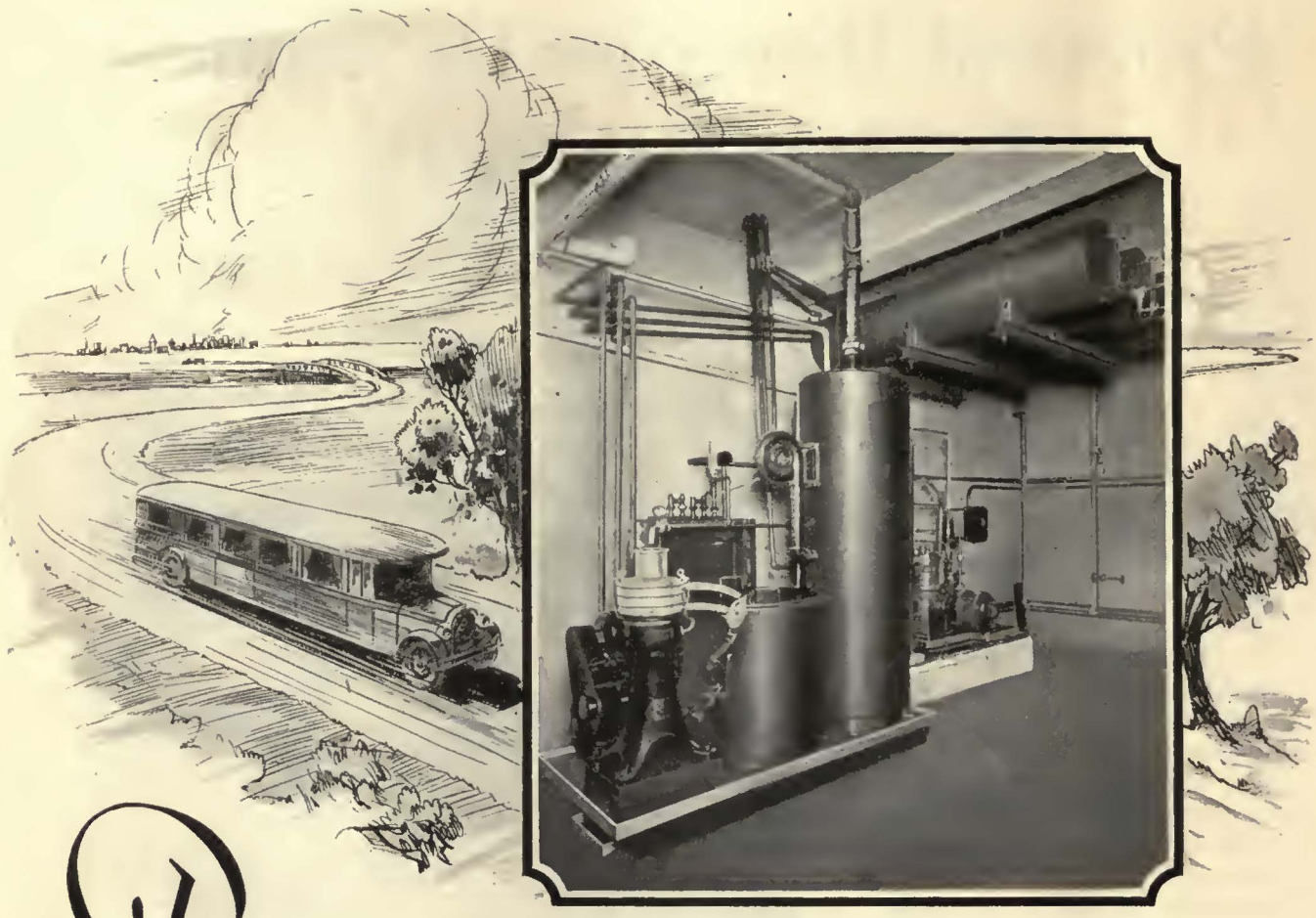
There is a full line of double and single International Fare Registers for mechanical, hand or foot operation in addition to the electrical devices.



Write today for International Register Catalog No. 5 containing full details and descriptions.

The International Register Company

15 South Throop St., Chicago



Better Lubrication for Twin City Buses

Any operator of a fleet of buses, trucks or taxicabs can lower the cost of motor maintenance by improving lubrication.

The Twin City Rapid Transit Company has done this and at the same time actually reduced lubricating costs by installing the De Laval Crankcase Oil Reclaiming Outfit.

This De Laval Outfit renews old oil, restores its viscosity—its power to lubricate and resist heat; enables you to change oil more frequently.

Most users find that over 80% of all crankcase oil used can be saved and used again, at full efficiency. This percentage of recovery amounts to about 99% of the reclaimable oil, the remainder consisting of dilution, carbon and other impurities.

Any garageman can operate the De Laval. Write today for complete details, being sure to ask for Bulletin 108-R.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 600 Jackson Blvd., Chicago

DE LAVAL PACIFIC COMPANY
61 Beale Street, San Francisco

DE LAVAL

Crankcase Oil Reclaiming Outfit
Car Axle Oil Reclaiming Equipment—Transformer Oil Purifiers

The Speaker

is the operating executive of one of the largest electric railway companies in the country. All street cars and buses in the system are operated one-man, with no loss in schedule speeds and improved satisfaction on the part of the passengers.

"The success of our 100% one man operation on buses and street cars would be impossible without

JOHNSON ELECTRIC FARE BOXES"

"Every Ring of the Bell Spells Savings"

S chedule speed of street cars and buses in service is increased.

A ccounting of fares at the instant of collection on the platform.

V aluable traffic data of passengers carried, and earnings with relation to cost of operation.

I nstant registration of individual fares by the coin itself.

N ightly or daily earning record of individual street car and bus.

G ross earnings from operation increased.

S afety-first principle made possible.

SPELLS "SAVINGS" that can be had with the use of the Johnson Full-automatic electric fare box on your street car and bus operation. It is the only device which full-automatically instantly registers each and every individual fare audibly and visibly. This device represents the very last word in fare collection.

Electro-magnet type of fare box—NOT motor driven; no drain on battery.

Write for particulars.

JOHNSON FARE BOX CO.

CHICAGO, ILL.
4619 Ravenswood Ave.

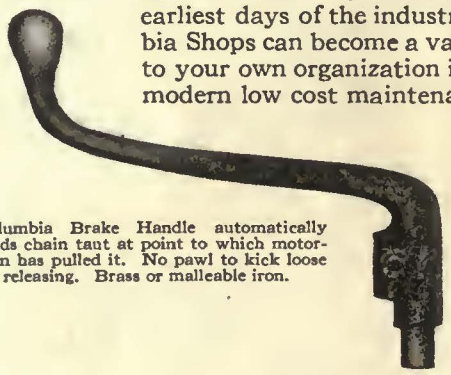
NEW YORK, N. Y.
2 W. 61st St.

COLUMBIA—*National*

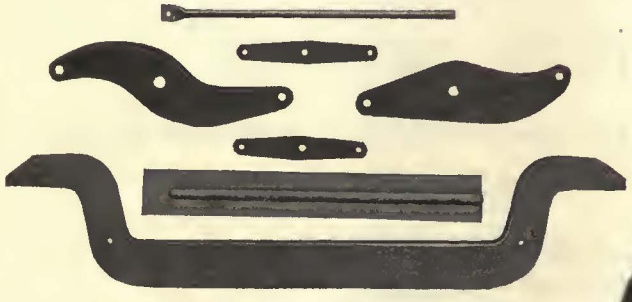
Columbia Service is now in its 35th year. Facilities were never more complete. Well rounded stocks of standard specialties assure prompt deliveries.

And, with experience in serving electric railways dating back to the earliest days of the industry, the Columbia Shops can become a valuable adjunct to your own organization in planning for modern low cost maintenance.

Call upon us freely

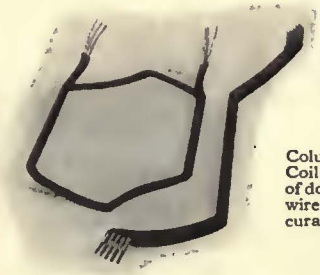


Columbia Brake Handle automatically holds chain taut at point to which motorman has pulled it. No pawl to kick loose for releasing. Brass or malleable iron.

