MAINTENANCE AND CONSTRUCTION ISSUE

ELECTRIC RAILWAY JOURNAL

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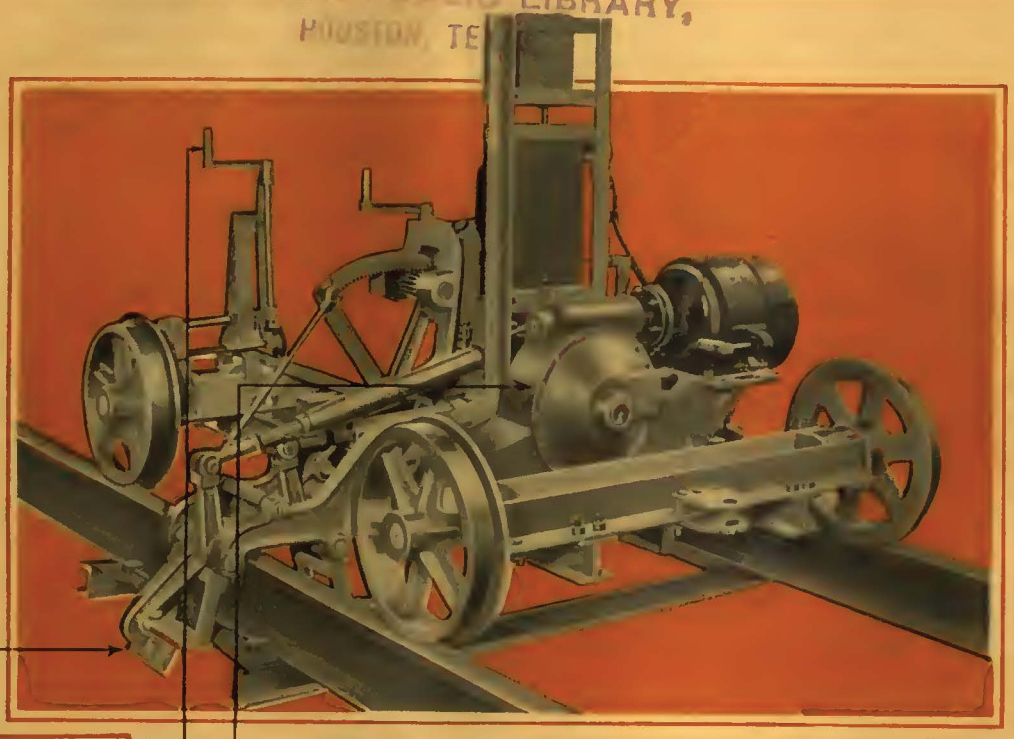

Lifting mechanism raises tamping arms clear of paving so that tamper can be taken to the job behind work train. Adjustment for different rail heights is provided for.

This hand lever operating geared drive propels the tamper along the track.

The motor, operating from overhead, drives through completely enclosed worm reduction gear, with clutch contained in the same housing.

now ready—

A Redesigned Machine for Compression Tamping

The Model A compression tamping machine, after careful redesigning based on field experience, is now ready. The first four machines, after thorough tests, are on their way to the job.

A stepped-up production schedule, proportioned to the wide interest in compression tamping and the unusual acceptance of mass production principles for paved track construction with Steel Twin Ties, will provide other machines quickly enough, we hope, to keep up with the demand.

Modern production methods plus Steel Twin Ties have revolutionized paved track construction. The results are two fold. More rapid, less expensive construction, plus greater permanence in the track so built.

A Bulletin, describing the new compression tamper and other modern track construction machinery will be gladly sent you.

THE INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO

BUY MORE AND SPEND LESS!

—for your maintenance work

1000 REWINDS IN 1925
600 REWINDS IN 1927

THIS record is only one of a number of accomplishments which the management of the Pittsburgh Railways Company has obtained through an economic analysis of its maintenance problems.

A similar economic analysis of your maintenance problem will, no doubt, convince you that you cannot be efficient in both manufacture and maintenance and that it pays to buy coils from the original manufacturer of your motors.

Heat and moisture have no terror for these boys

Westinghouse Renewal Parts Reduce Maintenance Costs

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

MEMBER AERA

1928

Westinghouse

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Vol. 71
No. 21

May 19, 1928

Pages
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CONTENTS

A Maintenance Contest Winner Speaks

HERE is a word from a recent winner in the JOURNAL's monthly maintenance contest:

"I appreciate very much notification of my success in winning the monthly maintenance prize. But I appreciate even more the JOURNAL itself. Its value to maintenance men cannot be estimated, for it brings every week money-saving methods that are worth thousands of dollars to those properties that utilize them.

"In our shops here, every man is interested in the JOURNAL and they have all learned many short cuts and improved methods of doing the routine maintenance jobs that are carried on in a railway shop."

This issue contains another group of items submitted in the monthly maintenance contest. In addition, the feature articles are devoted primarily to construction and maintenance subjects. Here are more ideas that are worth money to your property if they are applied.

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BETTER RAIL, BETTER TRANSPORTATION

Every car's a noisy car on noisy track

A summary of Professor D. D. Ewing's tests, as stated by him includes:

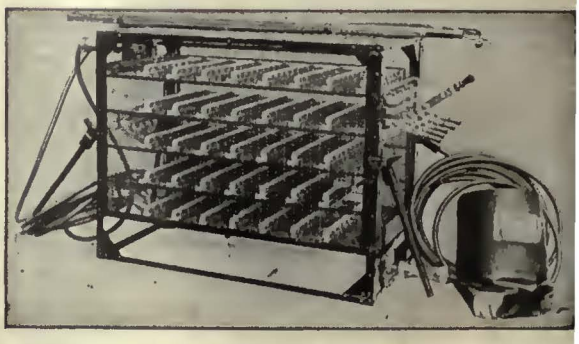
"*Where the track area is paved and the track and paving well maintained but little noise emanates from the rails themselves. The condition of the rails as to smoothness and freedom from sand and pebbles has an important bearing on the noise caused by the car.*"

Professor Ewing's definition of noise is "disagreeable sound." In your business, that means disagreeable expense and loss of revenue.

Eureka Radial Rail Grinder

Vulcan Rail Grinder

Reciprocating Track Grinder



"Ajax" Electric Arc Welder

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:

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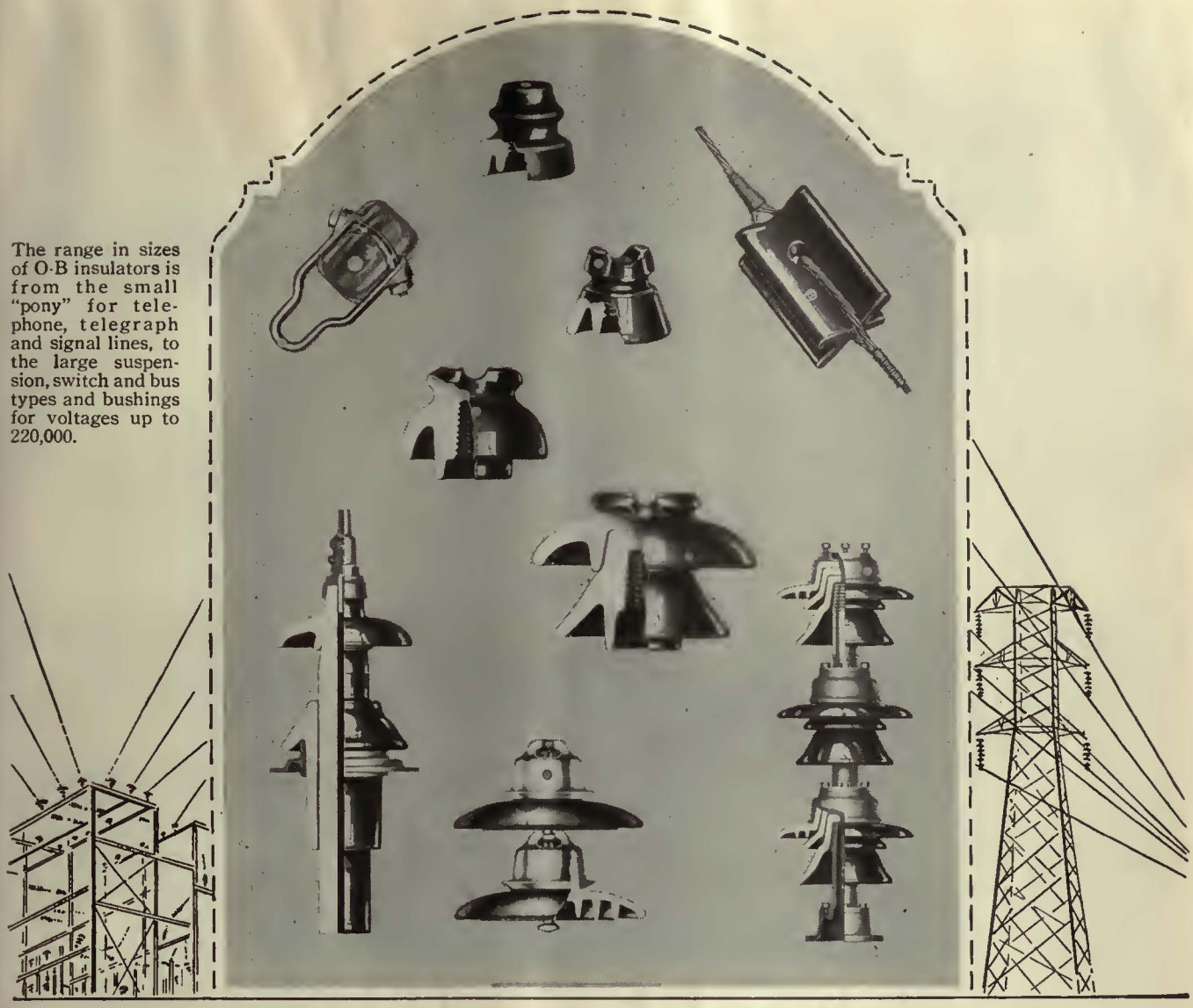
BETTER RAIL, BETTER TRANSPORTATION



The range in sizes of O-B insulators is from the small "pony" for telephone, telegraph and signal lines, to the large suspension, switch and bus types and bushings for voltages up to 220,000.

"What a Difference a Few Cents Makes"

IT costs every cent as much and takes every bit as much time to install a cheap insulator as it does to put up a good one. A few cents more spent on the insulator comes back in service with a profit in labor saved because of greater reliability and fewer replacements.

The labor and material cost of replacing an insulator, which has failed prematurely, will buy several good insulators which have demonstrated they will give dependable service through long life with a minimum of depreciation.

And that is why you get a lot more for your money in O-B insulators. The same porcelain as is used in the high tension units chosen by power companies for the extremely severe service encountered on vital transmission lines operating at voltages up to 200,000, comes to you in the smaller, lower voltage O-B insulators. They are identically prepared, tested and inspected.

The difference in first cost, where it exists, is paid back many times in the profit the extra service life provides.

For complete, specific information and illustrations on all O-B insulators refer to pages 9 to 415, O-B No. 20 catalog.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
466H

Ohio Brass Co.

PORCELAIN INSULATORS
LINE MATERIALS
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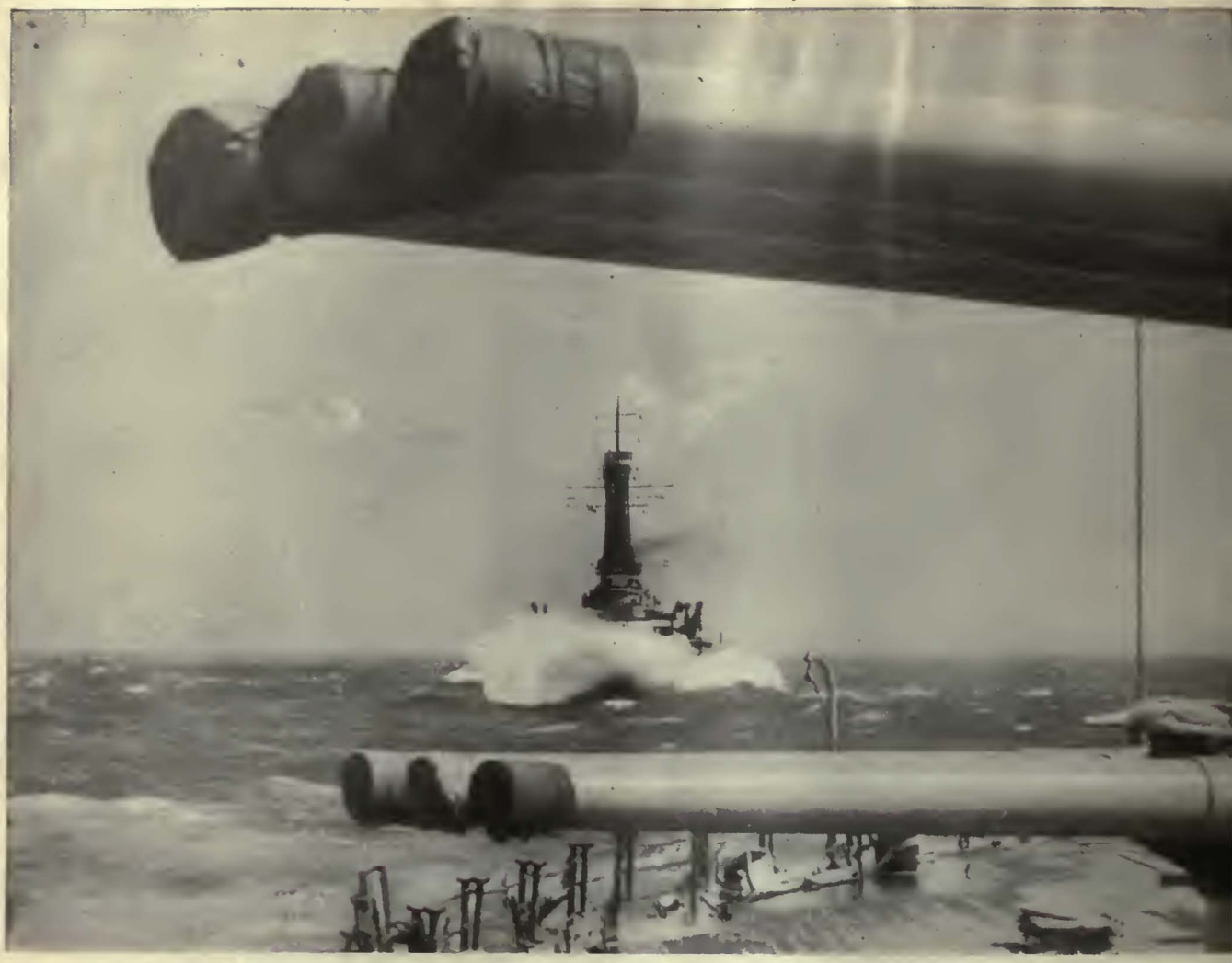


PROTECTION

Large slices of the taxpayers' money go to insure national protection.

Expensive protective organizations patrol our cities.

We are accustomed to pay well for protection and consider the cost a good investment.

Seldom is greater protection secured without additional cost, but the Davis "One Wear" Steel Wheel is an exception.

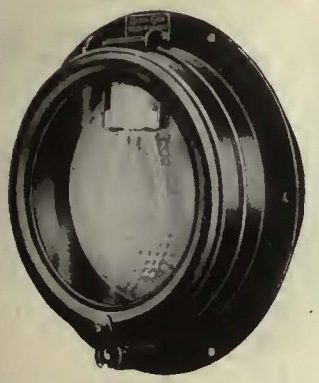
Protection against wheel failure from impact load is doubled by the use of a special heat-treated steel with the unusual physical properties.

Davis "One Wear" Steel Wheels are the safest steel wheels you can buy.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Golden Glow



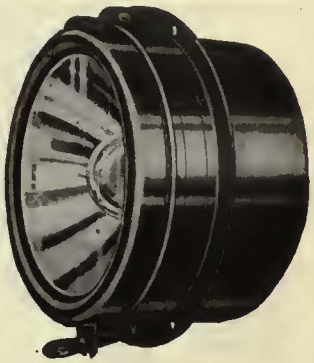
Type DG, Golden Glow Headlight for city service. Being fitted with a Golden Glow prismatic reflector it illuminates a wide area adjacent to and for about 50 feet ahead of the car.

Better Schedules!

Better schedules and higher speed in night operation are direct advantages of using good headlights.

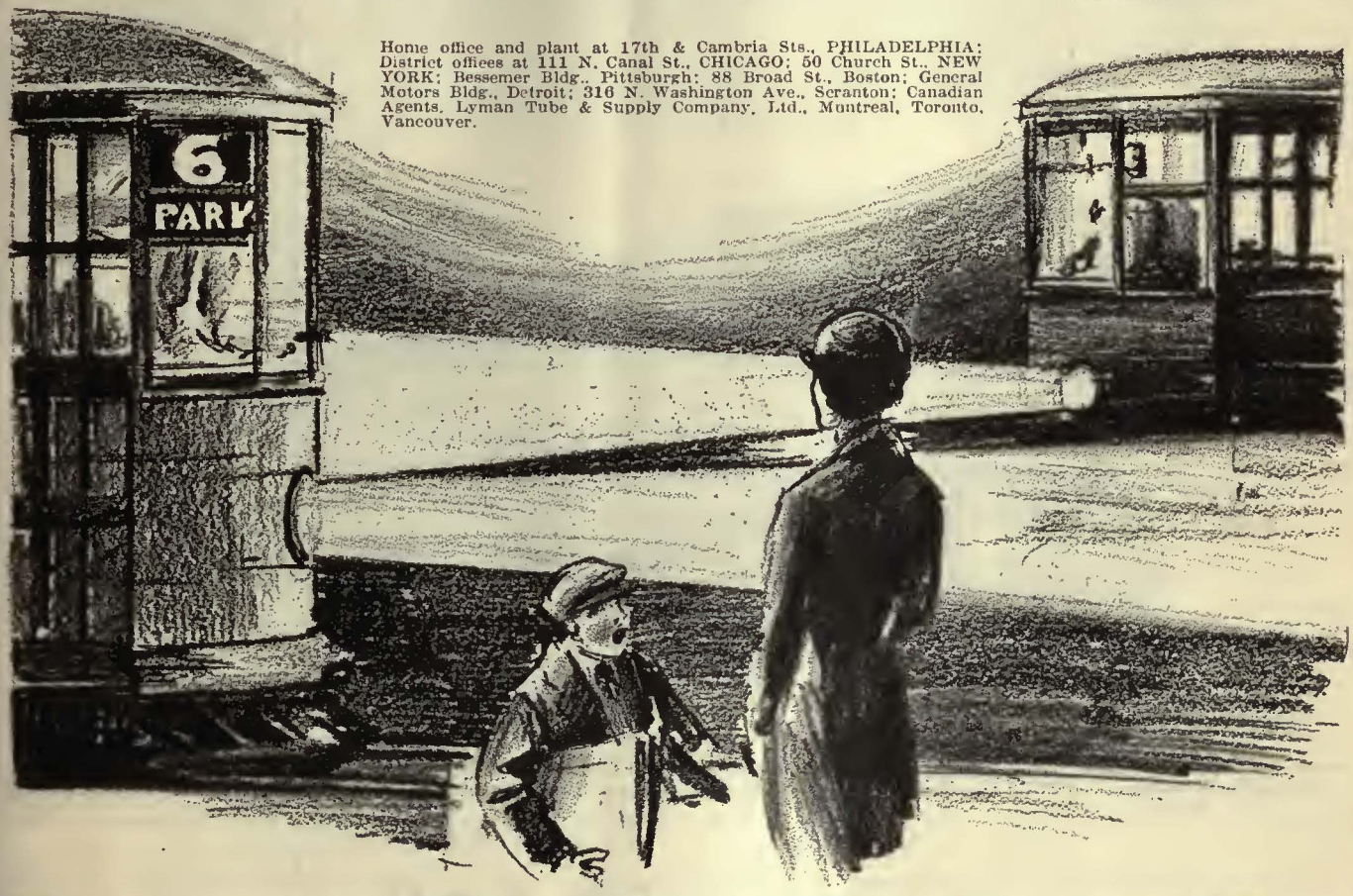
Golden Glow Headlights fulfill this need for more and better light. Their justly famous mirror-glass reflectors, which have been successfully introduced into every field of headlighting by this company, have set new high standards of headlight efficiency.