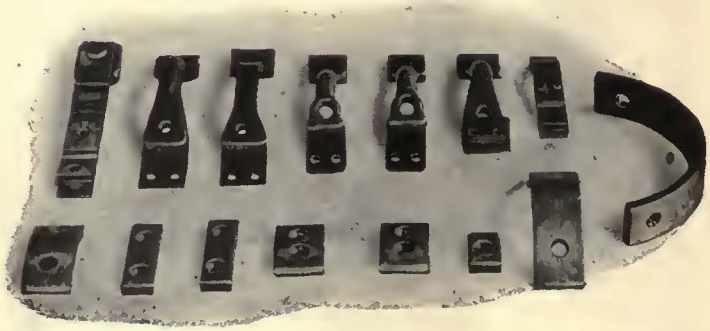


We are equipped to produce a wide variety of both light and heavy forgings. The Equalizer Bar and Brake Rigging illustrated are an example of the latter type. Produced to blue print and specifications.

Columbia Gear Cases. Absolutely oil water and dust tight. Top and bottom flanged over sides and ends with brackets bent over sides to remove all strain from rivets.



Columbia Armature and Field Coils made from the best grade of double cotton covered magnet wire, moulded or pressed to accurate slot dimensions.



Columbia Standard Fingers and Segment Burning Tips. Control Fingers of the removable tip type and interchangeable with the non-removable tip type. Construction insures good contact with shunt finger spring. Burning Segment Tips made for all types and service to permit quick replacement wherever contact is broken or worn.

Columbia Armature, Axle and Journal Bearings. Made of specially developed bearing bronze, known as Columbia No. 1 which has been adopted by a large number of roads as standard because of its long wearing qualities.

Columbia Line Ears. Made of specially developed composition metal withstands shocks of wheel and pole; all kinds of weather decomposition caused by electric arc and the clinching of the lineman's tools.

Headquarters for Maintenance

Two courses are open in buying *Trolley Cord*

You can buy— *"just trolley cord"*

In which case you will pay a low first price for a product of doubtful quality.

It may give you fairly good service, or it may break at a critical moment. It may jam the catchers on wet days, and then dry out stiff as a board. It may in fact cause trouble and expense in countless small ways. In any case it will give *short wear.*

Or you can buy— SAMSON SPOT CORD

The colored spots tell you at a glance just what you're buying—a cord made from extra quality yarn smoothly braided, uniform in thickness, and properly waterproofed by a special process.

Samson Spot Cord is always the same. It will always give *long wear.*

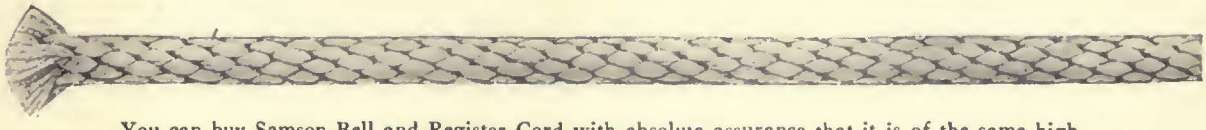
It does not swell or shrink,—runs easily in catchers and retrievers, rain or shine.

And when you consider that this good cord costs so very little more, is it worth taking a chance?

SAMSON SPOT TROLLEY CORD

TRADE MARK REG. U. S. PAT. OFF.

SAMSON BELL AND REGISTER CORD



You can buy Samson Bell and Register Cord with absolute assurance that it is of the same high quality and manufactured with the same care as Samson Spot Trolley Cord. Its neat appearance and finish match the finest of car interiors. It resists abrasion. Can be supplied in any reasonable length, in white, mahogany or drab—other colors to order.

Samson Signal Cord with galvanized wire center is made in mahogany color, sizes No. 6 and No. 8.

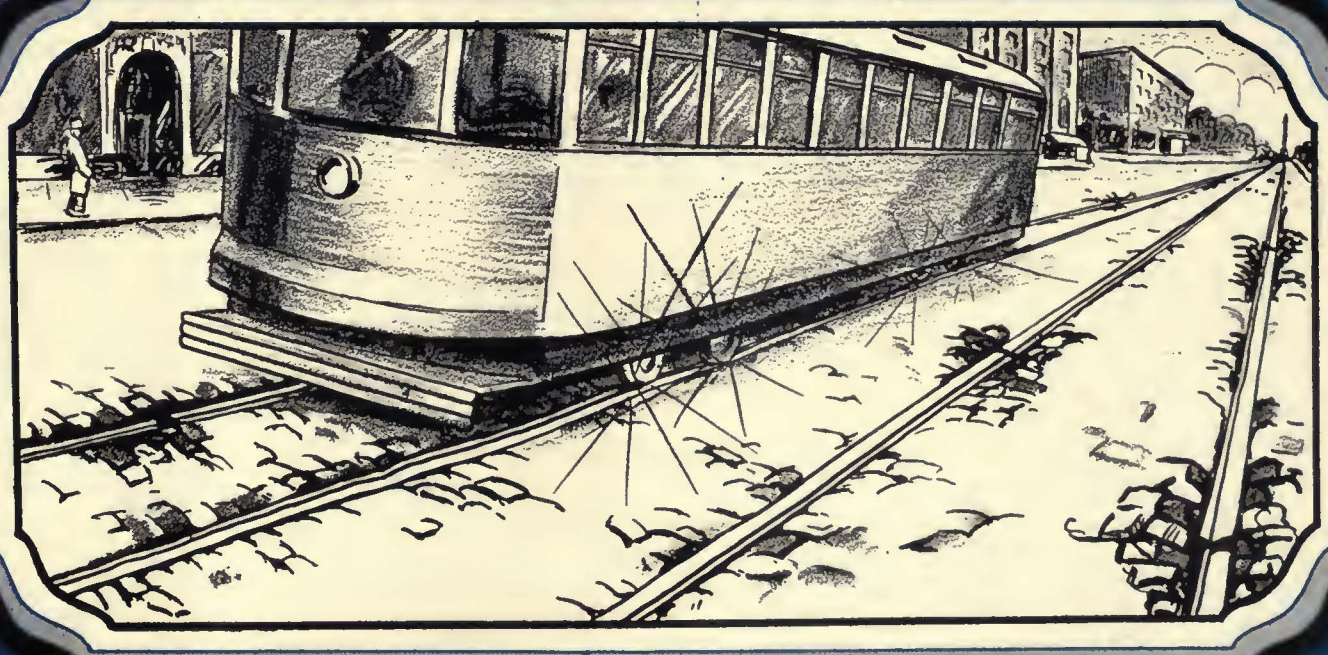
Samples on Request

SAMSON CORDAGE WORKS

88 BROAD STREET BOSTON, MASS.

TRADE MARK

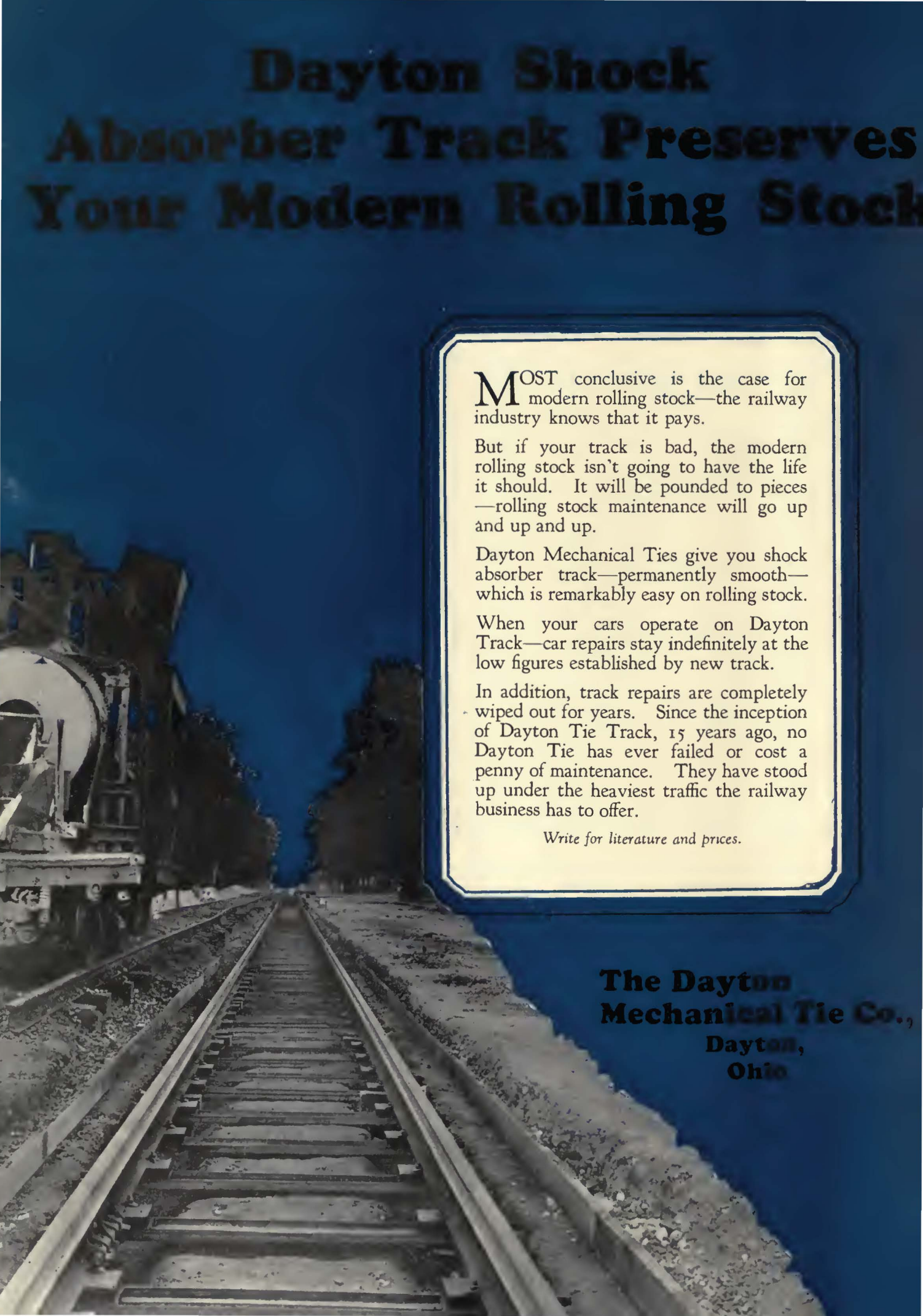
What's the use of modern rolling stock if you pound it to pieces on bad track?



The Dayton Mechanical Tie Co.

Dayton, Ohio

Dayton Shock Absorber Track Preserves Your Modern Rolling Stock



MOST conclusive is the case for modern rolling stock—the railway industry knows that it pays.

But if your track is bad, the modern rolling stock isn't going to have the life it should. It will be pounded to pieces—rolling stock maintenance will go up and up and up.

Dayton Mechanical Ties give you shock absorber track—permanently smooth—which is remarkably easy on rolling stock.

When your cars operate on Dayton Track—car repairs stay indefinitely at the low figures established by new track.

In addition, track repairs are completely wiped out for years. Since the inception of Dayton Tie Track, 15 years ago, no Dayton Tie has ever failed or cost a penny of maintenance. They have stood up under the heaviest traffic the railway business has to offer.

Write for literature and prices.

The Dayton Mechanical Tie Co.,
Dayton, Ohio

Market Street

No. 392-A with divided back

No. 392-A

No. 900-D

No. 208

—for utmost comfort in every type of service—

Railway's new maintenance program includes several types of H-K seats

When the Market Street Railway of San Francisco, California, started their 1927 improvement program they ordered 1,278 Hale-Kilburn Spring Cushion Seats. The success of this seat program was the result of close cooperation between the operating company and the experts in seat design of the Hale-Kilburn organization.

Included in this order are 730 covered with genuine green leather to be installed in the inclosed sections of 73 cars. The remaining 548 seats are cane-covered for use in open car sections. This is merely typical of the various rehabilitation programs now in effect on other electric railways in which H-K Seats play a prominent part.

Whether you want to remodel your old cars or build new cars it will pay you to fully investigate the complete line of H-K Seats—long noted for their comfort, appearance and long wearing qualities.

Typical H-K Seats

No. 392-A with divided back—luxurious plush covered revolving chair with special patented features for finest type of interurban cars.

No. 392-A—Built for the Market Street Railway these leather covered, reversible seats have deep, soft cushions which are both comfortable and durable.

Cane type is No. 400.

No. 900-D—double chair for bus or car with air spring cushion pads, attached to prevent promiscuous removal. Can also be made with extra arm and rotating feature for double end cars.

No. 208—de luxe divided seat with air spring cushion pads upholstered in leather or fabric.

Complete information about our many types of seats for cars and buses sent on request.

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Hale and Kilburn SEATS

Hold to new-car economy

What is Boyerizing?

Boyerizing puts more than the strength of steel into car parts and brake rigging. It builds up a glossy, glass-hard armor coating that defies wear and laughs at friction. In actual practice this means that you replace Boyerized parts *once* where you would replace ordinary steel parts *at least three times.*

The McArthur Turnbuckle
It's BOYERIZED

Requires only a small hand wrench to make an adjustment that "stays put." One full tooth exposed at the end of each section acts as a cutter in removing ice or caked mud.

in maintenance!

Parts that outwear the average *three to four times* can help keep per-car-mile figures down where they belong.

Startling low maintenance records have been made with new car operation. But the Industry's leaders warn that these must inevitably rise as time goes on. How much they will rise depends largely on how modern and efficient we make maintenance now.

BOYERIZE!

By making replacements as they become necessary on modern cars, with modern BOYERIZED Parts, you take a decisive step in the direction of *permanently* low maintenance. Time and again, on roads of every class BOYERIZED Parts have proved that they will outwear ordinary steel parts three to four times. Yet their cost is not even twice as much.

BOYERIZE!!

Economies such as BOYERIZED Parts effect concern not only actual costs of maintenance, but "shopping" time and passenger safety as well. Brake rigging especially needs every ounce of the extra strength that BOYERIZING gives.

Why not order a few BOYERIZED Parts for trial,— pins or brake levers for instance. You'll soon agree we're right in our claims.

- Brake Pins
- Brake Hangers
- Brake Levers
- Bushings
- Center Bearings
- Side Bearings
- Chafing Plates
- Manganese Brake Heads
- Manganese Truck Parts
- McArthur Turnbuckles

BEMIS CAR TRUCK COMPANY

Electric Railway Supplies

Springfield, Mass.

REPRESENTATIVES:

Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill. W. F. McKenny, 54 First Street, Portland, Oregon.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal. J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.

Up-to-date roads figure the PROFIT of maintenance *with* DIFFERENTIALS

Undoubtedly the greatest labor-saving equipment that has ever been developed for Electric Railways. More than sixty Electric Railways now operating a total of over three hundred Differential cars. In practically every case, this equipment has been made to pay for itself within the first year. Differential cars save labor on track construction and reconstruction, track maintenance, ash disposal, disposal of waste and excavated materials, snow removal, sand and coal hauling, and even save money when used as a locomotive or snow plow. It places material on the job at less than 2 cents per ton-mile gross. Full description in Bulletin D-18.

Showing how the Differential Dump Car distributes its load in desired quantities and clear of any ordinary width trench. The body is under complete control in all positions.

DIFFERENTIAL 3-WAY MOTOR TRUCK BODY

The truck body that dumps to both sides and to the rear. A single lever governs the direction of dumping and a screw hoist taking power from the transmission furnishes the dumping force. Has many uses the rear dump cannot fill. It forms a valuable supplement to your Differential cars.

CLARK CONCRETE BREAKER

Breaks concrete at less than 2 cents per track-foot. Speedy and safe, protects manhole covers, conduits, underground mains, etc.