To get complete descriptions and illustrations of the various styles and sizes of Golden Glow Headlights, ask for our latest pamphlets.



Type R, Golden Glow Headlights are made in various types and fitted with either 9 inch or 12 inch diameter Golden Glow reflectors for suburban and interurban service.

Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District offices at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.



ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

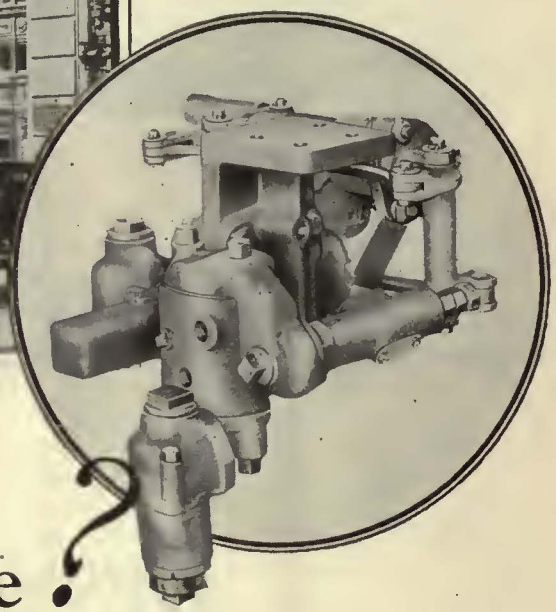
The Modern Car

It is a well-known fact that modern cars make for greater revenue as well as lower upkeep. Attractive design, comfortable riding, and fast operation invariably attract passengers.

Cars of this type that we have built are showing increased net earnings that will pay for the investment in five years.

CUMMINGS CAR AND COACH CO.

111 W. Monroe St.
Chicago, Ill.



Why is the Variable Load Brake . . . a Better Brake?

1. Greater Safety . . . same degree of retarding force on loaded and empty cars.

2. Reduced Delays . . . short stops permit cars to keep abreast of the traffic stream.

3. Faster Schedules . . . uniformly quick stops permit longer peak speed operation.

The Westinghouse Variable Load Brake is an attachment for use with straight air or semi-automatic equipments by means of which the brake cylinder pressure is automatically adjusted as the car weight changes, to provide the same retarding effect throughout the range of passenger loading.

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works, Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES

LOOK FOR THIS MARK

"STANDARD" STEEL PARTS

ON America's largest municipally owned and operated railway, the new Peter Witt Cars built by J. G. Brill Company and The St. Louis Car Company for the city of Detroit, are equipped with

"STANDARD"
ROLLED STEEL WHEELS

STEEL AXLES
STEEL SPRINGS

ARMATURE SHAFTS
ROLLED STEEL WHEELS

STANDARD STEEL WORKS COMPANY
PHILADELPHIA, PA.

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PORTLAND
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PITTSBURG
MEXICO CI

Looking  Ahead in Highway Transportation

The growth of highway transportation is one of the marvels of the 20th century. In a few brief years a network of regularly operated routes has covered the country from coast to coast. Suburban service has multiplied a thousandfold. City traffic conditions have visibly altered, requiring more mobile lines of transportation and vehicles of adequate capacity with lower operating and maintenance cost.

It is a time when every executive might well pause for a moment and look ahead—that he may reap the advantages of the new developments in highway transportation.

Versare

A Radical Departure
from Conventional Design

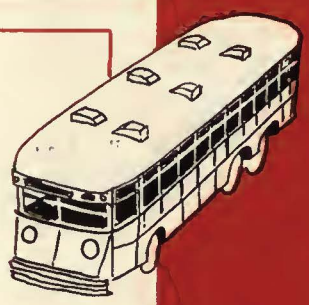
Traction companies have desired a single - deck, large-capacity, easily handled vehicle, that had ample leg and head room, wide aisle space, provision for circulating load, with doors that enabled the car to take on or let off passengers quickly to cut stopping time to a minimum.

It is here in the 6-wheel, gas-electric Versare Highway Unit, with the power plant in the rear!

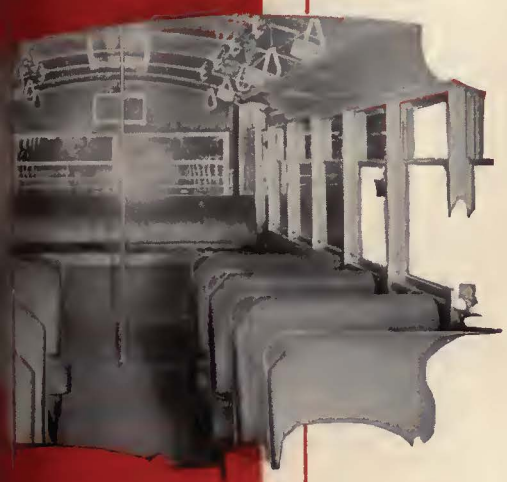
Versare engineers have developed this transportation unit along lines radically different from familiar types. In Boston, Montreal, Albany, Providence, Cleveland, New York and elsewhere this unit is meeting with such extraordinary success, and has so satisfactorily overcome every operating handicap, that it is destined to create a new era in highway transportation.

Versare

Greater Capacity
the Revenue Builder



Let us briefly touch on a few points of this new transportation unit—the Versare. They are well worth your serious consideration.

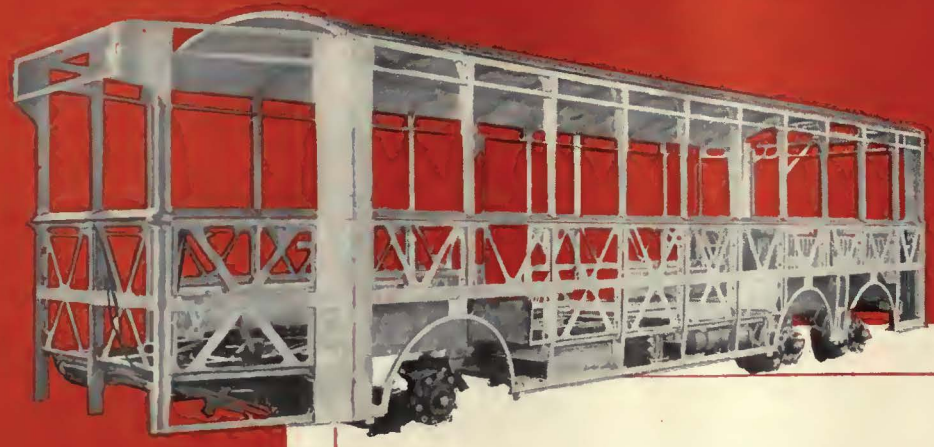


Here is a vehicle that utilizes every square foot of space for revenue. It carries comfortably 74 passengers—37 seated and 37 standees. With a powerful 125 h.p. gasoline engine and two 33 h.p. electric motors it has brute power for any grade, quick pick-up and speed. Easily handled in traffic; equipped with latest safety devices; exceptionally easy to keep clean and maintain due to accessibility of all parts.

The power plant can be removed and replaced in an hour without use of a crane. For quick inspection simply lift a panel.

Versare

Consider the Construction!



Side view of Versare frame, showing girder construction, extruded side posts, and wheel housings. This entire fabric is of Duralumin and Aluminum.

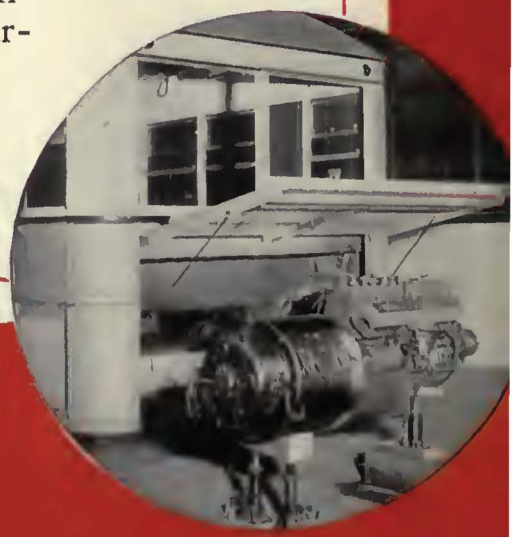
Rear view of Versare frame showing engine mounting and heavy channels affording protection at corners. When engine is installed this channelling extends clear across the back behind the bumper.

Here you have bridge type truss construction, the same as used for strength in cantilever bridges and dirigibles. There is nothing like it in highway transportation vehicles. The girders, angles, castings and side posts are of Duralumin, an alloy selected where tremendous tensile strength is required.

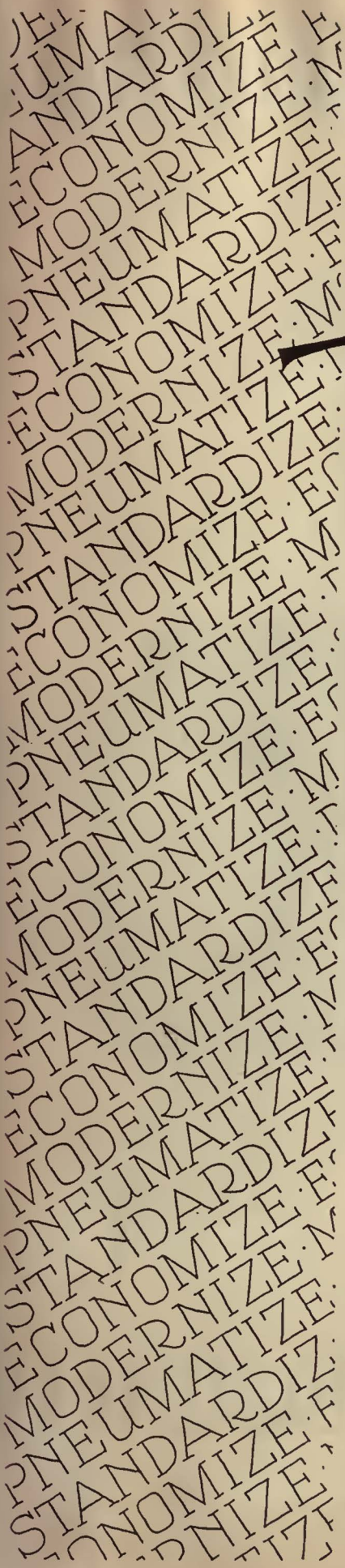
The frame is sectionalized. In case of a smash, the damaged section is easily replaced. Your maintenance men will appreciate this time saving and low cost feature.

In fact, everything has been incorporated in the Versare Highway Unit that would contribute to greatest earning capacity with lowest operating and maintenance cost per car-mile.

Versare Corporation
Albany, N. Y.



Versare



...and now it's TREADLE-IZE!

Let the N. P. Treadle work for you this year—Treadle operation is circulating load operation ~ ~ ~

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NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works: Rahway, New Jersey

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518 McCormick Building

MANUFACTURED IN
TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

They pai

POWER SAVINGS

—ECONOMY METERS installed on all cars *more than paid their cost during the first year of operation . . .*

The above page is from a report of the Georgia Power Company operating the Atlanta street railways and inter-urban service.

Economy Meters were installed on all motor cars at an approximate cost of $27,000. After eleven months in operation Atlanta figured a power saving of $30,000. An enormous return on the investment when you realize an even greater amount than just a power reduction, is being saved by the railway.

ECONOMY ELECTRIC

DISTRIBUTORS OR AGENTS FOR

Sangamo Economy Watthour Meters
Economy Gasoline Vehicle Meters
Haskelite and Plymetl
Woods Fare Box
Peter Smith Heate

for themselves in less than a year at Atlanta

Every Railway Company, large or small, can afford to have Economy meters on this basis.

The experience of the Georgia Power Company in Atlanta is only typical of the results obtained wherever Economy Meters have been installed and an effective power saving campaign launched.

ECONOMY METERS

for Electric Railway Operation

Based on the fact that there is an approximate difference of 30% in power used between the average good operator and a poor one, Economy Meters serve to point out the poor operators. Corrective instruction soon brings your motormen up to standard.

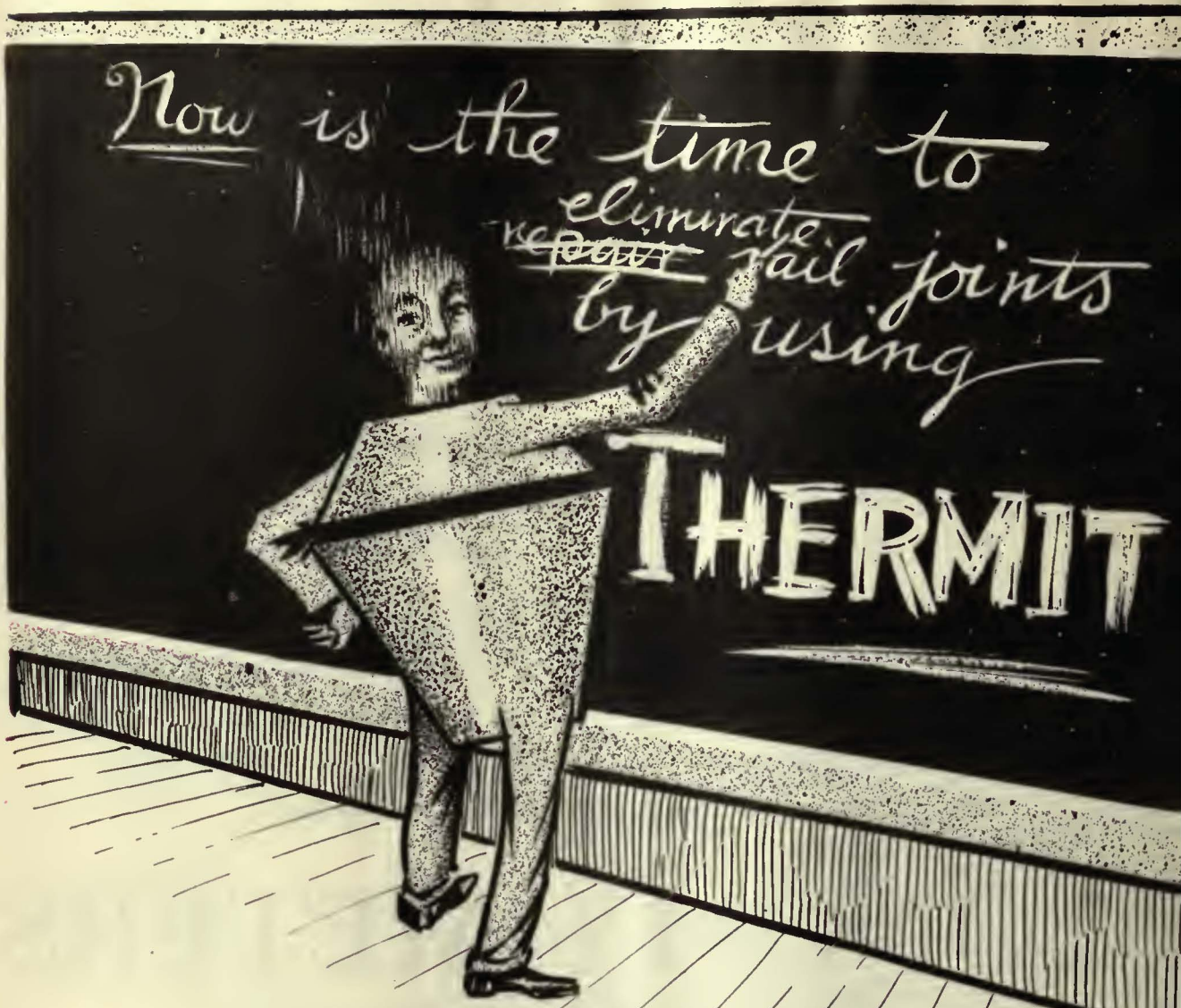
As a further power saver, metering the energy used at the car points out defective equipment. By means of the inspection dials an accurate check can be maintained on the service that equipment has rendered. Inspections can be made directly from the meter readings without complicated clerical records.

The meter itself is ruggedly built, requiring very little maintenance. It is also simple to install. May we send you further information on the savings others have made with Economy Watthour Meters?

DEVICES COMPANY

37 W. Van Buren St., Chicago

Cable Address: Sangamo, Chicago



Don't repair— *eliminate!*

Lessons learned through experience are seldom forgotten. That's why so many roads are now using Thermit for repairs, as well as on new construction. They've found that by Thermit welding old joints, there's no more cupping, no more noise, and no more patching, as long as the rail itself lasts.

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORO

Do you think beauty is a factor in winning riders?

Perhaps you do not agree entirely with the opinion held by many transportation engineers that beauty of design is important.

But take the question from another angle. Do you object to accepting their opinion if you get "Beauty at Low Cost" along with "Speed with Safety," "Comfort with Capacity," and "Lightweight with Strength?"

When may we present facts and figures to show how vitally these four combinations bear on the ability of Cincinnati BALANCED Lightweight Cars to increase patronage?