DIFFERENTIAL CAR WHEEL TRUCK AND TRACTOR

A dual traction system for electric or steam shovels, concrete mixers, etc., enabling machine to travel on rails or ground. Several large railways have shown an increased capacity of 75%, at the same time cutting the labor force in half, when their electric shovels were mounted on this device.

The DIFFERENTIAL Electric Locomotive Crane Car

Capacity 5 tons at radii 3 ft. to 26 ft., 2½ tons at radii up to 44 ft. Speedy—safe; one-man operation. Handles rail, special track work, poles, ties, bridge timbers, and clamshell bucket work.

Designed and constructed especially for electric railways. Conforms to all electric railway clearances and meets all requirements.

Photograph shows use of the Differential Locomotive Crane Car, with extended boom, lifting and placing rails. Each crane movement is controlled through its own individual power unit. Car control from crane-man's cab when working.

THE DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO

Why 'Wrought Steel' makes superior Wheels

A 10,000 ton hydraulic forging press—(twenty million pounds!)—is one of the reasons why Wrought Steel gives you unusual service. To obtain Wrought Steel, the metal is first rolled into blooms which are cut to the desired length. These discs, after reheating, are forged into wheels under enormous pressure. The wheels then pass to a rolling mill where all surfaces are rolled. After cooling, the wheels are machined to exact dimensions. This process completed, there is no possibility of irregularity in the steel structure that could cause fracture. Wrought Steel assures to the user the longest life and the greatest possible safety. It is for this reason they are specified under Pullman and passenger cars in the steam railroad field.

Send for new booklet—
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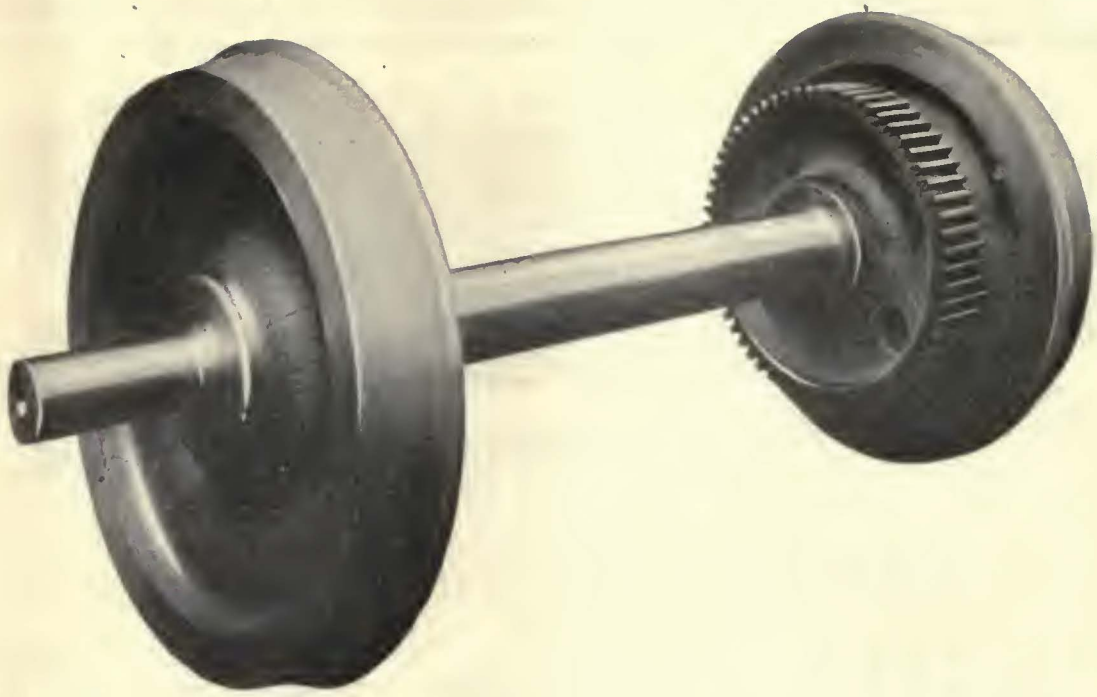

ARMATURE SHAFTS AND SPRINGS

SAFETY — This service record rests on a foundation of manufacturing and metallurgical experience dating back for many years and with all manufacturing facilities concentrated on production of these vital working parts. When so much goes into "Standard" Steel materials, it is natural to expect more *from* them. — SERVICE

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World Wide Recognition !

From Hawaii to New Zealand From Canada to Argentine

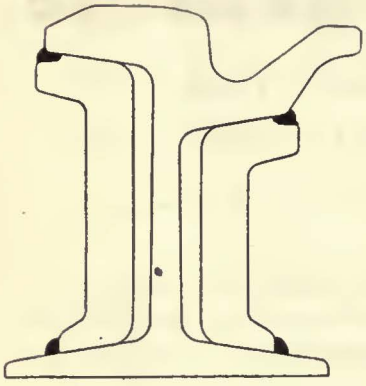
You'll find "Tool Steel" Gears and Pinions in daily service

Mere laboratory tests didn't win World Wide recognition for "Tool Steel" Gears.

It took years and years of steady, unfailing service under all kinds of conditions to cause such universal adoption of "Tool Steel" gearing as is illustrated by the above map.

Each dark line indicates a nation with a least one customer. Many nations have scores of "Tool Steel" customers, as —England 92, Holland 8, Spain 28, Australia 10, Italy 30, Africa 16, Brazil 12, Chile 9, etc.

The Tool Steel Gear & Pinion Company
Cincinnati, Ohio



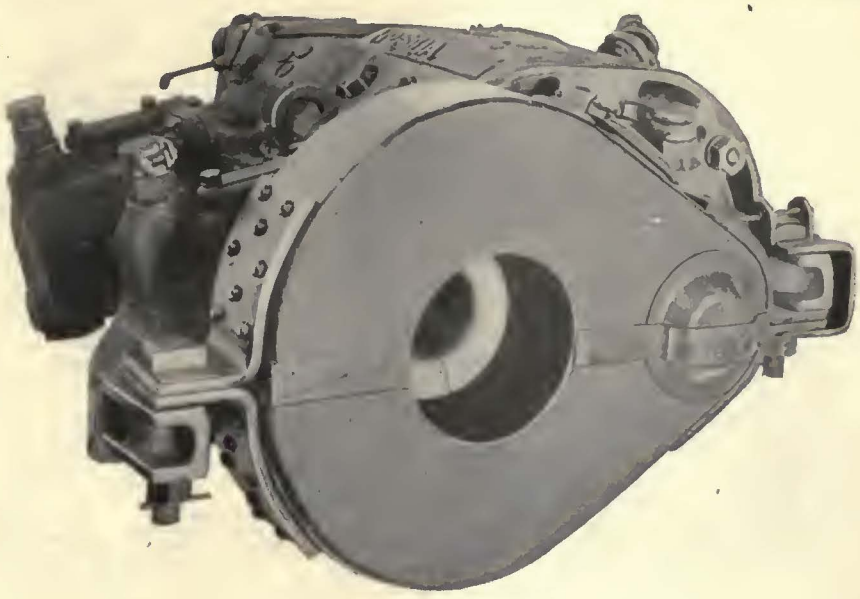
Weld Plates

Modern welding practice and Rail Joint Company patented "WELD PLATES" are playing highly important parts in the never ending drive to reduce maintenance costs.

Study the accompanying drawing. The contact areas at top and bottom are wide. The grooves provide for the retaining of ample weld along the upper edges. The use of short bolts is practicable.

"WELD PLATES" are the strongest and most up-to-date plates rolled especially for electric weld joints.

Others like them; why not you?



W. H. 510-A Motor

Gear Cases that reduce "Pull-Ins"

Gear troubles keep cars in shops eating up profits when they should be out in scheduled service. It's a long step toward economic operation when gears are protected with Chillingworth Drawn Steel Seamless Gear Cases. They qualify 100% as the ideal gear case. Their one-piece construction, with *overlapping* joint between the two halves, absolutely prevents the entry of dust or the escape of grease. The extra tough elastic deep drawing steel, without parts to loosen and without seams to open up,—these features *give the utmost protection to gears.* They combine light weight with great strength and toughness—the essentials that make for low maintenance.

Ask any of the nation-wide users of Chillingworth Gear cases about their superior merits.