Cincinnati Car Company, Cincinnati, Ohio

CINCINNATI BALANCED LIGHTWEIGHT CARS

—still a step ahead of the modern trend

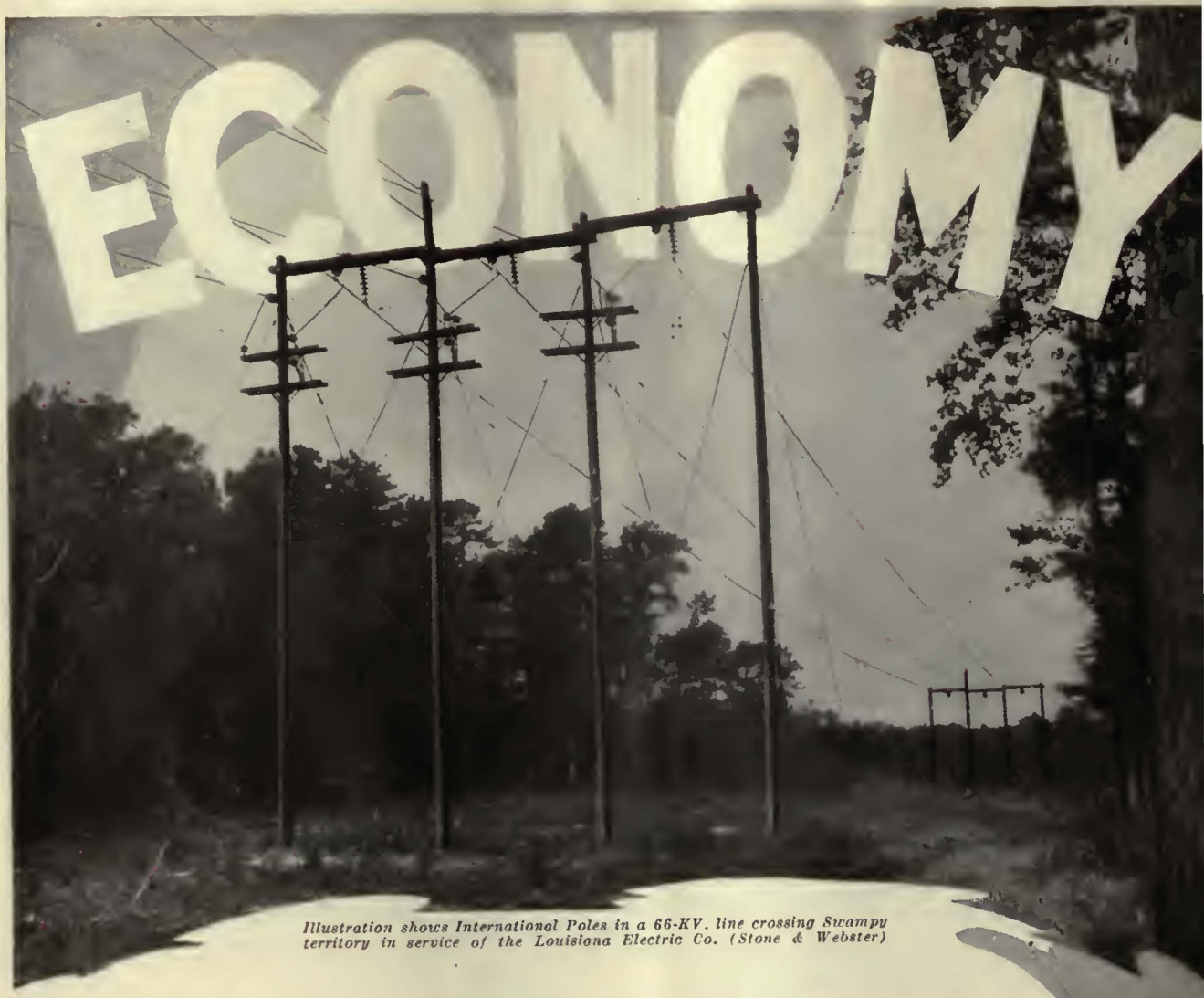


Illustration shows International Poles in a 66-KV. line crossing Swampy territory in service of the Louisiana Electric Co. (Stone & Webster)

Long Life Makes Low Cost

THE FIRST COST of Creosoted Pine Poles, all sizes and lengths, compares favorably with other poles. But, on the basis of annual cost, the real economy becomes strikingly apparent. Creosoted Pine Poles are strongest and have longest life. When the initial investment is distributed over their 35 to 40 years of service, the very low annual cost proves that the pole that lasts longest is least expensive.

Other marked economies are due to the fact that the Creosoted Pine Pole is so far superior in strength and durability that standard construction prescribes that smaller poles or fewer poles per mile be used in Creosoted Pine construction than when other woods are used.

International has poles in service 28 years and still in excellent condition. They last and lead in service.

2¢8
The International Dating Nail

International Creosoting & Construction Co.
Galveston—Texarkana—Beaumont

International
Creosoted Yellow Pine Poles

Bringing Them Out with Good Varnish

Heavy weather—insulations burned out—idle cars. Idle cars are expense items—they produce no revenue. All this because of a few cents saved in insulating materials. ¶Bring the cars out of the repair shop with G-E insulating varnish. It resists moisture and oil—it stands the gaff of rough wear. G-E varnish is continued protection through good weather and bad. ¶These varnishes were originally developed to insulate G-E railway motors and other apparatus. You are taking no chances when you specify G-E insulating materials.

Five popular G-E varnishes are:

No. 152 Clear Air Drying
No. 457 Black Air Drying
No. 447 Black Baking (especially recommended for railway use.)
No. 450 Clear Baking
No. 460 Black Baking

PROMPT SERVICE

G-E insulating materials are sold only by G-E Merchandise Distributors located throughout the country who are equipped to give you prompt service. Get in touch with the G-E Merchandise Distributor near you or write to the Merchandise Department, General Electric Company, Bridgeport, Connecticut.

This catalog contains a complete listing of the following G-E insulating materials:

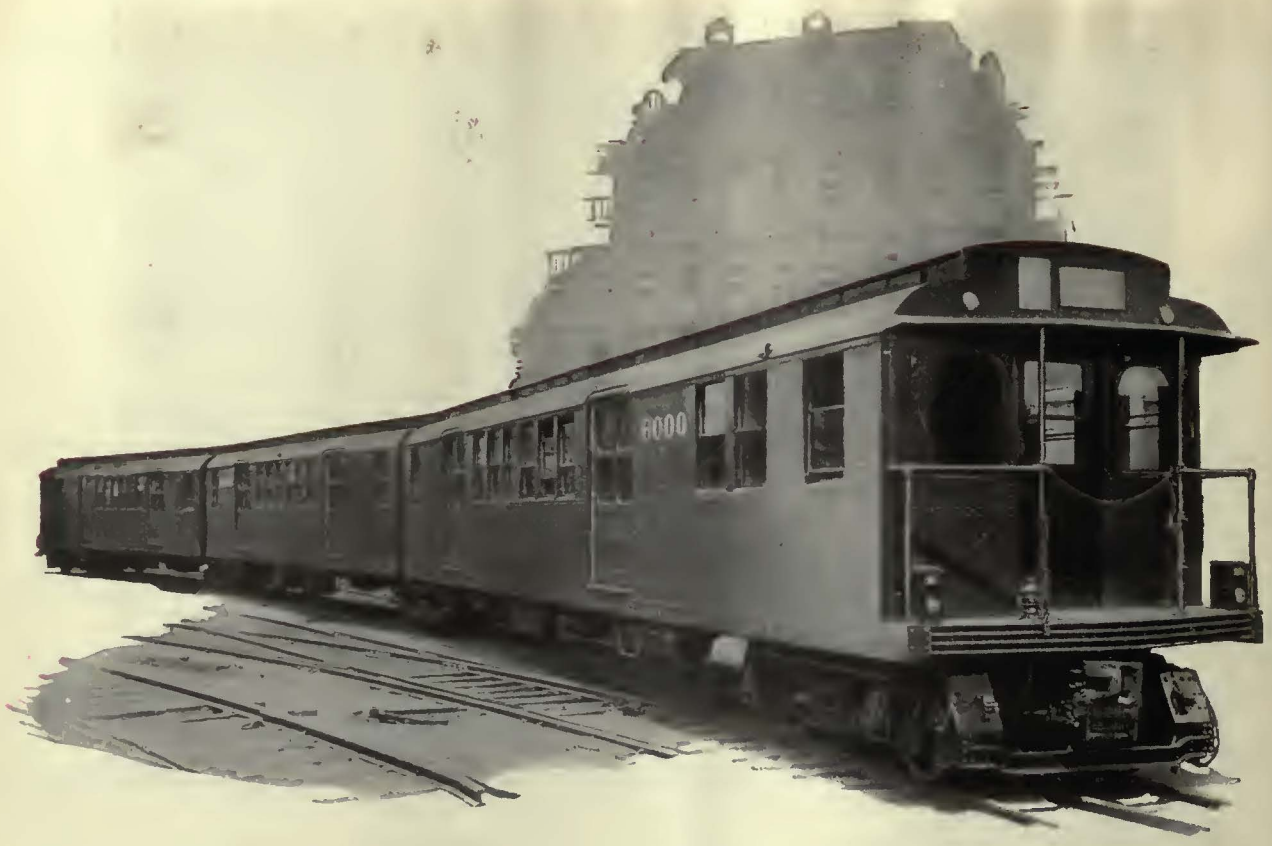
- Insulating and finishing varnishes
- Insulating oils
- Stickers
- Shellacs and paints
- Filling and sealing compounds
- Varnish-treated cloths and cloth tapes
- Flexible varnished tubing
- Insulating fibers and papers
- Motor tubing
- Asbestos and cotton tapes
- Friction and rubber tapes
- Prepared paper tapes
- Cords
- Twines

Send for your copy to the Merchandise Department, General Electric Company, Bridgeport, Connecticut.

800-208

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT



They must not fail!

Traffic conditions in New York demand that the subway trains must not fail.

Two years ago, the New York Rapid Transit Corporation found the operation of its two experimental G-E equipped, triplex, articulated cars to be so satisfactory that sixty-seven three-unit cars, each equipped with four GE-282 motors and duplex Type PC 15 control, were then placed in service.

These equipments have been so reliable and economical in operation that the New York Rapid Transit Corporation will soon place in service 50 more articulated cars, of which all will be equipped with G-E control, and three-fourths with GE-282 motors.

If you need electric railway equipment or supplies, whether for extension, replacement, rehabilitation, or maintenance, it will be well worth your while to consider the advantages of equipment and supplies which bear this monogram.

330-83

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

McGraw-Hill Publishing Co., Inc.
JAMES H. MCGRAW, *President*

Consolidation of
Street Railway Journal and
Electric Railway Review

CHARLES GORDON
Editor

Volume 71 — *New York, Saturday, May 19, 1928* — *Number 20*

Adequate Testing Is Good Insurance

CLOSE attention to every detail of maintenance of the motor, which is the heart of the car equipment. will do much to prevent failures. All motor repairs for a system should be done at one shop. It is only by such centralization that uniformly good results can be obtained. Overhaul methods which have been tried and found most effective should be used. Chemical cleaning tanks for housings, boring of armature bearings after they are pressed into housings, and dipping and baking processes are some outstanding practices that produce real results and eventually lower maintenance costs.

Adequate tests of overhauled motors is important as a means of making sure that nothing has been overlooked. The load method described elsewhere in this issue is one example of what a progressive property is doing to make certain that its equipment will perform satisfactorily when returned to service. It is the test to which all overhauled railway motors are subjected by New Orleans Public Service, Inc. At the last meeting of the Electric Railway Association of Equipment Men, Southern Properties, a representative of this railway stated that the payroll is 30 per cent less than five years ago while the number of car-miles operated is only 15 per cent less. This is striking evidence that money spent on putting equipment into first-class physical condition, and upon adequate testing facilities to insure against failure in service, is money well invested.

One Hundred Men in 1927 Did Work of Four Hundred in 1909

CONVINCING evidence of the great saving in man power made possible by the use of modern machinery is found in figures compiled by the Boston Elevated Railway concerning a recent track reconstruction job in Somerville. The work involved the reconstruction of 17,566 ft. of single track which had been in service for eighteen years. The old track was built in 1909 with 8-in. T-rail laid partly on wood ties and partly on steel ties. Joints were cast welded. The new track is built with 7¼-in. T-rail on International twin steel ties. Joints are seam welded. The old concrete base has been retained and the new track laid upon it.

On account of the narrowness of the street it was impossible to use a temporary third track during the course of construction. Work was carried on during regular working hours with a maximum force of 100 men. The entire job was completed in a period of four months without interruption to car traffic on the line. At the time of the original construction a maximum force of 400 men was employed. Curiously enough, the same foreman was in charge of both jobs.

Modern track-building machinery was responsible for this impressive reduction in the size of the force required to do the work. In 1909 all material was handled by trucks drawn by teams of four or six horses. Loading, unloading and placing of material was done by hand. In 1927 the old granite-block paving was broken up by means of a pavement plow. The blocks were loaded on motor trucks by a Barber Greene snow-loading machine equipped with special buckets. The old rail was cut by acetylene torches to short lengths for easy handling. Fastenings of the steel ties were burned off. The old base was swept clean by means of a tractor sweeper. New rails and ties were handled by a special rail carrying car equipped with an electric crane. Joints were welded electrically.

On this recent job one man with modern equipment accomplished a better result than four men with old tools had accomplished eighteen years ago. In the entire electric railway field it would be hard to find a better example of the profitable employment of machinery to save manual labor.

A Field for Special Bus Maintenance Equipment

VISITING the bus repair sections of most shops, one is impressed particularly with the lack of sturdily built tools for carrying on the work. Many of those in use are obtained from automobile accessory distributors and do not stand up in the continued service of a bus repair shop. In keeping buses on the road, tools are subjected to hard and continuous service that calls for very much more rugged design than has been customary in automotive practice.

Usually the tools now available were designed for automobile work and are little better than toys when put in the severe service of bus repairs. More sturdy tire changing equipment is needed. Wrenches and hand tools of cheap construction should not be used, stones and honing machines for hand-lapping and valve grinding often do more damage than they do good for the class of work found in bus repair shops. Presses, jacks, motor stands are among the miscellaneous items of shop equipment designed particularly for the service imposed in a bus garage. More production machine tools of this type are needed so that the work can be turned out rapidly and satisfactorily.

Shop equipment of ample capacity and ruggedness for bus maintenance is far too difficult to obtain at the present time. Some electric railway maintenance men have been misled into the installation of the comparatively light and ineffective equipment developed for automobile garages. All too often such equipment has

This is the issue in May that is devoted essentially to maintenance and construction subjects

proved entirely inadequate for bus maintenance purposes. Obviously there exists a distinct opportunity for the alert manufacturer of such equipment to develop machinery suitable for the maintenance of buses on a commercial basis. It is probable that there is a considerable field for the sale of such heavier duty maintenance equipment to large truck fleet owners as well as to bus operators and that a large and growing market exists which has been comparatively undeveloped.

Replacement Before Breakdown a Criterion for Pull-Ins

WHY does one city company show pull-ins every 4,000 miles and another show pull-ins every 100,000 miles? Is it necessarily due to a difference in definition of "pull-in," of character of equipment, of quality of materials, of skill in workmanship or character of service?

Inspection of property after property, over many years, indicates that the predominant reason is none of the foregoing. The most important factor is managerial policy. Does the department head or management place more stress on the minor factor of getting the last mile of service from materials or on the major factor of uninterrupted delivery of vehicle-miles to the public?

There is a strong temptation to place too much stress upon comparisons that don't compare, so to speak. The superintendent of equipment is driven to the point where he tries to get the last possible revolution out of a car wheel and trolley wheel or the final 64th of an inch from his bearings. The adoption and use of limit of wear gages as a measure of the time to scrap wearing parts has been painfully slow because of this constant pressure to get the last mile of wear.

The saying "Prevention is better than cure" is as old as the well-known hills, but it is just as true as ever. Pull-ins, exclusive of those for accidents, are not inevitable. They *are* preventable. Their elimination is wholly and solely a matter of replacement before breakdown. Is that trolley wheel groove so distorted and worn that it will inevitably tear down some of the overhead tomorrow, if not today? Has that car-wheel flange worn down to the chipping line? Will that commutator get by for another round trip before it is reslotted? Will those motor suspension axle bearings go till the next overhauling? All of this means taking chances on service interruptions.

A superficial view of the subject might lead to the conclusion that a more liberal scrapping policy to prevent trouble would increase costs so far as the mechanical department's showing is concerned. The contrary has proved the case on properties where maintenance policy has been altered along the lines indicated. It is true that the mileage per item may be lowered, but the over-all costs are less, since a pull-in generally involves much more than the replacement of the outworn or weakened part.

From the standpoint of the transportation department, the question of which is the better policy is not even a debatable one. It is not enough for electric railways to provide the lowest cost transportation service. They must also make good so unfailingly that those who patronize electric cars will have to think long and hard before they can recall leaving a vehicle because of a breakdown. A certain automobile maker, who shall be nameless for once, said of his product: "It takes you there and brings you back." That is a good slogan for the electric railway maintenance man!

Fenders Require Careful Attention

WHEN car fenders were first put on the mark careful attention was given to the initial cost, sir plicity of design, ease of installation, maintenance co sensitiveness, tripping and pick-up reliability before selection was made. Unsuccessful types have long sin passed out of existence, so that today there are only a fe types on the market. These have proved reliable aft years of service. Continued reliability, however, c be assured only by proper maintenance. The cost keep fenders in serviceable condition is only a small pa of the total cost of the equipment maintenance, b nevertheless the device requires constant attention.

Often a fender will be damaged in service by hitti an obstruction. Though this damage may be slight, is essential that all the parts should be looked over car fully and the fender tripped several times by means the gate before the car is returned to service. Ignori those precautions may mean a fender failure at a critic moment. This possibility of failures can be lessened a marked degree by checking the height of the apr and gate and their freedom of operation every night every second night. It is also important to see that t fender will pick up and latch securely. Often a fend will be tripped in service, and afterward, due to faulty latch, it cannot be held up in position. This ma cause its total destruction if the trouble is not detecte with a resultant material increase in the maintenance co

Financial Status Improved by Better Maintenance

STANDARDS of maintenance have changed radical during the past 25 years, but not more than have t standards of service that are adhered to by the mo progressive electric railways. Early in the present ce tury car failures were looked on with a certain cor placence, and were considered more or less as unavoidab evils. With the change that has taken place in the cha acter of service it has become recognized more and mo that the public is intolerant where failures of railwa service are involved.

The easiest way to reduce failures in service is to r place old parts with new at the first sign of destructi wear. This is not always feasible, and occasionally it necessary to keep equipment in service for many yea longer than would ordinarily seem desirable. An i stance of this is seen in the New York & Queens Coun Railway, particularly with regard to its motor equipmer When its cars were purchased, more than 25 years ag the motors were as good as the art afforded. Not on are these motors hopelessly out of date today, but un quite recently they had been allowed to go without eve ordinary care. As a result failures were far too freque and the service suffered accordingly.

It was not possible to purchase new cars or ne motors, so the present management decided to make t best of the bargain and do away with the hand-to-mou repairs that had become the practice. Enough mone was spent on the motors not only to restore them nearly as possible to their original condition, but in son respects to make them approach modern practice. T article by Thomas V. Campbell in this issue tells ho thoroughly this work has been done.

Ordinarily it would not pay to spend as much mone on rehabilitating old equipment as was done here. B

in the present instance it was manifestly impossible to obtain new capital. The repairs will permit the motors to give further reliable service. The maintenance costs have been reduced to normal. There has been about 1,000 per cent increase in bearing mileage and 75 per cent reduction in electrical failures. These are important factors in the maintenance of regular schedules, and consequently in the increased patronage now coming to the company. Furthermore, the improvement in the company's financial status may make it possible later on to finance new equipment where today that is impossible.

Equipment Designers Should Follow Closely the Problems of Operation

COMPLAINT is sometimes made by manufacturers that their equipment fails because it is improperly maintained. Often, however, it will be found that sufficient attention has not been given by the designer to making maintenance easy. If parts are to be inspected properly they must be accessible. If lubrication is needed there should be ample provision for it. The parts should be sufficiently rugged so they will not be damaged easily by unskilled workmen.

An example of unfamiliarity of the designer with maintenance occurred recently in connection with some equipment which had a shaft rotating at low speed. A pressure grease lubricating system was installed for the two bearings at the ends of the shaft. As the shaft was short, the grease cup was placed at the center and the lubricant was supposed to work toward each end. Only one end of the shaft was visible to the greaser. As it happened, the bearing at this end had more clearance than the invisible bearing. The workman forced grease in until it could be seen coming out of the end which was visible and assumed that the other end also was receiving its share. Seizing of the bearing at the far end soon resulted in serious damage to the shaft and bearing. When the apparatus was taken apart for repairs it was found that sufficient grease had not reached the damaged parts. Equipment gives best service which is worked out after close study of the conditions under which it must be maintained.

Decentralization Urged by Regional Plan of New York

SPENDING a billion dollars for subway construction in the next fifteen years will not solve the transit problem in New York City. Such is the conclusion reached in a comprehensive report on transportation recently published by the Regional Plan of New York and Its Environs. The reference to an expenditure of $1,000,000,000 includes the Transit Commission plan of 1922 calling for extensions to existing systems to cost at least $306,000,000, and the Board of Estimate proposal of 1925, requiring the expenditure of $543,000,000 for an independent municipal system. The report points out that the subways have never been able to keep pace with the demand for their use, and that the building of new subways to feed the present congested areas merely makes congestion worse. Additional facilities, instead of being planned to carry people to and from districts that are already overcrowded, should be planned to encourage a better balanced distribution of industry and population.

Despite the remarkable development of skyscrapers in the downtown section of the city, and more recently in the midtown section, the average height of buildings on Manhattan Island is still comparatively low. Yet some 3,000,000 persons now enter Manhattan south of 59th Street on a typical business day. If the policy of concentration continues, congestion will become worse. At present, however, there is no indication of a halt. The purpose of all the transit plans thus far proposed is to concentrate traffic in the congested portions of lower Manhattan, because that is where the majority of the passengers now desire to go. Rather than to foster this trend, the report recommends that additional facilities be so arranged that there will be gradual dispersion of traffic among a multiplicity of subcenters.

It is pointed out that this probably can best be attained by developing a system of belt-line and by-pass routes that would encourage a more desirable distribution. Only under a unified transit system for the entire city could such routes be developed successfully. With independent operation the tendency is always to tap the areas of greatest congestion in order to secure the maximum amount of business in the minimum time. All means of transportation, according to the report, should be planned to furnish direct routes not only to the older business centers but to the new ones which are arising or may be expected to develop. Short hauls between residences and places of work are advocated as a means of relieving congestion.

Builders of Great Industries Are Entitled to Fitting Rewards

B. C. COBB, Samuel Ferguson and M. S. Sloan are among the men in the utility industry who have deemed it judicious recently to raise their voices against the constantly growing tendency of government to inject itself into business. Although the point of view expressed by these utility executives is quite similar, the particular interest of transportation men attaches to the remarks of Mr. Cobb because of his position as chairman of the electric railway Advisory Council.

Mr. Cobb spoke before the Chamber of Commerce at Jackson, Mich. His subject was "Michigan and Her Public Utilities." In the course of his remarks he said some things about those who would create an "Electric Trust" bogey man, and the propensity of government to interfere with business, that were very much to the point. Mr. Cobb is proud of his country, but he is not proud of the mess it has made of the handling of the merchant marine. He is not proud of certain other governmental activities that might better be left to other hands. He reminded his audience not to forget that when their forefathers wrote the Constitution they intended that the government should stay out of business. Many there are who think our forefathers were wrong in what they did, but Mr. Cobb does not think so. As he sees it, tie men's hands, crush down their spirit by governmental interference and operation, take away the reward for work well done, and the incentive to do is killed.

Like many other men, Mr. Cobb is unable to understand why the desire should exist to throw a brick at the electric industry, the industry that has done more in the past ten years for the advancement of American manufacture and American labor than any other industry in the country. It certainly is a queer manifestation, this one in the United States, that looks with suspicion upon the men who build great industries.

MOTOR REHABILITATION

Decreases Troubles

By Thomas V. Campbell
Superintendent of Maintenance of Fisk & Roberts
Consulting Engineers and Managers New York & Queens County Railway
Woodside, N. Y.

WHAT can be accomplished to solve the problem of excessive motor maintenance costs? The answer is afforded in the experience of the New York & Queens County Railway in increasing the life of armature and axle bearings and decreasing field and armature failures. The life of bearings has been prolonged tenfold and electrical failures reduced 75 per cent as a result of a complete motor rehabilitation program involving welding and reboring of armature and axle bearing fits, dipping and baking armatures and fields and installing a new method of bearing lubrication.

Bake ovens showing sliding doors, counterweights and motors being entered for preheating. The heater control switches can be seen on the brick wall

Rebuilding of GE-80 Motors

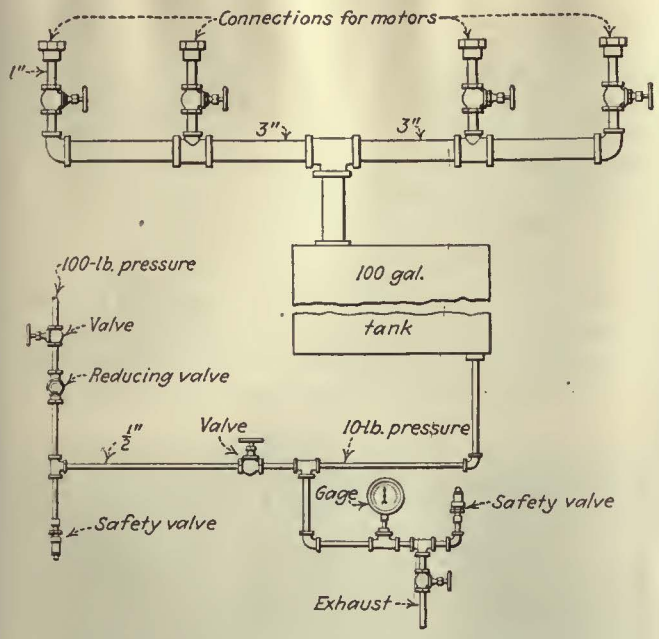
Early in 1902 twenty-eight double-truck cars with GE-80 four-motor equipments were put in regular service on the various divisions of the railway. The usual practices were followed in maintaining the bearings, and mileage was consistent with the grade of bearings used. However, in 1925 an epidemic of broken bearings resulted in a heavy increase in maintenance costs and a reduction in the mileage per bearing from approximately 80,000 to 15,000. After a careful study of the underlying reasons for the breakage it was determined that the cause was abnormal wear on the upper armature bearing housing, axle bearing housing and caps, which permitted the bearings to shift from their correct position.

Immediate steps were taken to prevent this bearing destruction and to restore the cost of maintenance to a normal basis. Although ample electric welding facilities were available for the building up of the worn parts, it was nevertheless found that there was no machine in the shop suitable for the boring process. A machine that had been used for similar work on another type of motor was purchased and a number of mechanical changes were made so that it would be suitable for the reboring of GE-80 motors. When these changes were completed and the machine was installed in its permanent location, plans were formulated and schedules arranged for a systematic rehabilitation of the entire group of motors.

Electric welding was used to build up the worn surface of the armature housing. This permitted a new bore $\frac{1}{4}$ in. less in diameter than that furnished by the manufacturers. This was done in order to avoid the purchase of heavy bronze bearings, thus effecting a substantial saving. The lighter casting fitted to the new bore has shown a large increase in mileage.

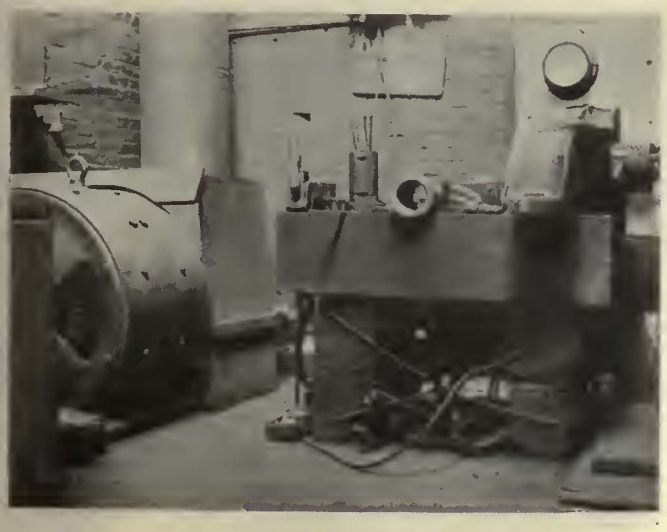
To correct the axle liner housing and cap wear, it was decided to build up the surface by electric welding to such a degree that it could be rebored to its original size. This was necessary because the axle linings used on these motors are designed with a wall only $\frac{1}{4}$ in. thick on account of being used on a 5-in. axle. The bearing would not have sufficient strength if the bore were decreased, as was done on the armature bearing housing.

The welding current was obtained from a 30-kw.



Arrangement of piping for painting motor frames and fields

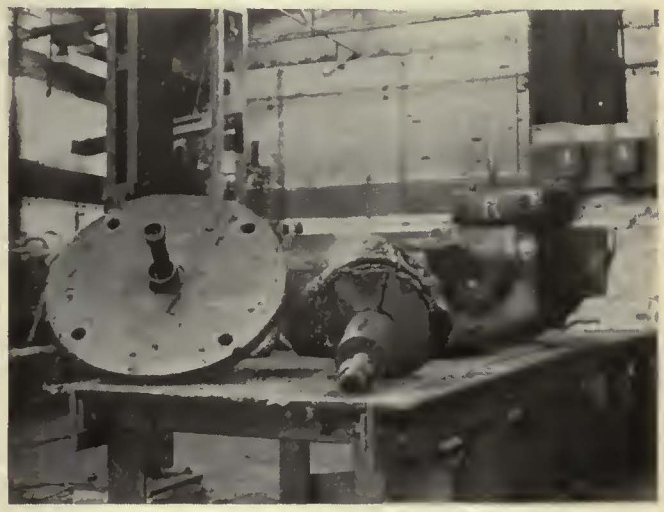
motor-generator set manufactured by the Allegemeine Elektricitäts Gesellschaft, the generator being designed to operate up to 65 volts and deliver a maximum of 460 amp. The motor operates from the 500-volt shop circuit. The welding metal was laid on the surface longitudinally, and the rough edges were later trimmed off with an electric motor-driven portable emery wheel. The motor frame was then ready to be finished in the boring machine. The cutting tools of this machine are attached to the ends of the boring bars, and the centers of these bars are adjusted to the axle and armature shaft bearing centers furnished by the motor manufacturer. Since the lower halves of the motor frames were not to be rebored, it was possible to install permanently the lower half of a GE-80 motor frame on the traveling bed of the mill in correct alignment. This simplified the set-up and eliminated the necessity of lining up each top half, it being merely bolted to the lower half. A cast-iron drum or jig was made up and installed between the two halves of the motor frame at the field poles. This assured the proper distance between the shaft centers and the field poles. This jig has a bronze bushing in the center through which the boring bar passes, eliminating whipping. Two wrought-iron braces were forged and bolted to the angle projection of the traveling bed to take care of the strain caused by boring all four housings at the same time. Holes were cut in the permanent half of the motor frame to permit snap-gaging the bores on the pinion end during the machining process. The regular openings provide a means for accomplishing the same result on the commutator end. The machine is driven by a direct-connected 500-volt motor.



Section of welding room showing generators of 30-kw. motor-generator set

Lubrication of Bearings

After careful consideration it was decided to adopt the Rico vacuum oiling system and make the necessary bearing housing changes to accommodate the apparatus while the motor frames were being rebored. This method was considered far superior to the former one, since the employee engaged in the lubricating and inspection of bearings is guided by a specified standard.



Field-coil assembly stand with finished motor frames and pinion-end connections for painting GE-80 and GE-210 motor frames. The built-up jib crane is also adjacent to bench

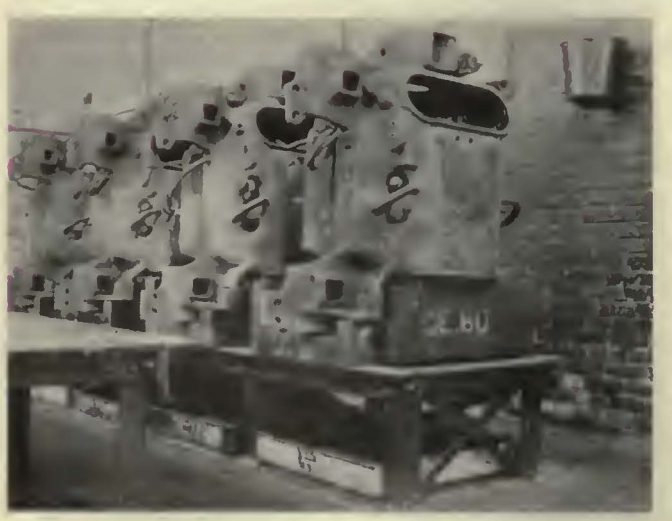
The opening in the armature bearing housing waste window had to be reduced to 1x3½ in., and a 1x3-in. slot was left in the housing. Plates ⅛ in. thick welded to the outer edges of the slots in an angular position in the waste chambers form a funnel which permits the oil-saturated waste to fall by gravity to the point of contact. Similar changes were made in the axle housing to accommodate the new oiling system. In addition to the change in the top part of the axle-bearing housing, the larger waste window in the axle cap was closed entirely by a ¼-in. plate welded to the sides. This permitted changing the design of the bearings so that the upper and lower halves of the axle liner would be identical and thereby interchangeable. This is obviously a great advantage; the greatest wear occurs on the top half of the bearing, because most of the weight is suspended through the top half to the axle and the pressure is increased when the motor is in operation in one direction.

After the various parts of the motor are welded and machined, they are stenciled with a number corresponding to the manufacturer's number appearing on the motor frame. This is done to eliminate errors in assembling motors with parts which have not been machined together.

Horizontal boring machine showing the two boring bars and upper half of GE-80 motor frame bolted to lower half permanently fastened to the traveling bed

After the boring process is completed the frame is removed from the boring mill and transported to the field assembly bench. The framework of this bench is made of 3x3½-in. angles and is 22 in. high, 30 in. wide and 12 ft. long. This framework is covered by ⅛x6-in. steel strips riveted to it. A built-up jib crane 25 ft. high is located adjacent to this bench and is designed with a 6-in. I-beam boom 12 ft. long that will handle the motors on this and the adjacent painting bench. The crane is made from 6-in. channels and tied together with ½x6x12-in. plates. The weight is carried on a pivot plate 12x12x¾ in. which is bolted to the floor and allows for free movement of the boom. The boom is reinforced with a 1-in. round iron rod fastened to one end and to the gaff. Adjustment is made by a turnbuckle. A 2-ton chain hoist and a 2-ton air hoist provide the motive power for lifting.

After the motor frame is placed on the assembly bench, it is blown out and cleaned thoroughly. The field coil seats are smoothed and all projections are removed. Then the frame is painted. Impregnated field coils are installed and bolted in place. Care is exercised to see that the field coil springs, oil canvas liners, side and top shields are in proper position. The connections are then

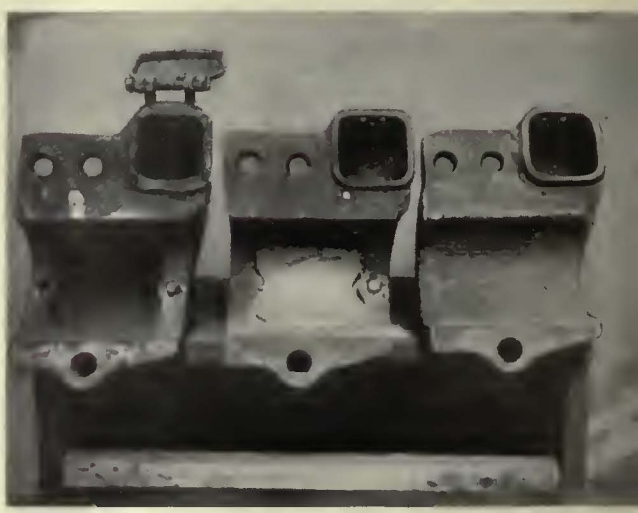


Painting stand with four GE-80 motors installed in vertical position ready for internal painting

made for internal and external use. The two halv of the motor frame are now bolted together and seal with a canvas gasket. All drain holes are plugged wi wood, and specially constructed casting with a 1-i pipe connection in its center is fitted to the pinion en The assembled motor frame is now ready to be tran ferred by a hand truck to the baking oven, where it heated at 100 deg. C. for about seven hours.

Construction of Baking Oven

The oven is made of furnace brick supported by a ste framework. It is 13 ft. 10 in. long, 10 ft. 2 in. wid 6 ft. high and is divided into two equal compartment The vertical walls are 9 in. thick. T-beams spaced



Three stages in changing the waste window of GE-80 axle c on left. Center, ¼-in. plate installed and ready for weldin Right, welding completed.

10-in. centers form the ceiling framework, which is fille in with firebrick. Each compartment is heated with 3 double coil electric heaters arranged in four circuits co trolled by individual switches. The front of each con partment is inclosed by a door made from No. 16 gag sheet steel. The space between the inside and outsid sheathing is filled with magnesia blocks. The doors a raised and lowered vertically and are counterweighte with a piece of 5-in. car axle suspended on a ¼-in. ste cable passing over pulleys. The end guide for thes doors is made of two angles that form a Z bar with plate bolted to it. The center guide is built up of tw plates with 1½-in. spacers, thus providing a double guid to accommodate both doors.

Painting Motor Frames and Fields

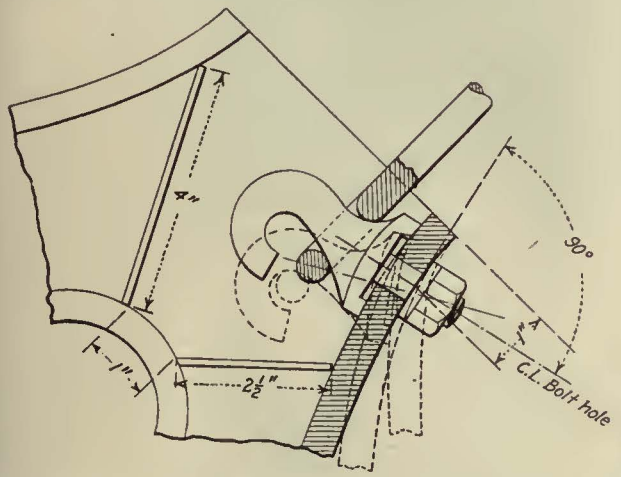
After the preheating the motor frames are remove from the oven and placed in a vertical position on a sp cially constructed rack. The pipe connection that wa inserted in the frame before baking is now pointed dow ward. This rack is adjacent to the field assembly stan Its framework is made from 3x3½-in. angles and is 17 i high and the same length as the assembly stand. Thi steel framework supports individual wood frames mad of oak, each designed to support one motor safely in vertical position. The stand will accommodate four mo tors. Directly under it and beneath the floor is a 100 ga tank in which the insulating paint is stored. A 3-i header extending the entire length of the rack is installe below this rack and is connected to the top of the tan

Vertical risers are tapped off of this header under each motor. A union connection and valve installed on the end of these risers permits connecting the motor to the paint supply pipe and controlling the paint outlets. The 100-lb. shop air line is connected to the bottom of the tank through a reducing valve, gage and supply valves. This air pressure is reduced to approximately 10 lb. When the motor frames are in their proper position and the pipe connections are made, the air pressure is increased in the tank, forcing the paint into the motor frame to a height above the field coils. The paint remains in the motor frame until its temperature decreases to about 20 deg. C., measured by a thermometer. Then it is drained back into the storage tank by releasing the air pressure.