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An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

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GOOD, versatile man of personality and character. Successful record as transportation executive. Particularly adapted to personnel work. Correspondence solicited. PW-981, Electric Railway Journal, 7 So. Dearborn St., Chicago, Ill.

OPERATING official available. Broad experience, fine record of achievements, city and interurban properties, East and Central West. Recognized ability, successful in handling labor, public relations, selling transportation, increasing revenue, accident prevention, solving traffic problems. Progressive, efficient and a worker for results. Fine references. Correspondence and appointments for personal interview invited. PW-977, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

SUPERINTENDENT of railways with 20 years' experience, desires for personal reasons to make change. Nation wide reputation as railway operator. Can take full charge. Has ability to handle men and show results, correspondence invited and treated in confidence. PW-979, Electric Railway Journal, 7 So. Dearborn St., Chicago, Ill.

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LET me put on your preferred stock customer ownership sale. Can successfully conduct campaign of any size and handle both sales and accounting details. Wide experience. Highest of references. SA-980, Electric Railway Journal, 7 So. Dearborn St., Chicago, Ill.

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WANTED

4—Westinghouse 333-V-2, or four Westinghouse 303-A Motors with Baldwin or Taylor Trucks to fit.

1—Westinghouse D-2-EG or D-3-EG Air Compressors.

The Lima-Toledo Railroad Co.
J. B. CORDERMAN, M. M., Lima, Ohio

Keep your Eye on the

Searchlight Section

and your Advertisements in it

0197

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Rotary Converters

2—G. E. Co., 300 kw. type T.C. 6-300-1200 form P. 1200 r.p.m., 60 cycle, 6 pole, 600 volt, direct current rotary converters.

Transformers

4—G. E. Co., 150 kw. type H, form SPQT 2300-v./370 v. O.I.S.C. transformers with reactance coils, field rheostat, aluminum cell lightening arresters, equalizer switches, starting switches. In first class condition. Low price. Delivery April 1, 1927.

JOHN C. GILPIN, Esq.
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FOR SALE

15 BIRNEY SAFETY CARS

Brill Built
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Cars Complete—Low Price—Fine Condition

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

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12 General Electric CP-27.
6 General Electric CP-28.
16 Westinghouse DH-16.

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Specialists in street cars or any part of a street car. Illustrated bulletin supplied on request.

Don't Say, "*It isn't worth anything*"

THAT surplus Used Equipment you have lying around the shop or yard can be turned into cash! The fact that it is of no further value to you doesn't mean it isn't of value to somebody else. There's always a market for used equipment. Reach the greatest number of prospective buyers for the surplus equipment you have, at a minimum cost, thru an advertisement in the—

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Air Circuit Breakers
Roller-Smith Co.

Air Receivers & Aftercoolers
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Ohio Brass Co.
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Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.

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Manganese Steel Forge Co.

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American Brown-Boveri Elec. Corp.

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Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

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Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Illinois Steel Co.
St. Louis Car Co.
Standard Steel Works Co.
Westinghouse E. & M. Co.

Axles, (Front and Rear) Motor, Truck and Passenger Car
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Axles, Rear
Wisconsin Parts Co.

Axles, Steel
Bethlehem Steel Co.
Carnegie Steel Co.

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More-Jones Brass & Metal Co.

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Public Service Eng. Bureau

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Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
Drew Elec. & Mfg. Co.
Eureka Co.
General Electric Co.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
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Columbia Machine Works & M. I. Co.
Stucki Co., A.

Bearings, Roller
Hyatt Roller Bearing Co.
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Bearings, Roller and Ball
Timken Roller-Bearing Co.

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Bells and Gongs
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Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
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Railway Trackwork Co.

Blowers
Buffalo Forge Co.

Blowers, Portable, Motor-Driven
Martindale Elec. Co.

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Fitzjohn Mfg. Co.
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Columbia Machine Works & M. I. Co.
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Cummings Car & Coach Co.
Graham Bros.
International Harvester Co.
St. Louis Car Co.
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Bemis Car Truck Co.
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Irvington Varnish & Ins. Co.
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Westinghouse E. & M. Co.
Wood Co., Chas. N.

Commutator Slotting Equipment, Hand & Motor-Driven
Martindale Elec. Co.

Commutator Stones
Martindale Elec. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
Columbia Machine Works & M. I. Co.
Eureka Copper Prod. Co.
General Electric Co.
Westinghouse E. & M. Co.

Compounds, Insulating
Johns-Manville Corp.

Compressors, Air
General Electric Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Westinghouse Tr. Br. Co.

Compressors, Air, Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compressors, Gas
Sullivan Machinery Co.

Condensers
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Condenser Papers
Irvington Varnish & Ins. Co.

Conduit Duct Underfloor
Johns-Manville Corp.

Conduits, Fibre
Fibre Conduit Co.
Johns-Manville Corp.

Connectors, Solderless
Dossert & Co.
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works & M. I. Co.
Consolidated Car Heating Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Eureka Copper Prod. Co.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Conveying & Hoisting Machinery
American Bridge Co.

Copper Wire
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining Co.

Copper Wire Instruments Measuring Testing and Recording
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining Co.

Cord, Brll, Trolley, Register
American Steel & Wire Co.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebling's Sons Co., J. A.
St. Louis Car Co.
Samson Cordage Works
Silver Lake Car Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Cowl Ventilators
Nichols-Lintern Co.

Cranes, Hoist & Lift
Eureka Copper Prod. Co.
Electric Service Supplies Co.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossings
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co., Inc.

Crossing, Frog and Switch
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

Crossing Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co., Inc.

Crossings, Track (See Track Special Work)

Crossings, Trolley
Ohio Brass Co.
Westinghouse E. & M. Co.

Culverts
Central Alloy Steel Corp.

Curtains & Curtain Fixtures
Brill Co., The J. G.
O. M. Edwards Co., Inc.
Pantasote Co., Inc.
St. Louis Car Co.

Dealer's Machinery & Second Hand Equipment
Elec. Equipment Co.
Van Loan Corp., Irving S.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Works & M. I. Co.
Electric Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
National Pneumatic Co., Inc.
Safety Car Devices Co.

Doors and Door Fixtures
Brill Co., The J. G.
Cincinnati Car Co.
O. M. Edwards Co., Inc.
General Electric Co.
Hale-Kilburn Co
St. Louis Car Co.

Doors, Folding Vestibule
National Pneumatic Co., Inc.
Safety Car Devices Co.

Drill Grinder
Gallmeyer-Livingston Co.

Drills, Rock
Sullivan Machinery Co.

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Drills, Track
Amer. Steel & Wire Co.
Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.
Dryers, Sand
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Ears
Columbia Machine Works & M. I. Co.
Electric Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Electric Grinders
Railway Trackwork Co.
Electric Transmission Towers
American Bridge Co.
Electrical Wires and Cables
Amer. Electrical Works
American Steel & Wire Co.
Roebling's Sons Co., John A.
Electrodes, Carbon
Railway Trackwork Co.
Una Welding & Bonding Co.
Electrodes, Steel
Railway Trackwork Co.
Una Welding & Bonding Co.
Engineers, Consulting, Contracting and Operating
Archbold-Brady Co.
Beeler, John A.
Buchanan & Layng Corp.
Byllesby & Co., H. M.
Day & Zimmermann, Inc.
A. L. Drum & Co.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelker & DeLeuw
Linn & Marshall Co.
McClellan & Junkersfeld
Richey, Albert S.
Sanderson & Porter
Stevens & Wood, Inc.
Stone & Webster
White Eng. Corp., The J. G
Engineers, Inspecting & Chemists
Pittsburgh Testing Laboratory
Engines, Gas, Oil or Steam
Ingersoll-Rand Co.
Westinghouse E. & M. Co.
Engines, Gasoline
Waukesha Motor Co.
Exterior Side Panels
Haskelite Mfg. Corp.
Fare Boxes
Cleveland Fare Box Co
Economy Elec. Devices Co.
Illinois Motive Equipment Co.
Johnson Fare Box Co.
Perey Mfg. Co., Inc.
Fare Registers
Electric Service Sup. Co
Fences, Woven Wire and Fence Posts
Acme Wire Co.
Amer. Steel & Wire Co.
Fenders and Wheel Guards
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Fender Co
Root Spring Scraper Co.
St. Louis Car Co.
Star Brass Works
Wood Co., Chas. N.
Fibre and Fibre Tubing
Westinghouse E. & M. Co
Field Coils (See Coils)
Files, Commutator Slotting
Martindale Elec. Co.
Flangeway Guards, Steel
W. S. Godwin Co., Inc.
Floodlights
Elec. Service Supplies Co
Floor, Sub.
Haskelite Mfg. Corp.
Flooring, Fireproof
Irving Iron Works Co.
Flooring, Monolithic
Johns-Manville Corp.
Flooring, Non-Slipping
Irving Iron Works Co.
Flooring, Open Steel
Irving Iron Works Co.
Flooring, Steel Subway
Irving Iron Works Co.
Flooring, Ventilating
Irving Iron Works Co.
Floors
Haskelite Mfg. Corp.
Forges
Buffalo Forge Co.
Forgings
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Columbia Machine Wks.
Duff Mfg. Co.
Eureka Copper Prod. Co.
Standard Steel Works Co.
Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co Inc.
Frogs, Track (See Track Work)
Frogs, Trolley
Electric Service Supplies Co
Ohio Brass Co.
Westinghouse E. & M. Co
Funnell Castings
Wm. Wharton, Jr. & Co Inc.
Furnaces, Electric Steel Melting
American Bridge Co.
Fuses and Fuse Boxes
Columbia Machine Works & M. I. Co.
Consolidated Car Heating Co
General Electric Co.
Westinghouse E. & M. Co
Fuses, Refillable
General Electric Co.
Garage Equipment
Columbia Machine Wks. & M. I. Co.
Gaskets, Asbestos
Johns-Manville Corp.
Westinghouse Tr. Br. Co
Gasoline
Texas Co., The
Gas Producers
Westinghouse E. & M. Co
Gasoline Torches
Economy Elec. Devices Co.
Gates, Car
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Gauges, Oil & Water
Ohio Brass Co.
Gear Blanks
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Standard Steel Works Co.
Gear Cases
Chillingworth Mfg Co
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co
Westinghouse E. & M. Co.
Gears and Pinions
Bemis Car Truck Co
Bethlehem Steel Co
Columbia Machine Works & M. I. Co,
Electric Service Supplies Co.
General Electric Co.
National Railway Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.
Generating Sets, Gas-Electric
General Electric Co.
Generators
American Brown-Boveri Elec. Corp.
General Electric Co.
Leece-Neville Co.
Westinghouse E. & M. Co
Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.
Gongs (See Bells and Gongs)
Grating, Steel Subway
Irving Iron Works Co.
Greases (See Lubricants)
Texas Co., The
Grinders and Grinding Supplies
Metal & Thermit Corp.
Railway Trackwork Co.
Grinders, Portable
Ingersoll-Rand Co.
Railway Trackwork Co.
Grinders, Portable Electric
Railway Trackwork Co.
Grinding Bricks and Wheels
Railway Trackwork Co.
Guard Rail Clamps
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co. Inc.
Guard Rails, Tee Rail and Manganese
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.
Guards, Trolley
Elec. Service Sup. Co.
Ohio Brass Co.
Hammers, Pneumatic
Ingersoll-Rand Co.
Hand Holds
Central Equipment Co.
Harps, Trolley
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co
A. Gilbert & Son Brass Fdry. Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works
Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co
St. Louis Car Co.
Headlining
Columbia Machine Works & M. I. Co.
Haskelite Mfg. Corp.
Pantasote Co., Inc.
Heaters, Car (Electric)
Consolidated Car Heating Co
Economy Elec. Devices Co.
Gold Car Heat. & Light. Co
Smith Heater Co., Peter
Heaters, Car, Hot Air and Water
Smith Heater Co., Peter
Heaters, Car, Stove
Smith Heater Co., Peter
Helmets—Welding
Railway Trackwork Co.
Una Welding & Bonding Co.
Hoists and Lifts
Columbia Machine Works & M. I. Co.
Ford Chain Block & M. Co.
Hoists, Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.
Hose, Bridges
Ohio Brass Co.
Hose, Pneumatic
Westinghouse Traction Brake Co.
Ignition Units
Leece-Neville Co.
Industrial Tractors
International Harvester Co.
Inspecting Engineers & Chemists
Pittsburgh Testing Laboratory
Instruments, Measuring, Testing and Recording
American Steel & Wire Co.
Economy Elec. Devices Co.
General Electric Co.
National Railway Appliance Co.
Roller-Smith Co.
Westinghouse E. & M. Co
Insulating Cloth, Paper and Tape
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co. Inc.
U. S. Rubber Co.
Westinghouse E. & M. Co.
Insulating Silk
Irvington Varnish & Ins. Co.
Insulating Varnishes
Irvington Varnish & Ins. Co.
Insulation (See also Paints)
Electric Railway Equipment Co.
Electric Service Sup. Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co. Inc.
U. S. Rubber Co.
Westinghouse E. & M. Co.
Insulation, Paper & Boiler
Johns-Manville Corp.
Insulation Slot
Irvington Varnish & Ins. Co.
Insulator Pins
Drew Elec. & Mfg. Co.
Elec. Service Supplies Co.
Hubbard & Co.
Insulators (See also Line Material)
Drew Elec. & Mfg. Co.
Electric Railway Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hemingray Glass Co.
Irvington Varnish & Ins. Co
Ohio Brass Co.
Westinghouse E. & M. Co.
Interior Side Linings
Haskelite Mfg. Corp.
Interurban Cars (See Cars Passenger, Freight Express etc.)
Jacks, Automatic Lowering
Duff Mfg. Co.
Jacks, Ball-Bearing Screw
Duff Mfg. Co.
Jacks (See also Cranes, Hoists and Lifts)
Buda Co.
Columbia Machine Wks.
Duff Mfg. Co.
Elec. Service Supplies Co.
Jacks, Governor Controlled
Duff Mfg. Co.
Jacks, Horizontal
Duff Mfg. Co.
Jacks, Lifting
Duff Mfg. Co.
Jacks, Pipe Forcing
Duff Mfg. Co.
Jacks, Pole
Duff Mfg. Co.
Jacks, Push and Pull
Duff Mfg. Co.
Jacks, Special Purpose
Duff Mfg. Co.
Jacks, Track
Duff Mfg. Co.
Joints, Rail (See Rail Joints)
Journal, Box Liner
Manganese Steel Forge Co.
Journal Box & Pedestal Jaw Gibs or Liners
Manganese Steel Forge Co.
Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Lamps, Guards and Fixtures
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
Lamps, Arc and Incandescent (See also Headlights)
General Electric Co.
Westinghouse E. & M. Co.
Lamps, Signal and Marker
Elec. Service Supplies Co.
Nichols-Lintern Co.
Ohio Brass Co.
Lanterns, Classification
Nichols-Lintern Co.
Leather
Cleveland Tanning Co.
Letter Boards
Cincinnati Car Co.
Haskelite Mfg. Corp.
Lighting Fixtures, Interior
Electric Service Supplies Co.
Lighting Systems
Leece-Neville Co.
Lightning Protection
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Line Material
A. Gilbert & Son Brass Fdry. Co.
Line Material (See also Brackets, Insulators, Wires, etc.)
Dossert & Co.
Drew Elec. & Mfg. Co.
Electric Railway Equipment Co.
Electric Service Sup. Co
Eureka Copper Prod. Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Locking Spring Boxes
Wm. Wharton, Jr. & Co., Inc.
Locomotives, Diesel, Electric
American Brown-Boveri Elec. Corp.
Locomotives, Electric
American Brown-Boveri Elec. Corp.
Cincinnati Car Co.
Cummings Car & Coach Co.
General Electric Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
Locomotives, Oil Engine, Electric Driven
Ingersoll-Rand Co.
Lubricating Engineers
Standard Oil Co. (of Ind.)
Texas Co.
Universal Lubricating Co.
Lubricants, Oil and Grease
Standard Oil Co. (of Ind.)
Texas Co.
Universal Lubricating Co.
Machinery, Insulating
Amer. Insulating Mach. Co.
Manganese Parts
Bemis Car Truck Co.
Manganese Steel Forge Co.
Manganese Steel Castings
Wm. Wharton, Jr. & Co., Inc.
Manganese Steel Guard Rails
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.
Manganese Steel, Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co., Inc.
Manganese Steel Switches, Frogs and Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.
Meters (See Instruments)
Roller-Smith Co.
Mica
Mica Insulator Co.
Mirrors, Inside and Outside
Cincinnati Car Co.
Motor Buses (See Buses, Motor
Motor and Generator Sets
American Brown-Boveri Elec. Corp.
General Electric Co.
Motor Leads
Dossert & Co.
Motors, Electric
General Electric Co.
Westinghouse E. & M Co.
Motorman's Safety Mirrors
Drew Elec. & Mfg. Co.
Motorman's Seats
Brill Co., The J. G.
Cincinnati Car Co.
Electric Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N
Nitrocellulose Finishes
Valentine & Co.
Nuts and Bolts
Bemis Car Truck Co.
Bethlehem Steel Co.
Cincinnati Car Co.
Hubbard & Co.
Ohmmeters
Roller-Smith Co.
Oil Purifiers
De Laval Separator Co.
Oil Reclaiming Devices
Skinner Automotive Devices Co.
Oils (See Lubricants)
Texas Co., The
Omnibuses (See Buses, Motor)
Oxy-Acetylene (See Cutting Apparatus Oxy-Acetylene)
Packing
U. S. Rubber Co.
Westinghouse Traction Brake Co.
Packing, Asbestos
Johns-Manville Corp.
Paint, Guns
De Vilbiss Mfg. Co.
Paint, Iron Preservative
Johns-Manville Corp.
Paint, Spraying Devices
De Vilbiss Mfg. Co.
Paints and Varnishes (Insulating)
Electric Service Sup. Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Paints & Varnishes, Preservative
Jos. Dixon Crucible Co.
Paints & Varnishes, Railway
National Ry. Appliance Co.
Paints & Varnishes, Woodwork
Valentine & Co.
Panels, Outside, Inside
Haskelite Mfg. Corp.
Pavement Breakers
Ingersoll-Rand Co.
Sullivan Machinery Co.
Paving Guards, Steel
Godwin Co., Inc., W. S.
Paving Material
American Brake Shoe & Fdry.
Paving Materials—Vitrified Brick
National Paving Brick Mfrs. Ass'n.
Pedestal Liners
Manganese Steel Forge Co.
Pickups, Trolley Wire
Drew Elec. & Mfg. Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Pinion Pullers
Drew Elec. & Mfg. Co.
Duff Mfg. Co.
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.
Pinions (See Gears)
Pins & Bushings for Brake Equip.
Manganese Steel Forge Co.
Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.
Pipe Fittings
Standard Steel Works Co.
Westinghouse Tr. Brake Co.
Planers (See Machine Tools)
Plates for Tee Rail Switches
Ramapo Ajax Corp.
Pliers, Rubber Insulated
Electric Service Sup. Co.
Plywood, Roofs, Headlining Floors, Interior Panels, Bulkheads, Truss Planks
Haskelite Mfg. Corp.
Pneumatic Tools
Ingersoll-Rand Co.
Pole Clamps
Clark-Williams Eng. Co.
Pole Line Hardware
Bethlehem Steel Co.
Drew Elec. & Mfg. Co.
Electric Service Sup. Co.
Ohio Brass Co.
Poles, Metal Street
Bates Expanded Steel Truss Co.
Electric Railway Equipment Co.
Hubbard & Co.
Pole Mountings
Clark-Williams Eng. Co.
Pole Reinforcing
Hubbard & Co.
Pole Sleeves
Drew Elec. & Mfg. Co.
Poles, Ties, Posts, Piling and Lumber
American Creosoting Co.
International Creosoting & Naugle Pole & Tie Co.
Poles & Ties Treated
American Creosoting Co.
International Creosoting & Cons. Co.
Poles, Trolley
Bell Lumber Co.
Electric Service Sup. Co.
Nuttall Co., R. D.
Poles, Tubular Steel
Electric Railway Equipment Co.
Electric Service Sup. Co.
Portable Grinders
Buda Co.
Pothead
Okonite Co.