Final Operations

When the paint is drained thoroughly the motor frame is disconnected and returned to the assembly rack. It is opened and all sealing material and fixtures removed from the pinion end. The laminated pole faces are now cleaned thoroughly with gasoline to remove excess paint and assure a clear surface. An overhauled armature with its newly-fitted bronze bushing is then inserted. Redesigned axle liners are placed at the same time and secured by the lower cap to keep them intact until they are placed in the truck. Next the completed motor is placed on the floor, and power is applied intermittently through a controller, the motor being run in each direction for several minutes. This makes certain that the bearings are fitted properly, that no undue heating will develop, and that the electrical work has been performed properly.

The painting equipment was developed for this property by the Fisk & Roberts management primarily to safeguard the fields against premature breakdowns. Some of the tracks are laid through a section which is not

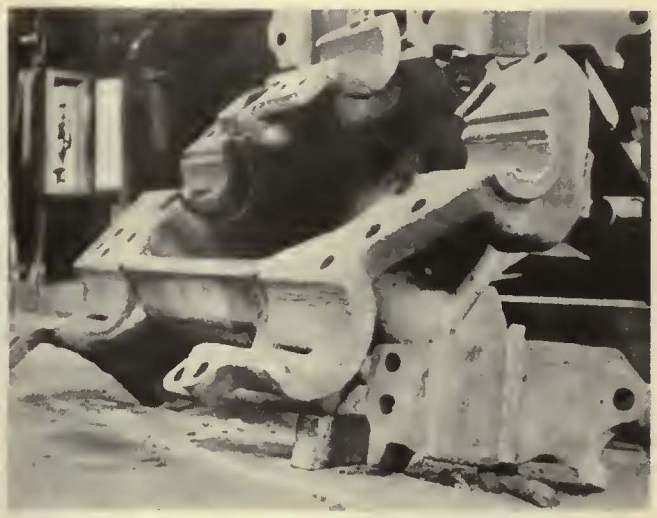


Sketch showing angular plates installed in armature bearing lining

drained. The result is that these tracks are often covered by water 4 to 10 in. deep. The painting process has practically eliminated failures due to this cause.

Overhauling GE-210 Motors

In 1910 twenty double-truck cars with GE-210 two-motor equipments were placed in service. Since then they have been operating continuously. Early in 1924 some wear developed in the armature bearing housing. We decided not to build up the housing as was done with the GE-80 motors but to rebore it to a large diameter and install an oversize bronze bushing.



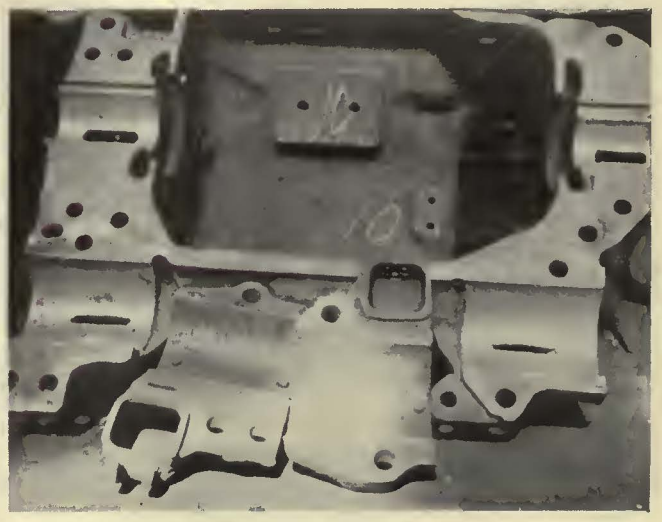
GE-80 bearing fits welded and ready for machining

Careful study was given to the fields of these motors, especially their support and painting. The field support originally supplied by the manufacturer was abandoned and a spring support substituted. This change was made to obtain a fixed tension on the field coil between the upper and lower points of contact. Prior to this change a number of field coils loosened, caused by the drying out of the insulation material. They worked about so that the insulation became worn and finally the field grounded. To install the new spring support it was necessary to cut away a portion of the old one and use it between the pole pieces and the motor frame. This had to be done to obtain the proper air gap. The remaining portion was discarded and a spring substituted that maintains a constant tension in the field coils at all times. As a result, the insulation wear caused by loose fields is eliminated.

After this field work was completed the pinion end of the motor was provided with a fixture having a pipe connection, all holes were sealed, and the same procedure followed as with the painting process on the GE-80 motors.

Overhauling of Armatures

All GE-80 armatures are inspected carefully and, where necessary, they are rebuilt complete with new shafts, coils and commutators. After an armature core



GE-80 bearing fits machined and ready for bearings

leaves the machine shop the slots are either filed or ground smooth with an emery wheel. Next the end bells are insulated with shellacked red pressed paper. Then fabric impregnated with an insulating compound is placed over the red paper and the coil slots insulated with fish paper. After this the new coils are installed in the slots, being paraffined liberally to eliminate unnecessary pounding and prevent short circuits. A piece of fish paper is placed between the upper and lower coils, and mica is inserted at the end of the slot against the edge of the laminations to prevent the coils from being injured at the point of exit from the slot. The coil ends are then inserted into their proper commutator ears.

Heating of the commutator for soldering is done by a gas flame that is directed on a remote section. When the soldering is completed the winding is again tested for grounds, open and short circuits. The armature is next removed to the banding lathe, where temporary bands are put over the flat steel plates installed on the top of each coil. This assures that the banding pulls the coils well down into the slots. The armature is then placed in the baking oven and heated at a temperature of 120 deg. C. for three hours. Afterwards the temporary bands are removed and permanent bands put on. This metho banding draws the coils into a solid mass, prever movement which usually results in an open circuit. A the banding, the armature is returned to the oven t baked for four hours at a temperature of 120 deg. C is then taken out of the oven and placed in the ban lathe and thence revolved in a bath of insulating p and paint is poured liberally into the coils. After the armature is baked for 30 hours at 120 deg. C evaporate all moisture. It is then fitted with new a ture bearings and placed on a rack until needed service.

This plan of motor rehabilitation has reduced maintenance costs to a normal basis and has resulte about 1,000 per cent increase in bearing mileage an per cent reduction in electrical failures. This reha tation was one of the important features of the prog adopted by Fisk & Roberts in resuscitating this prop Its successful outcome is recognized as an important tor in present operation, particularly the maintenanc regular schedules, and is a contributing cause of healthy increase in patronage now coming to the car this company.

Some Equipment Maintenance Notes from Atlanta

WHEN controllers are overhauled in the shops of the Georgia Power Company, Atlanta, Ga., all parts are sand blasted and cleaned, after which worn parts are renewed and put in perfect condition. The sand blasting method of cleaning has proved of great advantage. Motor rehabilitation includes the cleaning and repainting of all parts. Fields are taken out and reinsulated, dipped, baked and tested. Trucks are dismantled so that all worn parts can be inspected regularly. Compressors are overhauled every eighteen months and air-brake equipment is cleaned on a six months program.

Systematic inspection of various car equipment parts is facilitated by the report and record system. Each conductor or operator makes a daily record which embraces the performance of the car from the time it leaves the carhouse until its return. The superintendent of equipment receives the statements and uses them as a basis for his inspection procedure. As a result of this method motor troubles have decreased considerably. There were but twelve in 1926 as compared with 271 in 1921, or a 95.6 per cent decrease. There were a total of 331 hot journal troubles in 1921, and but seven in 1926. Hot armature bearings have been reduced from 45 in 1921 to three in 1926.

Other interesting figures show a decrease in controller troubles to 21 in 1926 as compared with 292 in 1921. Brake slack adjusters and other improvements incorporated in the new cars have reduced brake failures. There were 397 in 1921, and only 26 in 1926. In addition to the installation of slack adjusters PV brake valves were installed and all brake cylinder packing leathers were renewed.

In connection with one-man car operation there was at first some complaint of stiffness of brake valves which was found to be due to the system of lubrication. This was remedied by the installation of Dot pressure lubricators. These were placed on top of the valve stem. On four-motor cars, line breakers and LB type contro handles have been installed, which has eliminated fl overs from the platform controller. The line bre equipment is designed so that the controller handle r be stopped on the first point during acceleration. minum cell-type lightning arresters have replaced type arresters and have reduced damages from light from 1533 in 1921 to 0 in 1926. Behind this 100 cent new car and rehabilitation program is a thorou modernized car shop.

Recently, a new method of car cleaning has been in duced by which the units are cleaned without the neces of bringing them into the carhouse. Cars are dry wi instead of being washed and waxed. Commencing the first of 1927 the company reduced its car pain interval from 24 months to 20 months. Cars are wa every six months and are swept and cleaned every they return to the carhouse.

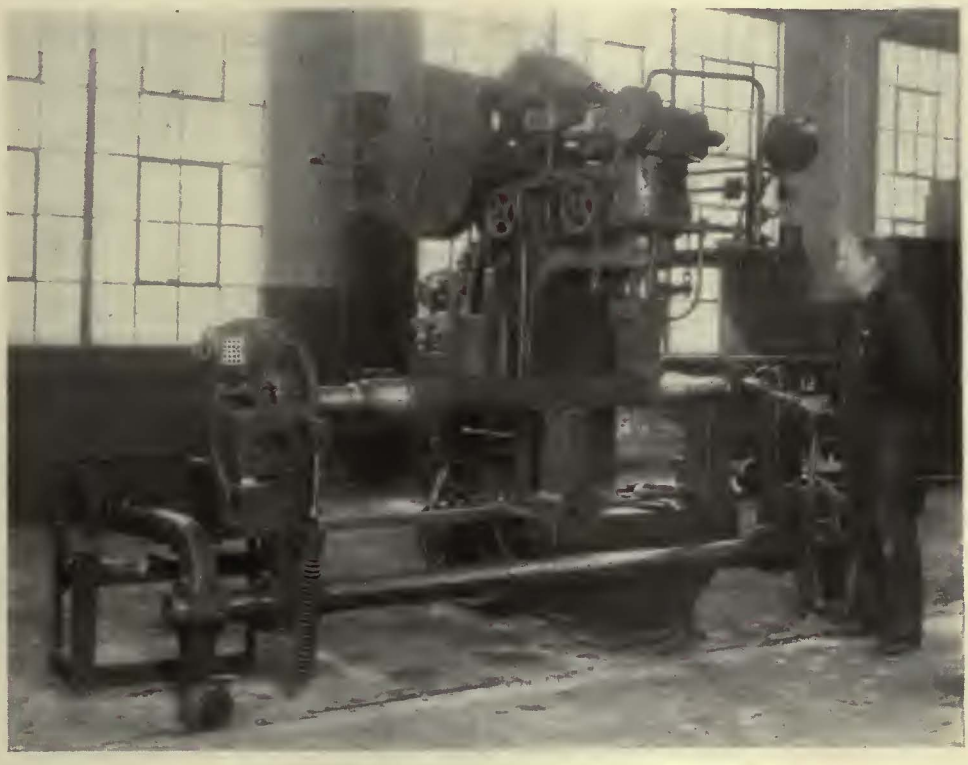
Additional saving has been brought about by instal Economy meters on all units at an installation cos $27,000. Operation was begun in February, 1926, wh resulted in saving of energy at the car of 2,950, kw.-hr. which translated into operating expense i saving of $30,000. During the first month that th meters were in operation, that is, February, 1926, consumption of energy per average car-mile was redu 4.13 per cent below the amount consumed prior to date, and in December, 1926, due to increased interes the part of the personnel, there was a 13.10 per cent crease in the amount consumed as compared to the pe prior to meter installation.

As another economical adjunct to the car operat a new 12 cu.yd. sand car with a 160 cu.ft. compres and other equipment, has been introduced. This mounted on an old express car. The tank is filled gravity from the dry sand bin and is unloaded by co pressed air into elevated tanks or bins at the carhouse

Wheel, Gear and Axle MAINTENANCE in Brooklyn*

For efficient maintenance of these parts on the Brooklyn-Manhattan Transit lines, the most modern machine tools have been installed in the Coney Island shops. Careful grouping of machines eliminates rehandling

By *Clarence W. Squier*
Associate Editor *Electric Railway Journal*



Every axle that does not go to the grinding machine for truing is tested at the 200-ton hydraulic press. If bent, this machine provides a quick means for straightening

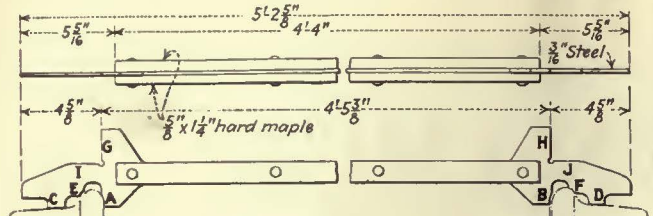
DUE to the large volume of wheel, gear and axle inspection and repairs on most electric railways, and to the necessity for repeating maintenance operations continually, the work is placed on a production basis more often than other railway maintenance procedures. As a result it is quite common to find wheel and axle work done in sections of the shop set apart for this purpose. The wheel press, boring mill, axle lathe and wheel lathe universally used for this work are usually grouped to eliminate unnecessary handling. With the advantage of a new shop at Coney Island with new machine tools, the mechanical department of the Brooklyn-Manhattan Transit lines has been able to perfect a most effective department for this work.

The wheel and axle department occupies a section of the shop 60x200 ft. Not all of the machine tools for which space is provided have been installed, but when completely equipped the department will include the tools listed in the accompanying table. A large section just east of the shop provides convenient open departmental storage for wheels, axles and shafts. This material is handled by overhead electric crane and electric crane trucks through doorways directly to boring mills or lathes for the machine work. Mounted wheels that come from the truck overhauling or repair departments are handled by overhead crane and enter and leave the section at the wheel lathe end. The entire department is also served by a 7½-ton overhead traveling crane, while groups of machines have jib cranes, there being four of these in the department, each having an 18-ft. boom.

**This is the third article on methods used and equipment installed in the Coney Island shops of the B.-M.T. Corporation. Others were "Truck Overhauling," published April 21, 1928, and "Intermediate Truck Repairs," published May 5, 1928.*

Handling Reduced to a Minimum

The number of times that wheels and axles are handled and the amount of handling equipment has been kept to a minimum by particular attention to location and grouping of machines. Wheel boring is done in the central



Wheel mounting and check gage

When mounting new or newly turned wheels after one wheel is pressed into position, the stop *A* or *B* of the mounting gage is placed against the inside of the flange of the wheel pressed in position and the corresponding tread stop *C* or *D* against the tread of the wheel. The second wheel is pressed onto the axle until the opposite tread stop comes in contact with the tread with the corresponding gage point *E* or *F* in contact with the outside of the flange.

For mounting partly worn wheels after one wheel is pressed into position, the stop *G* or *H* of the mounting gage is placed against the side of the flange of the wheel with the corresponding surface *I* or *J* resting on the top of the flange. The second wheel is then pressed onto the axle until the opposite stop *G* or *H* comes in contact with the inside of the flange of the wheel.

In checking wheels when both stops *C* and *D* will not rest on the treads of the wheels, they are out of gage.

part of the section. Each of the Sellers 48-in. car wheel boring machines has two built-in jib cranes. While one wheel is being bored another is picked up and held in position by one of the cranes to be swung on to the table of the mill, as soon as the boring of the wheel in the mill is completed. The other jib crane with the previously finished wheel in suspension deposits it on a truck placed alongside.

From the boring mill, wheels to be mounted on axles go to the Chambersburg Engineering Company double-acting, 400-ton, hydraulic wheel press. This machine is used also to press gears on and off. The double pressure heads make it possible to dismount both wheels from a trailer axle without the necessity of removal, after one wheel is pressed off, in order to turn the axle for pressing off the remaining wheel.

Hydrograph chart records are kept of each pressing-on operation. These are numbered consecutively for each day's work, and a notation is also made on each record of the wheel number, the man that fitted the wheel, and the diameter of its bore. Each day's records are put in an envelope and filed by dates. If it is necessary to consult the records for a particular wheel pressing later, the truck overhauling report furnishes the date wheels we changed and number of the wheels. The hydrogra records for that date with wheel number identify the pa ticular operation. In addition, a book record for ea pressing is kept at the press. When filled these boo are filed.

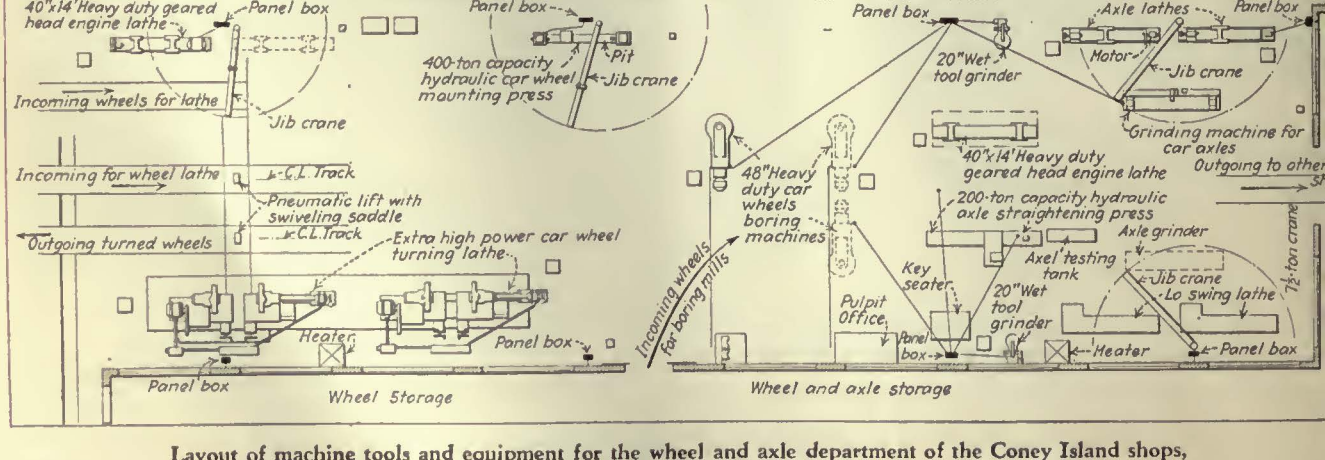
Subway motor axles have a seat for wheels $7\frac{7}{16}$ to $7\frac{5}{16}$ in. in diameter, and trailer axles have a wheel se of $6\frac{1}{2}$ in. to $6\frac{3}{8}$ in. in diameter. Pressures for forci wheels on must be not less than 75 tons nor more th 95 tons for motor axles, and between 70 and 90 tons f trailer axles. The wheel seat for a standard subw axle may vary 0.001 in. plus or minus. Wheels are bor 0.001 in. per inch of diameter smaller than the axle. Tl gives a pressing-on pressure of from 10 to 12 tons p inch of diameter. Complete information regarding whe and axle fits for the different equipment in operatic pressing-on pressures, mating of wheels, scrapping dia eters, etc., is furnished the wheel and axle department blueprint form.