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Okonite-Callender Cable Co. Inc.

Power Houses
American Bridge Co.

Power Saving Devices
Economy Elec. Devices Co.
National Railway Appliance Co.

Pressings, Special Steel
Cincinnati Car Co.

Pressure Regulators
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Westinghouse Traction Brake Co.

Pumps
A. S. Cameron Steam Pumps (Ingersoll-and Co.)
Ingersoll-Rand Co. (A. S. Cameron Steam Pumps)

Pumps, Air Lift
Ingersoll-Rand Co.
Sullivan Machinery Co.

Pumps, Vacuum
Ingersoll-Rand Co.
Sullivan Machinery Co.

Ponches
Buffalo Forge Co.

Punches, Ticket
International Register Co.
Wood Co., Chas. N.

Rail Braces and Fastenings
Ramapo Ajax Corp

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Illinois Steel Co.
Rail Joint Co., The

Rail Joints—Welded
Lorain Steel Co.
Metal & Thermit Corp.

Rails, Relaying
L. B. Foster Co.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
L. B. Foster Co.
Illinois Steel Co.

Rail Welding
Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.

Railway Safety Switches
Consolidated Car Heating Co
Westinghouse E. & M. Co.

Rattan
Brill Co., The J. G.
Cummings Car & Coach Co.

Electric Service Sup. Co.

Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Rectifiers, Mercury Arc Power
American Brown-Boveri Elec. Corp.

Registers and Fittings
Brill Co., The J. G.
Cincinnati Car Co.
Electric Service Sup. Co.
International Register Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.
Bethlehem Steel Co .
Carnegie Steel Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Cincinnati Car Co.
Electric Service Sup. Co.

Resistances
Consolidated Car Heating Co

Resistance, Wire and Tube
American Steel & Wire Co
General Electric Co.
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co.

Roller Bearings
Hyatt Roller Bearing Co.

Roofing, Asbestos (Corrugated & Flat)
Johns-Manville Corp.

Roofing, Car
Haskelite Mfg. Corp.
Pantasote Co., Inc.

Roofing & Shingle Asbestos
Johns-Manville Corp.

Roofs, Car & Bus
Haskelite Mfg. Corn.

Rubber Specialties of All Kinds
U. S. Rubber Co.

Safety Control Devices
Safety Car Devices Co.

Sanders, Track
Brill Co., The J. G.
O. M. Edwards Co., Inc.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.

Sash, Metal, Car Window
O. M. Edwards Co., Inc.
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Electric Service Sup. Co.

Seating Materials
Brill Co., J. G.
Fitzjohn Mfg. Co.
Hale-Kilburn Co.
Haskelite Mfg. Corp
Heywood-Wakefield Co.
Massachusetts Mohair Plush Co.
Pantasote Co., Inc.
St. Louis Car Co.

Seats, Bus
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
S. Karpen & Bros.
St. Louis Car Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
S. Karpen & Bros.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co
Van Loan Corp., Irving S.

Shades, Vestibule
Brill Co., The J. G.
Cincinnati Car Co.

Shears
Buffalo Forge Co.

Shock Absorbers
Cleveland Pneumatic Tool Co.

Shovels
Brill Co., The J. G.
Hubbard & Co.

Shovels, Power
Brill Co., The J. G

Side Bearings (See Bearings Center and Side

Signals, Car Starting
Consolidated Car Heating Co
Electric Service Sup. Co.
National Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.

Signal Systems, Block
Electric Service Sup Co
Nachod & U. S. Signal Co.
Wood Co., Chas. N

Signal Systems, Highway Crossing
Nachod & U. S. Signal Co.

Signals, Warning
American Strombos Co.

Slack Adjusters (See Brake Adjusters)

Sing
Carnegie Steel Co.

Sleet Wheels and Cutters
A. & J. M. Anderson Mfg. Co.
Cincinnati Car Co.
Columbia Machine Works & M. I. Co.
Electric Railway Equipment Co
Electric Railway Improvement Co.
Electric Service Sup. Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Plows
National Railway Appliance Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G
Columbia Machine Works & M. I. Co.
Consolidated Car Fender Co
Cummings Car & Coach Co
Root Springs Scraper Co.
St. Louis Car Co.

Snow Sweeper, Rattan
J. G. Brill Co.
Heywood-Wakefield Co.

Solder
A. Gilbert & Son Brass Fdry. Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)

Spacer, Tie
Duff Mfg. Co.

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.
Wm. Wharton, Jr. & Co Inc.

Spikes
Amer. Steel & Wire Co.
Illinois Steel Co.

Splicing Compounds
U. S. Rubber Co.
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Spray Nozzles
Drew Elec. & Mfg. Co.
Perey Mfg. Co., Inc.

Springs
National Railway Appliance Co.

Springs, Car and Truck
American Spiral Spring Co.
American Steel Foundries
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
St. Louis Car Co.
Standard Steel Works Co.

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

Stair Steps, Safety
Irving Iron Works Co.

Steel and Steel Products
American Steel & Wire Co.
Carnegie Steel Co.
Illinois Steel Co

Steps
Irving Iron Works Co.

Steps, Car
Brill Co., The J. G.
Cincinnati Car Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Nichols-Lintern Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
A. & J. M. Anderson Mfg. Co.
Electric Service Supplies Co
Ohio Brass Co.
Westinghouse E. & M. Co

Strand
American Steel & Wire Co
Roebling's Sons Co., J. A.

Straps
Central Equipment Co.

Street Cars (See Cars, Passenger, Freight, Express etc.)

Structural Steel
American Brown-Boveri Elec. Corp.

Superheaters
Babcock & Wilcox Co.

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

Switch Stands and Fixtures
Ramapo Ajax Corp.

Switchboards, Asbestos
Johns-Manville Corp.

Switches
American Brown-Boveri Elec. Corp.

Switches, Selector
Nichols-Lintern Co.

Switches and Switchboards
Consolidated Car Heating Co.
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co

Switches, Tee Rail
Ramapo Ajax Corp

Switches, Track (See Track Special Work)

Synchroscopes
Roller-Smith Co.

Tampers, Tie
Ingersoll-Rand Co.
Railway Trackwork Co.

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

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co Inc.

Telephones and Parts
Electric Service Sup. Co

Telephone & Telegraph Wire
American Steel & Wire Co

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

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

Ticket Choppers & Destroyers
Electric Service Sup. Co

Tickets & Transfers
Globe Ticket Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

Tie Plates
Illinois Steel Co.

Ties and Tie Rods, Steel
American Bridge Co.
Carnegie Steel Co.
Godwin Co., Inc., W. S.
International Steel Tie Co

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

Tires
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tongue Switches
Wm. Wharton, Jr. & Co., Inc.

Tool Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Tools, Track & Miscellaneous
Amer. Steel & Wire Co
Columbia Machine Works & M. I. Co.
Electric Service Sup. Co.
Hubbard & Co.
Railway Trackwork Co.

Torches, Acetylene (See Cutting Apparatus)

Towers and Transmission Structures
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Westinghouse E. & M. Co.

Tower Wagons and Auto Trucks
MacCardell & Co., J. R.

Track Expansion Joints
Wm. Wharton, Jr. & Co., Inc.

Track Grinders
Metal & Thermit Corp.
Railway Trackwork Co.
Ramapo Ajax Corp.
Una Welding & Bonding Co.

Track, Special Work
Bethlehem Steel Co
Columbia Machine Works & M. I. Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

Trackless Trolley Cars
Brill Co., The J. G.
St. Louis Car Co.

Transfers (See Tickets)

Transfer Tables
American Bridge Co.

Transformers
American Brown-Boveri Elec. Corp.
General Electric Co.
Westinghouse E. & M Co.

Transmission Towers & Structure
American Bridge Co

Traps, Steam & Radiator Control Valves & Radiators
Johns-Manville Corp.

Treads Safety Stair Car Step
Cincinnati Car Co.
Irving Iron Works Co.

Tree, Wire
Okonite Co.
Okonite-Callender Cable Co.

Trolley Bases
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses, Retrieving
General Electric Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E & M. Co.

Trolley Materials
Drew Elec. & Mfg. Co.

Trolley Material (Overhead)
A. & J. M. Anderson Mfg. Co.
Electric Service Sup. Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Trolley Shoe
Miller Trolley Shoe Co.

Trolley Wheel Bushings
A. Gilbert & Sons Brass Fndry. Co.
More-Jones Brass & Metal Co.
Star Brass Works

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
American Brass Co.
Amer. Electrical Works
American Steel Foundries
Amer. Steel & Wire Co.
Anaconda Copper Min. Co
Bridgeport Brass Co.
Roebling's Sons Co., J. A.

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

Truck & Body Bolster Center Plates
Manganese Steel Forge Co.

Trucks, Car
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Cummings Car & Coach Co.
St. Louis Car Co.

Trucks, Motor
International Harvester Co.
White Co., The

Truss Planks
Haskelite Mfg. Corp

Tubing, Yellow and Black, Flexible Varnish
Irvington Varnish & Ins. Co

Turbines, Steam
American Brown-Boveri Elec. Corp.
General Electric Co.
Westinghouse E. & M. Co.

Turnstiles
Electric Service Sup. Co.

Turntables
American Bridge Co.
Electric Service Supplies Co.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers and Silks
Irvington Varnish & Ins. Co.

Ventilators
National Ry. Appliance Co.

Ventilators, Car
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Vestibule Linings
Haskelite Mfg Corp.

Voltmeters
Roller-Smith Co.

Wash Fountains
Bradley Washfountain Co.

Waterproofing

Welded Rail Joints
Electric Railway Improvement Co.
Lorain Steel Co., The
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welders, Portable Electric
Electric Railway Improvement Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welders, Rail Joint
Ohio Brass Co.
Railway Trackwork Co.

Welding Processes and Apparatus
Electric Railway Improvement Co.
General Electric Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welding Steel
Electric Railway Improvement Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welding Wire
American Steel & Wire Co.
General Electric Co.
Railway Trackwork Co.
Roebling's Sons Co., J. A.

Welding Wire and Rods
Railway Trackwork Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Asa'n of Mfrs. of Chilled Car Wheels.

Wheels, Car Steel & Steel Tire
American Steel Foundries
Bemis Car Truck Co.
Carnegie Steel Co.
Illinois Steel Co.
Standard Steel Works Co.

Wheels, Steel Disc
Budd Wheel Co.

Wheels, Trolley
Columbia Machine Works & M. I. Co.
Electric Railway Equipment Co.
Electric Service Supplies Co.
Eureka Copper Prod. Co.
General Electric Co
A. Gilbert & Son Brass Fdry. Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

Wheels, Wrought Steel
Carnegie Steel Co.
Illinois Steel Co.

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Westinghouse Traction Brake Co.

Window Guards & Fittings
Cincinnati Car Co.

Wire Rope
Amer. Steel & Wire Co.
Roebling's Sons Co., J. A.

Wires and Cables
Acme Wire Co.
Aluminum Co. of America
American Brass Co.
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Bridgeport Brass Co.
General Electric Co.
Okonite Co.
Okonite-Callender Cable Co.
Roebling's Sons Co., J. A.
Westinghouse E. & M. Co.

Wood Preservatives
American Creosoting Co.

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Brill Modern Cars

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The five new light-weight Brill modern cars recently placed in service by the Williamsport Passenger Railway are designed and equipped particularly for one purpose—to attract increased patronage. Every detail has behind it the same thought—the desire to win the public's approval, at the same time avoiding the excessive operating costs of the older and heavier equipment.

THE J. G. BRILL COMPANY
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AMERICAN CAR CO. ST. LOUIS, MO. — G. C. KUHLMAN CAR CO. CLEVELAND, OHIO. — WASON MANF'G CO. SPRINGFIELD, MASS.

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Now Ready for Three Types of Buses

Gas-Electric Drive has so increased bus speed, bus mileage, and bus safety, and has so reduced bus depreciation that this equipment is now made in three standard sizes for:

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