Machine Tools for Wheel and Axle Section of Coney Island Shops

Two extra high power wheel turning lathes.
Three 48-in. heavy-duty wheel boring machines.
One 400-ton hydraulic wheel-mounting press.
One 200-ton hydraulic axle-straightening press.
Three 40-in. x 14-ft. heavy-duty geared-head engine lathes.
Four 8-in. LoSwing axle lathes.
Two 12x96-in. grinding machines for axles.
One external key seater.
Two 20-in. wet tool grinders.
One axle-testing stand with tanks.

In mounting wheels it is the practice to have bo wheels on the same axle of the same tape size. A spec type of gage is used for gaging wheels. This has o side for gaging new and newly turned wheels and t other for gaging partly worn wheels. New and new turned wheels are gaged from throat to throat, wh worn wheels are gaged from back to back.

As the wheels used on the rapid transit motor ax have diameters ranging from $30\frac{1}{4}$ in. to $34\frac{1}{4}$ in., and gea have outside diameters of 25 in. to 27 in., it is possil to support the wheels at the rim for pressing off. A c cular yoke has been supplied by the manufacturer of t press to go over the outside of the gear and fit betwe the rim of the wheel and the center frame of the pre



Layout of machine tools and equipment for the wheel and axle department of the Coney Island shops, Brooklyn-Manhattan Transit Lines

during the pressing. The yoke is suspended from a pipe framework with a roller support so it can be put into position or swung out of the way easily by the operator.

The Brooklyn system was a pioneer in the use of steel wheels for electric railway service, adopting them in 1905. Excellent results and substantial economies have been obtained. By concentrating all wheel and axle work at one point, under the direction of one man, every mile of service consistent with safety is obtained from the wheels.

Checking for Wear Systematized

The different maintenance foremen are expected to see that the wheels are worn to, but not below, the various scrapping dimensions which are furnished them in blueprint form for their guidance. New wheels for subway motor axles are 34¼ in. in diameter and can be worn to 30¼ in. Subway trailer wheels are of 31 in. diameter when new and can be worn to 27 in. When the wheels removed from the trucks are received in the wheel shop, they are checked carefully with gages to ascertain dimensions and defects. An inspector also checks the axles carefully and measures them to determine whether truing up is needed and also to make certain that the bearing fits on the trued-up axles are above the scrapping limit. If a bearing fit will not true up above scrapping dimensions the inspector paints it red and the wheels and axle are routed to the wheel press for removal of the wheels. The same inspector who inspects bearing fits also determines whether the wheels can be returned to service and indicates any work that is necessary. If it is found that the wheel will not true up to ¼ in. above the scrapping limit it is marked for removal.

At top—Boring out a subway wheel. The wheel suspended from the crane on the left is ready to be swung into position. A truck at the right receives wheels after they are bored. The crane at the right handles finished wheels

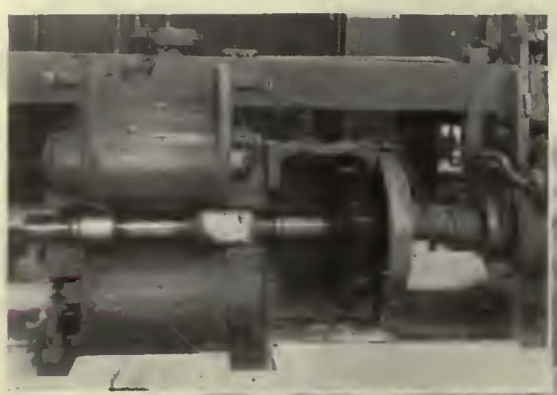
At left—A truck load of finished wheels being taken away from the boring mill by an electric crane truck

For steel wheel maintenance work the wheel lathe is an important and busy tool. At present, one high-powered lathe is doing the work. This was supplied by William Sellers & Company, Philadelphia, Pa. Three pairs of wheels per hour are turned out, on an average . Handling of the wheels is speeded up considerably through the use of pneumatic floor lifts and a hoist which forms a part of the lathe. The lathe has two turret tool posts, each arranged to hold four tools. There is a roughing tool for the wheel tread, a flange roughing tool, a combined tread and flange finishing tool, and a chamfering tool. The lathe swing is 42 in. and a ⅜-in. cut can be made at high speed. Through the use of an efficient clamping arrangement, wheels can be removed and new ones put in place for turning in two minutes. Only one man and a helper are assigned to the lathe. The helper assists in wheel handling, sweeps up chips, oils the machine, takes wheel measurements and does other work necessary while the wheels are being turned.

The wheels are rolled directly into position in the lathe on a track. Crossing this at right angles are two tracks used for the incoming and outgoing mounted wheels. There are two pneumatic floor lifts, one in the center of each crossover. The helper rolls a mounted pair of wheels along the incoming track to the crossover, steps on a button controlling the valve to admit air to the hoist cylinder of the lift, and the plunger raises the wheels free of the track. The wheels are rotated a quarter turn and then are lowered to the track leading to the lathe. The action is reversed to remove a pair of wheels after turning. This has proved a very easy and quick method for serving the lathe.

Each axle is carefully inspected and tested to detect any minute cracks that would be liable to result in breaking later. The axle, with its wheels in position, is wet with a bath of kerosene while on a test stand. The axle is then wiped dry and is painted with a paint of lime in a solution of one-third alcohol and two-thirds water. The alcohol causes the mixture to dry quickly. After numerous tests, this proportion was found to give a smoother coating than any other combination or composition. A crack retains some of the kerosene. This penetrates the lime coating quickly and leaves a brown discoloration so that detection is easy. Axles without wheels are dipped in kerosene and then wiped dry and painted with the lime. An accompanying illustration shows a crack at the end of an axle that was detected by this method. To get

an idea of the depth of the crack the axle was turned down to the different diameters shown. Since this method of inspection was adopted no axles that have undergone this test have broken in service. It has been in use about 1½ years. After testing, axles with wheels mounted are stored on racks to keep them off the floor until they are removed to other departments or shops for mounting in trucks. Wheel racks have four 3x4-in. angles arranged in pairs, each pair spaced wheel gage distance apart. The angles are fastened together by steel straps to form a rigid framework. Alternate pairs of wheels are staggered so as to take up a minimum amount of room. Each bearing seat has a protective covering, made of a number



At top—A yoke fits between the inside of the wheel and the center frame of the press over the outside of the gear for pressing off wheels from the gear end of the axle.

Center view — Pressing a wheel on an axle at the 400-ton hydraulic wheel press.

At bottom—The yoke used in pressing off wheels at the gear end of the axle and other accessories used in the pressing operation are mounted at the back of the press so as to be swung into position easily by one man.

of wooden strips strung on small ropes. Each strip is about 1 in. square and of a length sufficient to cover the bearing surface. By tying the loose ends of the ropes together the covering is held securely.

Bearing seats which are worn tapered, out of round, cut or have rough fillets are turned in a gap lathe. For this work with wheels in position, two heavy duty American 24-in. by 14-ft. geared head engine lathes are used. The bed of the lathe has two gaps for the wheels, the swing in the gaps being 40 in. Each lathe has two carriages, one with two tool posts. With this equipment the two motor suspension axle bearings and one-truck journal bearing can be trued up at the same time.

New axles have bearing seats ¼ in. in the rough over size when received from the manufacturers. They are turned and ground to accurate sizes in the wheel and a department. For this work there are two groups of th machines each. In each group there are two 8-in. L Swing axle lathes and one 12x96-in. grinding mach Bearing fits are turned in the lathe to a size 0.015 in 0.018 in. larger than standard. They then go to grinding machine and are finished accurately to ex size. The Low-Swing lathes were furnished by the S eca Falls Machine Company to be used for axle armature shaft turning. Their beds are 108 in. lo There are two carriages with three tool posts on each that six tools can be used for cutting on the same p at one time. As a result of the use of these rapid p duction lathes the time necessary to finish axles has b reduced to one-fourth of that necessary with ordin engine lathes.

An accompanying illustration shows one of these lat

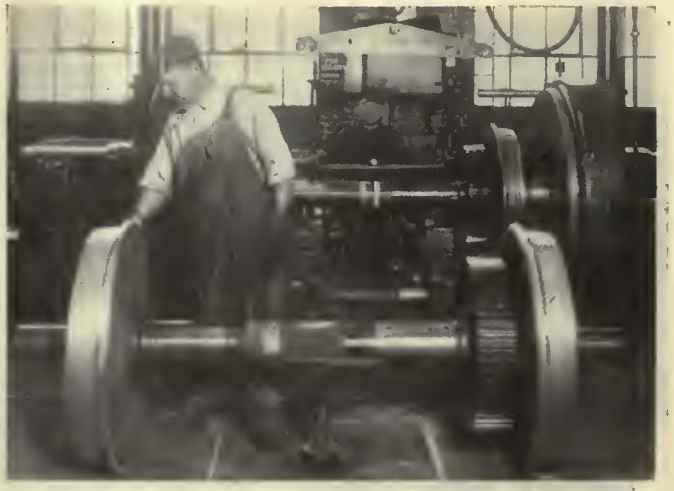
turning a large subway car axle. The various finish fits for this type of axle are, journals 5x9 in., dustgu surfaces 6⅛x2 in., wheel fits $7\frac{7}{16}$x6½ in., gear se 7½x6⅛ in., and axle bearings 6½x12¾ in. The total len of the axle is 7 ft. 1 in. With the improved lathe equ ment this size axle is turned ready for grinding in average of three hours. With the single-tool lathe or narily used, the machining operations on an axle of t size would require at least three hours for rough finishi and an additional nine hours for finishing cuts. P viously two different lathes were used, one for rough and the other for finishing, so it was necessary to cha the axle from one to the other.

In addition to provisions for multiple tools cutt simultaneously, this type of lathe has a geared headst

providing for six spindle speeds and a geared feed with nine changes. The geared headstock is rugged, so as to withstand the severe strain imposed upon it when several tools are taking heavy cuts. The clutch for starting and stopping the machine is on the driving pulley shaft and is operated by the shifter rod placed above the table. In order to obtain rigidity the tool holders are clamped directly to the carriage casting itself, which, in turn, bears directly on the bed of the lathe. This eliminates numerous intervening parts in the supports for the cutting tools and avoids possibility of vibration. The cutting tools do not extend across the bed of the lathe, so that the carriage can be run past the tailstock or back rest without moving the tools from their position. A geared pump built into the head of the lathe provides a continuous flow of cutting compound. The volume of axle work in the Coney Island shops permits the lathes to be kept busy continuously.

Finishing of axles by grinding, which is coming into quite extensive use, has been adopted in the Brooklyn shops. Landis 12x96-in. grinders are used. There is a saving of approximately 25 per cent in the time taken to finish axles as compared with that when they are finished in a lathe. There is also greater accuracy of dimensions and smoothness of finish, so that longer life of bearings results. Where wheels or gears are to be pressed on axles, the grinding finish produces more uniform pressure for the pressing and the grinding finish eliminates irregularities common with filing or rolling, so due to the smoother surface there is a better fit and more surface area in contact between the wheel bore and the axle. This method is also of advantage in producing a better fit of bearing so that the pressure per square inch is reduced. As the pressure employed in grinding is not great, there is little danger of particles of emery becoming embedded in the surface of the axle, and all loose particles are washed away with the heavy flush of water used. Axles without wheels that have surfaces to be trued up go to the grinding machine. Those with wheels mounted go to the gap lathes for truing.

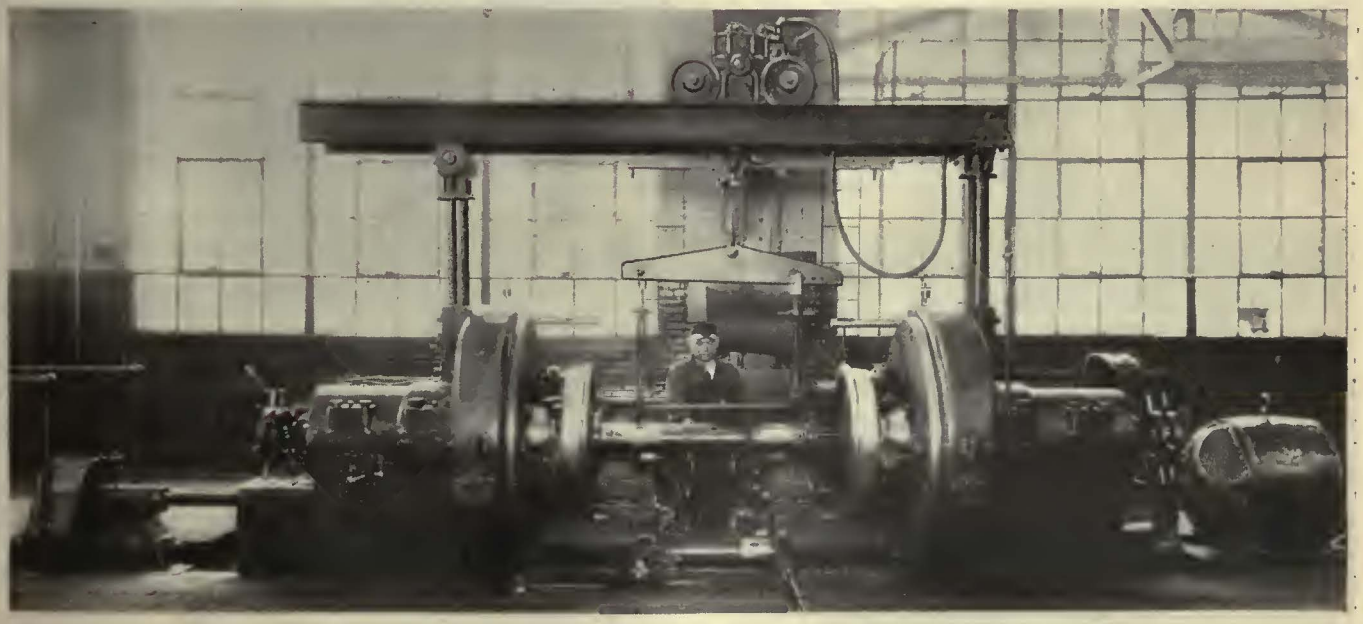
The 200-ton hydraulic axle-straightening press forms an important part of the equipment for the axle section. Every axle without wheels that does not go to the grinder goes to this test machine to determine if it is bent. If so, the straightening becomes an added part of the maintenance procedure.



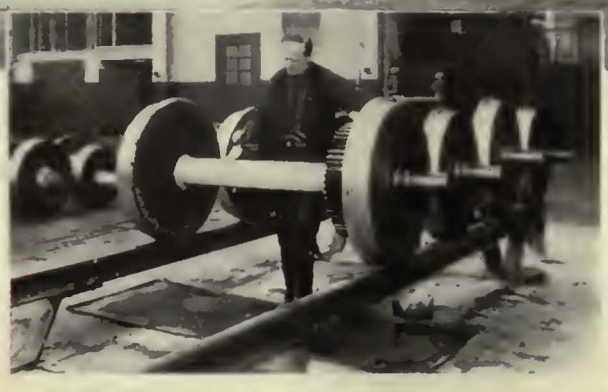
Pneumatic floor lifts provide a convenient means for turning wheels from the incoming and outgoing tracks to that serving the wheel lathe

Besides the machine tools, the axle section contains a large number of portable axle racks. Each will hold seven axles with gears mounted and they are placed at convenient locations so that the jib crane which serves one of the various machines can deposit an axle in one of these racks after it is turned and is waiting to go to the grinding machine. After grinding the same jib crane handles the axle to another rack, or an individual axle can be picked up by an overhead traveling crane and taken to another section as desired.

These axle racks are constructed of angles and channels. The ends form a triangle. Two 12-in. channels form the top portions of the ends. To these, 6-in. angles are riveted to form the support for the ends of the axles. To prevent injuries to the axles the faces of these angles are covered with $\frac{1}{8}$-in. copper. Gusset plates strengthen the framework at all corners. The complete rack is 5 ft. wide and 8 ft. long. The bottom framework is constructed of 4-in. angles, with a plate at each corner. These are 6 in. wide and $\frac{1}{2}$ in. thick and have holes so that tackle can be fastened to lift the entire rack with load by



An average of three pairs of wheels per hour are turned in this wheel lathe



Rapid Transit Service Requires Careful Checking and Testing of Wheels and Axles

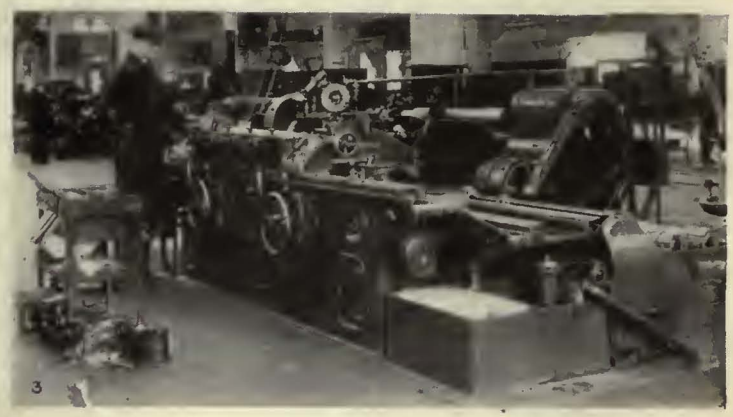
At top—All axles are tested carefully for cracks before being sent out from the wheel and axle department. The axle of the pair of wheels on the stand at the left has just received a bath of kerosene. Axles of mounted wheels on the track at the right have been painted with lime as the second operation of the test.

Second view—Painting the axles of mounted wheels with lime on the test stand.

Third view—Crack at the end of an axle. The turned sections show the depth and width of the crack at different depths.

The bearing fits of axles are protected by wooden strip coverings. These are shown at the right.

View at the bottom shows mounted wheels ready for service are placed on racks to keep them on the floor.



Equipment for Axle Work

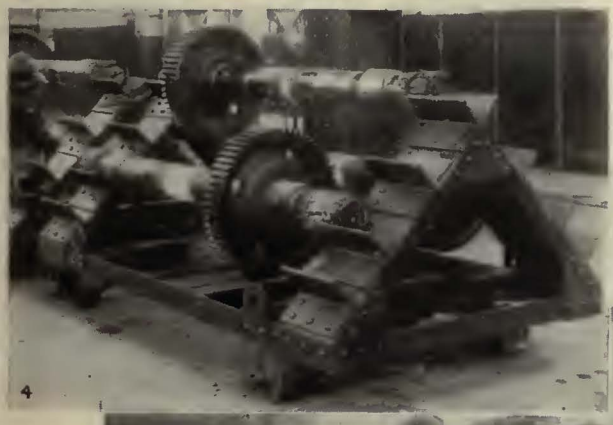
1. One of the batteries of three machines used for finishing axles. Two Lo-Swing lathes are shown in the foreground and an axle grinding machine in the rear. Between these are axle racks to receive axles in various stages of completion.

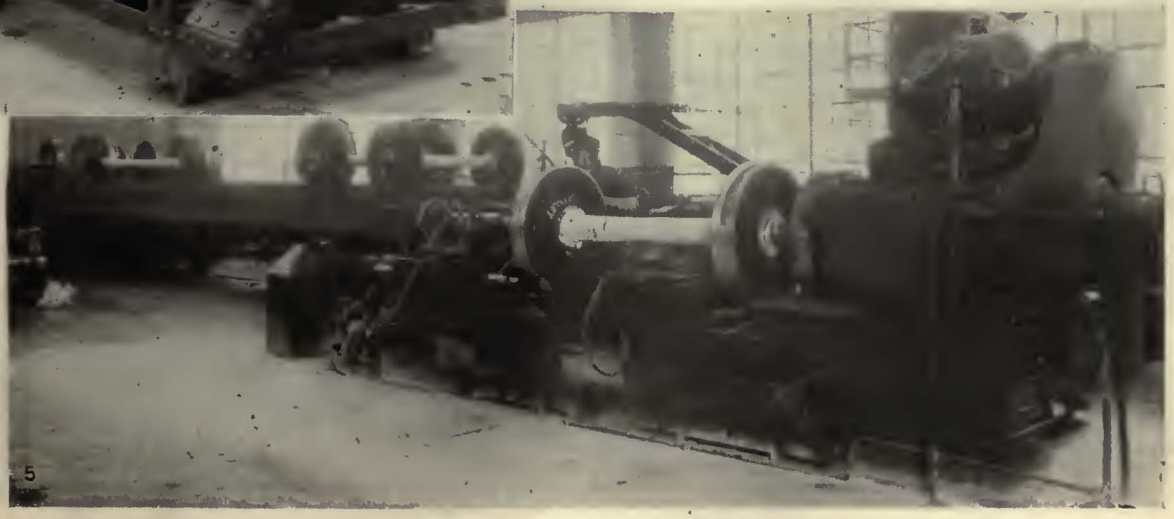
2. Turning an axle in one of the 8-in. lathes with two carriages having multiple tool posts.

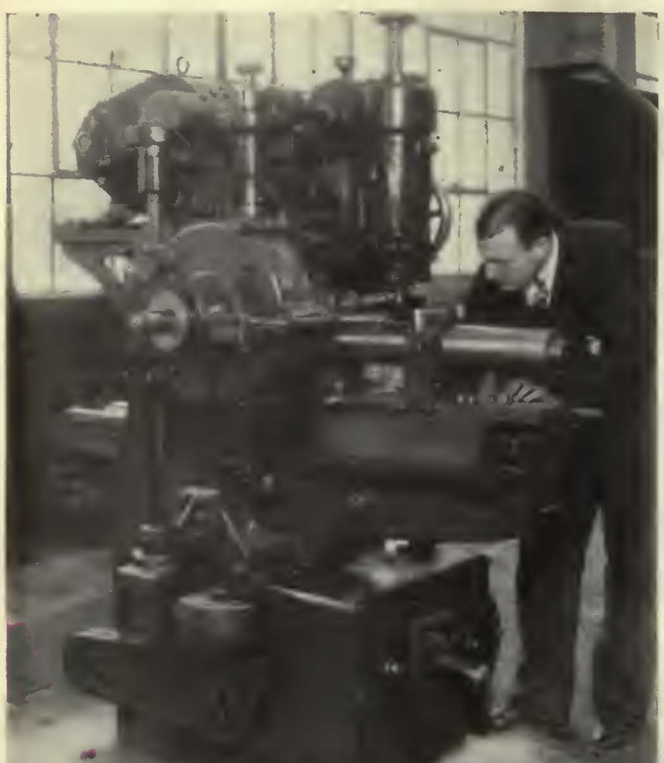
3. The finishing operation of axles is done in a grinding machine.

4. Portable axle racks provide a convenient means for storing axles.

5. High-power gap wheel turning lathes are used for turning axle bearing fits with wheels mounted. A supply car is shown at the left as it is being loaded with wheels to go to other shops of the system.







An external keyseater for armature shafts forms a part of the equipment of the wheel and axle department

an overhead traveling crane if desired. As the racks are fitted with wheels they can be moved with their load of axles. The wheels are of 8 in. diameter and have a 4-in. face. The front axle is constructed of a 4-in. I-beam and has a center bearing and circular side bearings so that it can swivel for turning sharp corners and moving about.

Maintenance work on wheels and axles for the entire B.-M.T. lines is done at the Coney Island shops. There are three other shops where wheels and axles are removed and installed. A wheel supply flat car makes daily trips to and from the shops. Handling of wheels mounted on axles at the Coney Island shops is facilitated by providing a track into the wheel and axle section so the car can be run inside and loading and unloading done with the overhead traveling crane. The top of the wheel supply flat car has wooden blocking bolted permanently in place to keep wheels from rolling while in transit.

The wheel and axle section also does the finishing work on new armature shafts. A Mitts & Merrill external key seater is used for cutting keyways in shafts.

Rails Replaced Without Disturbing Ties

By W. L. Lewis
Engineer Erie Railways. Erie, Pa.

IN THE summer of 1927 the Erie Railways found that the rails on West 18th Street, Erie, Pa., needed replacing while ties, paving, etc., still remained in good condition. This track had been rebuilt in 1915 on a 5-in. solid concrete base with a new 4-in. wire-cut lug brick pavement. At that time all new material was installed except the rail, which was relaid after the ends were cut off. After considering cost of reconstructing this stretch of track it was decided to remove the old rail and lay other rail in its place on the existing substructure. Due to several small abandonments of track the company had some very good 7-in., 80-lb. plain girder relayer rail on hand which it decided to use.

The work as carried out consisted of first digging a trench on each side of the rail. The old rail was removed and all dirt was cleaned out. The ties were also

A convenient departmental storage for wheels and axles speeds up production. Material can be brought in on a car and unloaded by the overhead 7½-ton traveling crane. Wheels are loaded on small trucks and taken to the wheel and axle department by electric crane trucks

cleaned carefully and where mechanical wear showed at the joints they were adzed carefully to a true surface. Upon the clean ties 8x12x3-in. white oak blocks S-2-S were laid with staggered holes drilled for spiking, the staggering being reversed from the original. A special cut spike was used $8\frac{1}{2}$x$\frac{5}{8}$-in. instead of the $5\frac{1}{2}$x$\frac{9}{16}$-in. standard. This gave the same length of spike in the tie and as the ties were all in first-class condition and to a perfect surface the rail lined up advantageously.

After the track was lined up and spiked thoroughly amesite was tamped with bar tampers under the base of the rail between the ties. Then by the use of 2x6-in. forms to keep the concrete away from the rail, the excavated portion was filled in with concrete to within 5 in. of

Track on West 18th Street before reconstruction was started

the top of the rail except a portion about 7 in. wide, which was kept open to the base of the rail by the forms. This was filled in with amesite after the concrete had set and was bar-tamped thoroughly to the top of the rail. After this the whole top surface between the rails and to the pavement outside the rails was filled with amesite and rolled. The ties cut their own flangeway.

This job was watched closely during the past winter, which was exceptionally unfavorable for track construction, there being heavy snows with sudden thaws and freezes. Together with the adjoining pavement the work has stood up well and a considerable amount of this type of reconstruction is contemplated during the coming season. The accompanying table shows the cost of the reconstruction:

COST OF RECONSTRUCTING TRACK ON WEST 18th STREET, ERIE, PA.

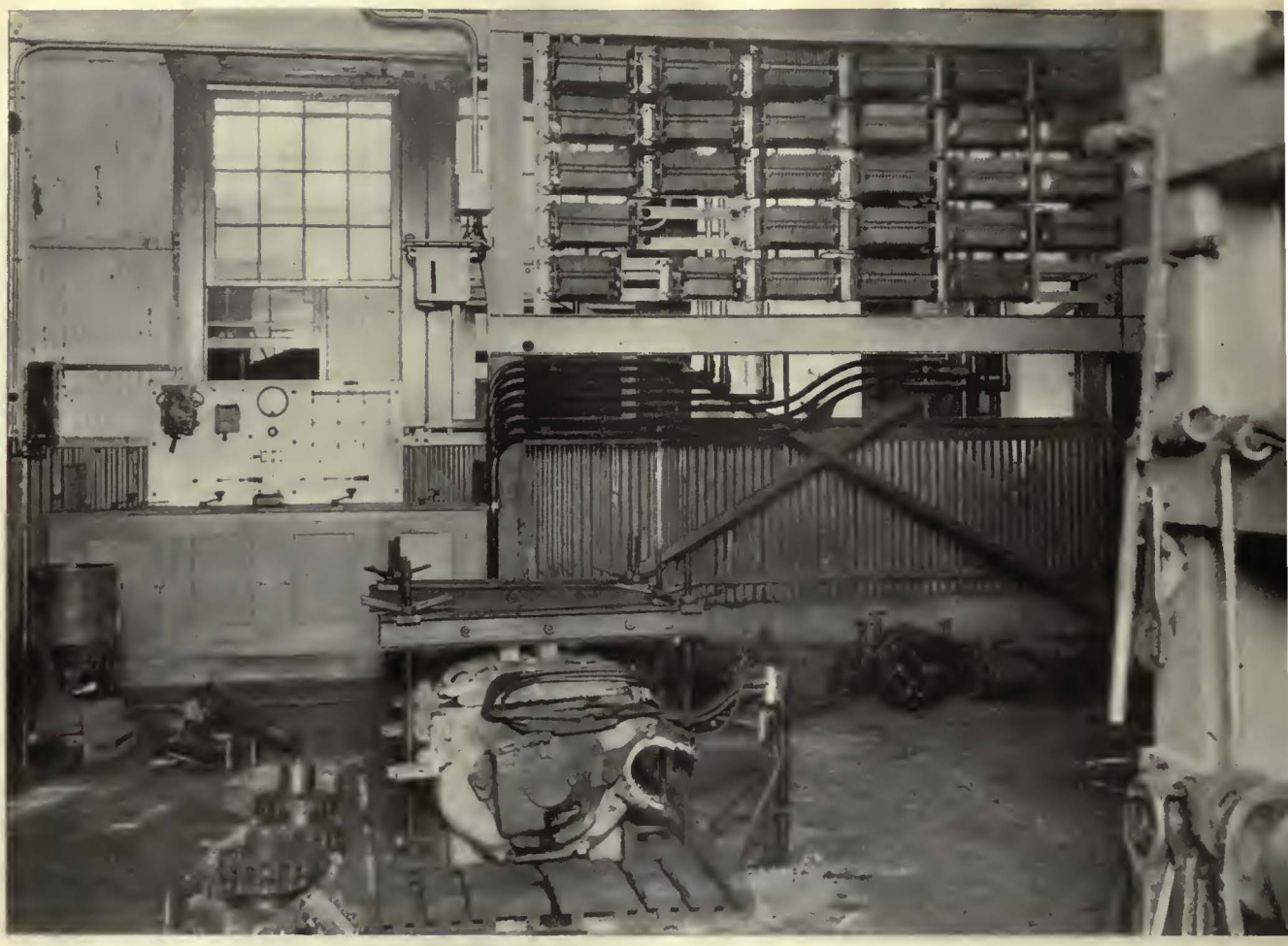
Class of Work	Cost	Class of Work	Cost
Grading	$403.34	Paving	1,379.59
Ties	268.32	Miscellaneous	21.20
Rails, etc	859.16		
Track labor	256.26	Total	$3,187.87

The item for paving in the table appears high. This is because the cost of the amesite used in tamping under the rail was charged to this account. Eight hundred and fifty feet was relaid with this type of construction by nineteen men and a foreman in nine days. The cost per lineal foot was $3.75. While this is not exceptionally low for the job, it is felt that the cost is justified by the results achieved, as it is expected that at least ten years' additional life will be obtained.

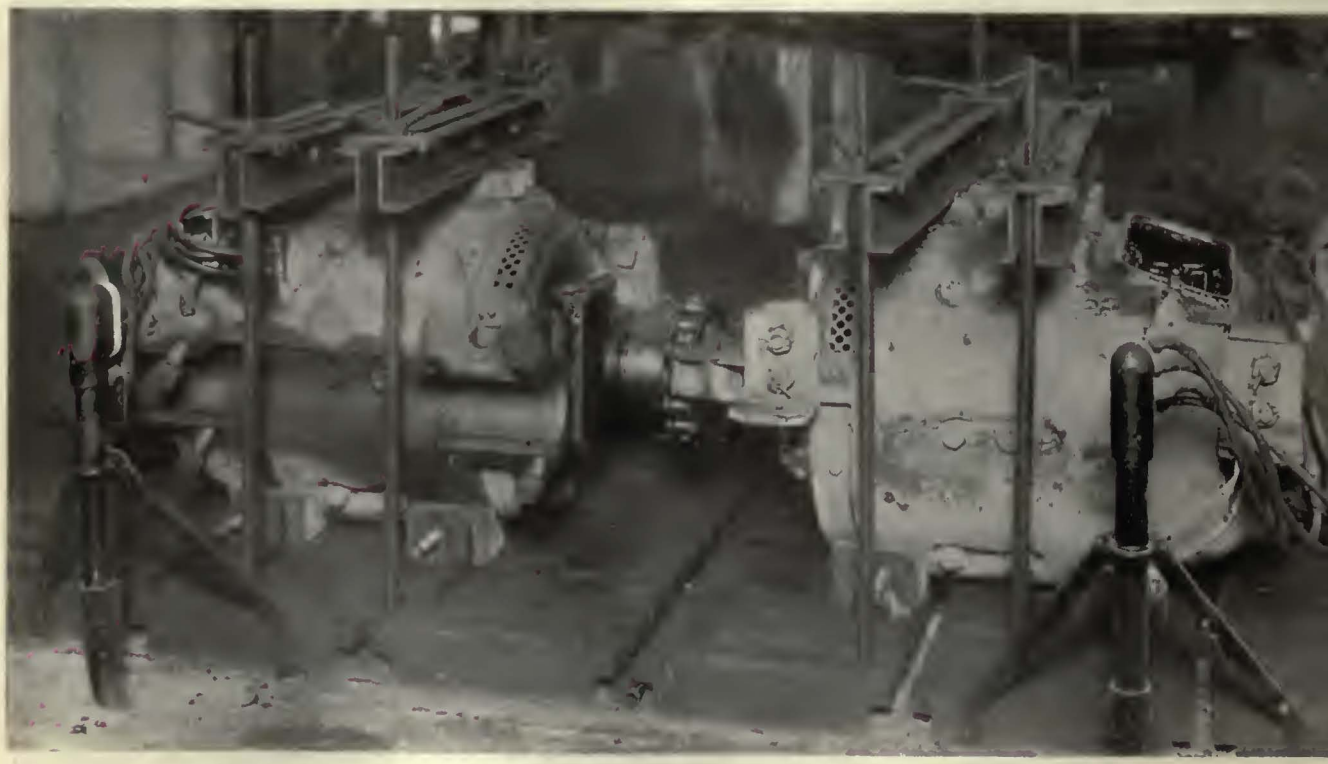
Replaced rail laid and lined

Changing and shimming the rail

Completed track taken at the same point as the first picture



The motors under test are shown in the foreground and the switchboard and load rheostat in the background

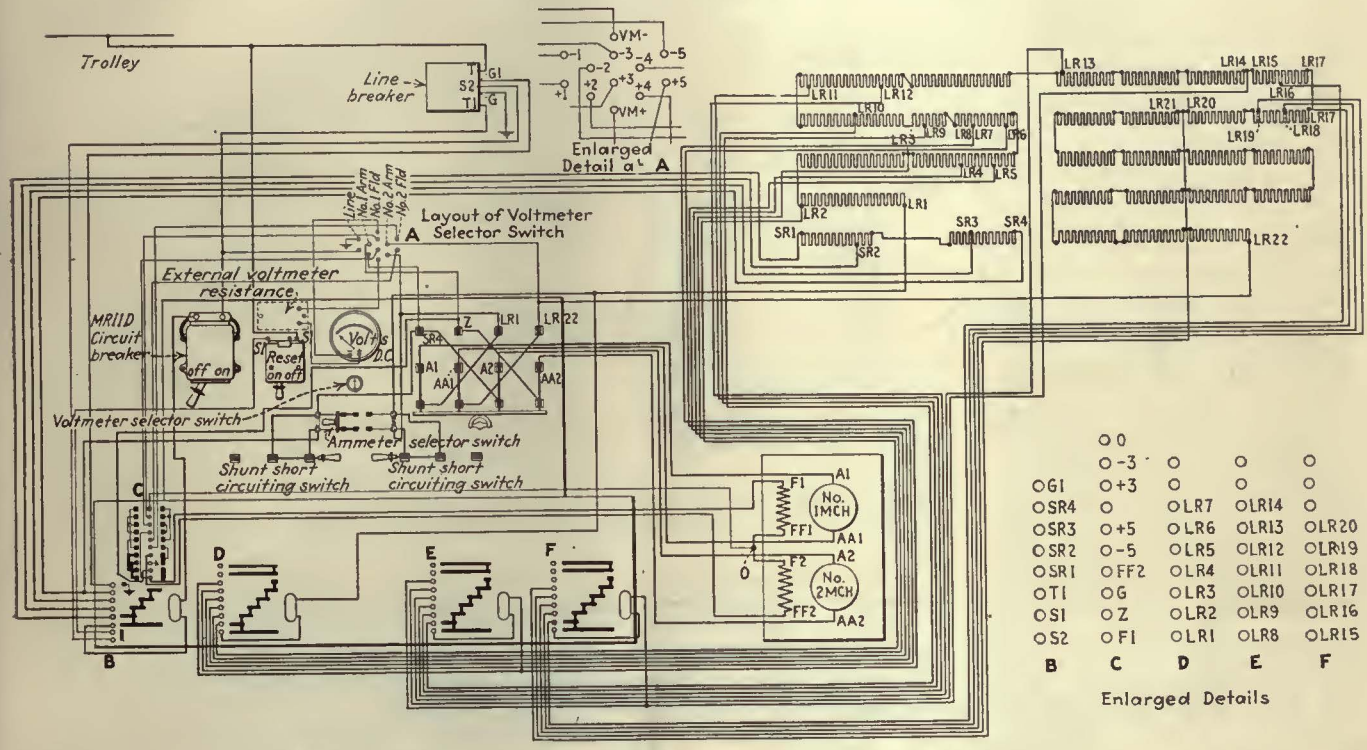


Two railway motors clamped in position on the bedplate ready for the load test

Railway Motor Load Testing Set

By A. J. Naquin
Equipment Engineer Rolling Stock and Shops Department, New Orleans Public Service, Inc., New Orleans, La.

Motors are given a running test after overhauling. Tested in pairs, one motor drives the other as a generator and so provides for convenient adjustment of load



Wiring diagram for motor load test of the New Orleans Public Service, Inc.

RAILWAY motors overhauled in New Orleans are given a load test by use of a testing set designed by the railway engineering department of the New Orleans Public Service, Inc. Accompanying halftones show the general arrangement of the apparatus and a diagram shows connections. The load for the motor under test is furnished by having it drive another motor as a generator. Motors are tested in pairs and either motor can be used as a generator while the other unit is used as a motor to drive it. The direction of rotation of either unit may also be changed at will by the reversing switch of the control.

The motors are set up for the test on a bedplate which has convenient slots for bolting and clamping the motors in position. The pinion ends of the two motors are placed together and connected by a flexible coupling. In the illustration showing the controlling switchboard in the background the loading rheostats are in the upper right-hand corner. There are four controllers in the control cabinet, the one at the left being used for starting purposes. Three steps of resistance are cut while bringing the motor up to speed. The other three controllers determine the loading by cutting out units of resistance in the generator circuit. The controller at the extreme right is used for close adjustment; with it the motor and generator current is changed by increments of 3 amp. or less.

The current flowing through either the motor or generator is indicated on a portable ammeter by throwing a double-pole, double-throw switch to either the left or the right as desired.

The voltage from trolley to ground and across each motor may be read from the switchboard voltmeter by moving the selector switch beneath the voltmeter. A line breaker for opening the motor circuit is operated by either the control switch or the ratchet switch on the starting controller. A circuit breaker in series with the line breaker gives additional protection of the motor circuit; the former being set at 50 amp. higher than the latter.

All overhauled motors having rewound armatures are tested on this set for thirty minutes at 150 per cent of the hourly rating, being run fifteen minutes in each direction of rotation. During the test, commutation is carefully checked. About 10 per cent of the motors whose armatures are dipped and baked but without other repairs are also tested. All testing is done during the regular overhauling period which is every 40,000 car-miles.

It is believed that if an overhauled motor satisfactorily passes the high current test described, and the high voltage test also given every overhauled motor, that it may be placed in service for another 40,000 car-miles without danger of failure.

Keeping Accurate Records of Car Wheels

RECORDS of car wheels kept by the Omaha & Council Bluffs Street Railway, Omaha, Neb., have been found so efficient that out of 3,528 wheels scrapped in a period of two years less than 5 per cent lacked a completely detailed report. When car wheels are received from the foundry a shipping list which includes the serial numbers is obtained from the storekeeper. The wheels also are checked in by serial number by the stores department. In this way a double check of these numbers is obtained.

When a pair of wheels is mounted on an axle, an axle gear-wheel tag is filled out. The numbers of the axle, the gear and the two wheels that have been mounted are recorded, giving size, bore, specification number, and manufacturer of the wheel. This tag is then tied to one of the wheels and stays with the mounted pair until it is installed in a car.

When the wheels go in service, the tag is removed and the serial numbers of the wheels removed from the car are entered in the "out" column provided for that purpose, giving the reason for removal, location, date and car number, thus completing the tag. After transferring the information into the records, the tag is filed according to car number.

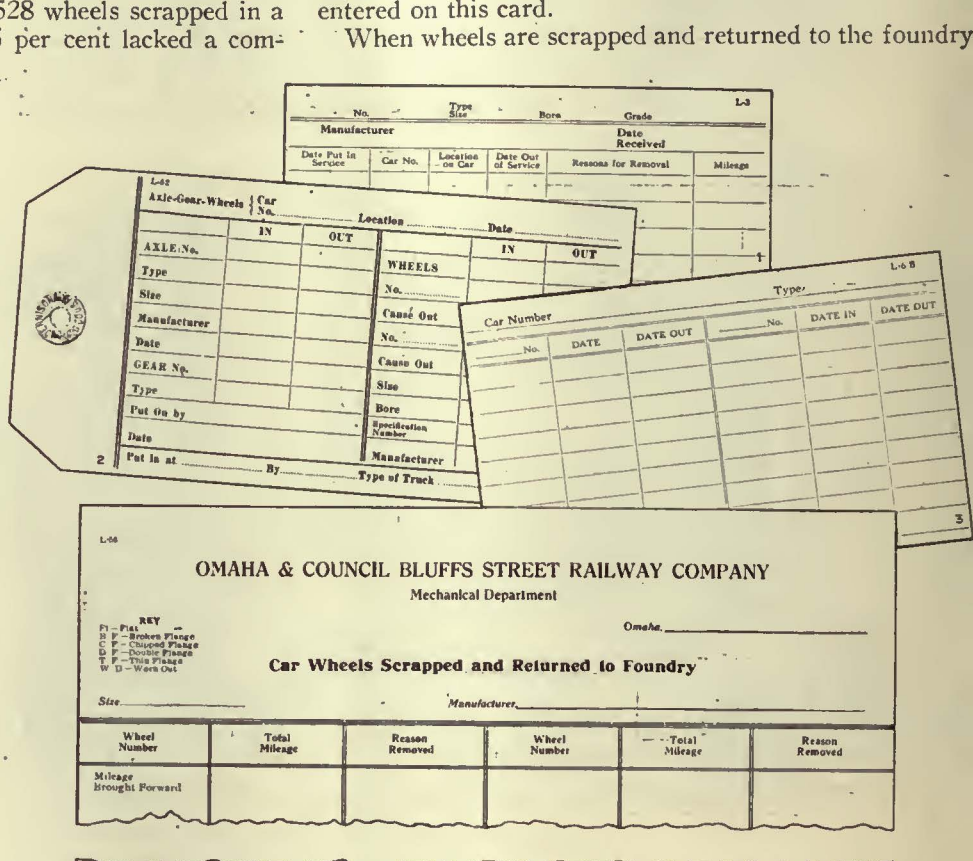
The car record, a 3x5-in. card, shows at any time what wheels are on any car. These cards are filed by car numbers. The entries for wheels installed and removed are transferred to this card from the tag.

The individual wheel record, another 3x5-in. card, shows the date the wheel is put in service, the car number, location on car, date out of service, reason for removal, and mileage. The entries likewise are transferred from the tag.

The car mileage, figured by the transportation department at each division office, is sent to the mechanical department the first of each month. The sheets show by cars the mileage by lines as well as miles per day for the month. The total mileage of each car is entered on cards which have monthly spaces sufficient for six years. These are filed numerically according to cars.

When a wheel is scrapped the wheel man reports it and an entry is made on the individual wheel card. The total mileage made by the wheel is then computed and entered on this card.

When wheels are scrapped and returned to the foundry or sold, their serial numbers are reported by the stores department. The corresponding individual wheel cards are removed from the files and entries are made on the "car wheels scrapped" sheet. This gives the total mileage of each wheel and the reason for its removal. The



These forms are used for recording complete information on the receipt, handling reclaiming and final disposition of car wheels used on the Omaha property

1. Individual record made out for each wheel.
2. Car record showing placing and removal of all wheels.
3. This tag is attached to each mounted pair of wheels. When they are placed the information regarding the wheels removed is entered on it.
4. Record of car wheels scrapped, giving for each classification and size of wheel the mileage and reason for removal for an entire order.

MILEAGE OBTAINED FROM CAST-IRON CAR WHEELS IN 1927—OMAHA & COUNCIL BLUFFS STREET RAILWAY

	Total Wheel Mileage					One-Wear Wheels			Two-Wear Wheels			Three-Wear Wheels			Miles per Wheel After Reclaiming	
Diameter, Inches	Total	Number Received	Recorded	Mileage	Average	Number	Mileage	Average	Number	Mileage	Average	Number	Mileage	Average	Two-Wear	Three-Wear
33	1,027	37	990	50,647,836	51,159	784	40,393,263	51,522	171	8,413,182	49,200	35	1,841,391	52,611	18,656	11,71
30	268	7	261	15,254,845	58,448	227	13,358,843	58,850	27	1,580,020	58,519	7	315,982	45,140	25,679	10,27
21	436	25	411	18,733,531	45,580	281	13,245,350	47,136	111	4,782,955	43,090	19	705,226	37,117	12,565	7,42
26	104	8	96	4,151,975	43,250	58	2,712,226	46,763	34	1,304,978	38,382	4	134,771	33,693	17,179	7,26
Weighted average	1,835	77	1,758	88,788,187	50,505	1,350	69,709,682	51,637	343	16,081,135	46,884	65	2,997,370	46,113	17,091	10,03

total mileage is computed for the entire shipment of each size of wheel.

A report is also made up each month from the tags, giving the number of wheels of each size removed from service, along with the causes of removal.

While the company at present is purchasing only steel car wheels, there are many cast-iron wheels in service on which a large mileage average has been obtained. The accompanying table gives the total mileage of car wheels which has been obtained from wheels of the several diameters used. As may be noted, in certain instances an average in excess of 60,000 miles has been secured.

Ventilated Room for Spray Painting

Two systems as used by the Leipsic Street Railways are described. One provides for a horizontal flow of air, the other for vertical flow to prevent fumes from spreading

SOME interesting provisions for spray painting adopted by the Leipsic Street Railways, Germany, were described in the Feb. 3 issue of *Verkehrstechnik*. The consolidation of two street railway companies, one with cars painted blue, the other red, brought about the necessity of repainting equipment. A uniform ivory color was adopted. To do this speedily and economically the spray method was used, since it was found that the brush method required more labor as well as greater space for an extensive job.

Nitro-cellulose lacquers were tried out first because they seemed especially suitable for spraying. Their durability did not prove entirely satisfactory and therefore an enamel system is now used.

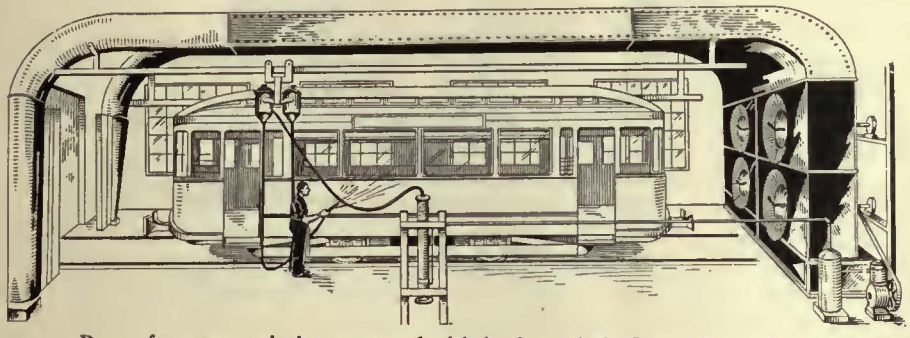
Where the condition of the old paint is such that it is inadvisable to remove the ground coat, rusty spots are first rubbed with a wire brush and then two coats of ivory-colored zinc paint are applied. After this an ivory-colored rubbing varnish is sprayed on and after sandpapering this, a coat of varnish is sprayed to complete the job. This simplified method was adopted in the belief that it is better to paint cars more frequently than had previously been the custom, since heavy street traffic and increased numbers of accidents made repainting necessary at least every two to three years.

Where cars were entirely repainted after the removal of the old paint, the time per car with the spray method was found to be 7½ hours as compared with 50 hours by the brush. Details appear in the accompanying table.

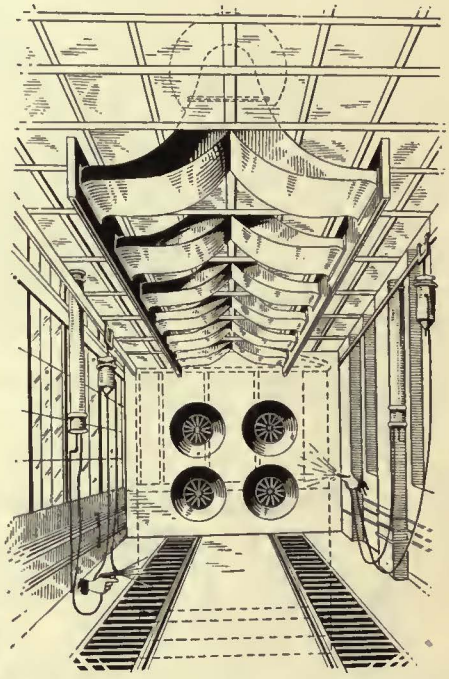
With an average wage of 42 cents per hour for the painting crew, the saving per car of average size amounted to $18. The amount of paint used was found somewhat greater with the spray method than with the brush, but this depended somewhat on the quality of paint used and the skill of the workmen.

Wooden seats were repainted by the brush method as it was found that in order to do a satisfactory job by spraying, it was necessary both to remove the seats from the cars and to use more paint. Lettering is also done with brushes.

Added facilities were provided at the shop for spray painting. This included necessary piping for connecting to the compressed air supply. Air is used at a pressure of from 37 to 52 lb. It was found that with the higher pressure there was a better distribution of paint, but a slightly greater quantity of paint was used. To protect the workmen against fumes from the paint without the use of masks, a special room with forced ventilation was built by a German firm. This has proved satisfactory for exhausting the disagreeable fumes. The special paint room is 53 ft. long and 15 ft. wide, and was erected in one section of the paint shop. Cars are run in and out through an opening at one end of the room while on the opposite end there are four exhaust fans. Each has an exhaust opening of 27½ in. A sprinkling device is also installed which sprays water in front of the fan opening, so that the particles of paint mix with the water as they are drawn out and then fall into a settling basin below the floor. In this basin the paint is separated from the water by gravity and the water is again pumped through the spraying equipment. The air drawn from the room is purified before it is led back again. The purifying of the air from paint and water is done by means of filtering, after which it again enters the room at the end opposite to that where the fans are installed.



Room for spray painting arranged with horizontal air flow. Convenient connections for compressed air are installed



Spray room with exhaust openings in the floor for vertical air flow

COMPARISON OF TIME NECESSARY TO PAINT A CAR BY THE SPRAY AND BRUSH METHODS

Class of Work	Time, Hours Spray	Brush
Covering windows	½	..
First coat of oil paint	1½	10
Two coats of ivory-colored zinc paint	2½	20
One coat of rubbing varnish	1¼	10½
One coat of lacquer	1	10
Removal of covers for windows	1	..
Total	7½	50½

With this method ample circulation of air is provided and the workmen are not subjected to drafts because the circulation is directed so as not to inconvenience them.

Some of the advantages found with this equipment are that the exhaust fans do not become clogged with paint and there is no danger of spontaneous combustion. Paint fumes which would be annoying if exhausted into the open air, are deposited in a form so that they can be removed without being spread through the neighborhood. The temperature of the room is easily kept constant since the air exhausted is used over again and so considerable loss of heat is avoided. The paint room has its own ventilation and forced air circulation, which is entirely separate from the surrounding shop, so the sucking up of metal and other dust from the shop is prevented. This is of importance in keeping slow-drying oil paints clean.

The compressed air system for the paint room is installed on rails so that it can be shifted as desired. It has an oil and water separating device. Separate valves permit renewal of the air in the room from the outside. This was found particularly desirable in the summer months when the air outside is warm.

At another location a spray painting room somewhat similar to this, but with some modifications, was used. This is shown in the second illustration. In this fresh air enters through nozzles at the ceiling and the mixture of air and paint fumes is exhausted through slots in the floor. A water sprinkling method is used in connection with this in order to prevent the fumes from spreading. An advantage of this system is that the fans can be placed so as not to obstruct the end of the room and thus both ends can be used and cars can be moved directly through if desired. Also, in painting trucks of cars this method proved of particular advantage.

Rhode Island System Installs Frequency Changer

WORK has been in progress the past few months on the installation of a frequency changer set at the power plant of the United Electric Railways, Providence, R. I. This machine allows the interchange of power between the railway power plant and the Narragansett Electric Lighting Company's plant and further, the New England Power Company's system. This work involves an expenditure of approximately $450,000 to complete the connection. The set went into commercial operation on Feb. 14.

The frequency changer set is made up of two synchronous machines with their individual exciters all on the same shaft. One of the machines, that for the railway end, operates on 25 cycles and the other machine is made to operate on 60 cycles.

With the installation of this interconnection, the railway will have the advantage of the larger power systems in case of accidents to the machinery in their plant and likewise the power systems will receive the advantage of the generating capacity of the railway plant in the event they have trouble. The stand-by capacity of both systems can now be used for extra capacity for either.

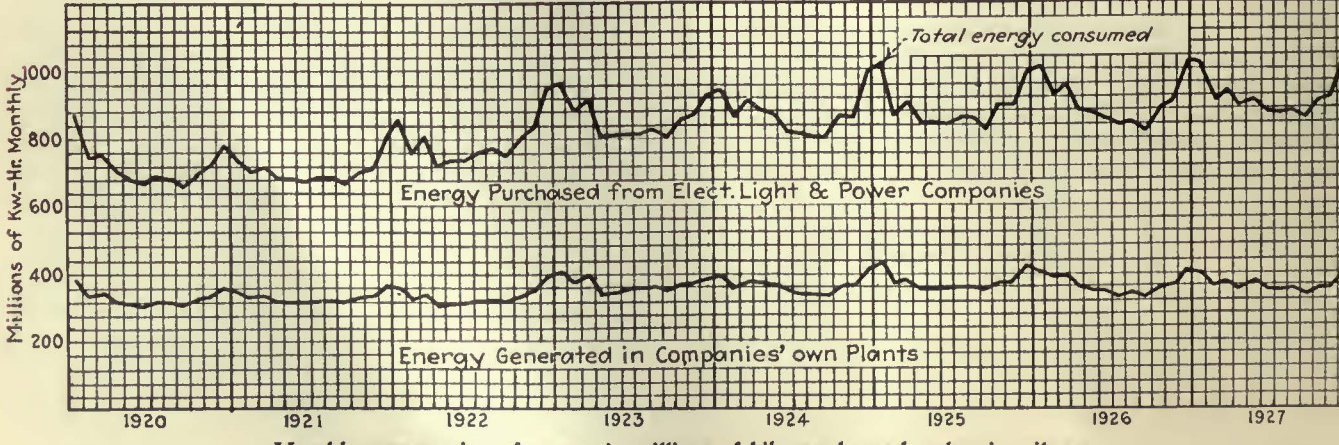
When passing power to the railway the 60-cycle energy is received through underground cables at 11,000 volts, three-phase, to the 60-cycle bus in the railway plant and thence to drive the frequency changer. This connection and the 60-cycle machine and switching equipment have a capacity of 21,000 kva. The 25-cycle machine of the frequency changer set then acts as a generator furnishing 11,000-volt, three-phase, 25-cycle energy direct to the 25-cycle buses of the railway system. This part of the connection has a capacity of 20,000 kw.

Energy Used by Railways Increases

DESPITE the use of buses, lighter rolling stock and improved apparatus, the monthly consumption of energy used by the railways is still on the upward trend. The accompanying chart shows the monthly consumption beginning with the year 1920. This is a continuation of the chart published with a résumé of energy consumption in the Aug. 20, 1927, issue of this paper.

The chart shows pronounced seasonal peaks with apparently erratic monthly fluctuations in addition. The latter entirely disappear, however, when the curve is replotted in terms of average daily energy consumption expressed as a per cent of the annual total. The seasonal variations are due primarily to such influences as car heating and snow removal.

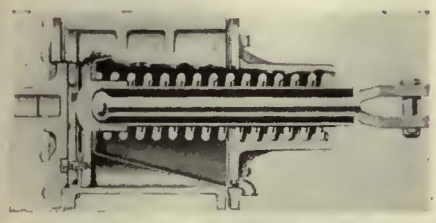
Although the energy consumption for the first few months in 1927 was below that of 1926, the total for the year was greater. The total energy consumption for 1927 was 11,013,000,000 kw.-hr. against 10,970,000,000 kw.-hr. for 1926. The total energy generated in railway-owned plants has decreased from 4,371,000,000 kw.-hr. in 1926 to 4,320,000,000 kw.-hr. in 1927, while the energy purchased from central station companies has increased from 6,599,000,000 kw.-hr. in 1926 to 6,693,000,000 kw.-hr. in 1927. For the last seven years the large portion of the steady increase in energy consumption for transportation purposes has been in the energy purchased from central-station companies.



Monthly consumption of energy in millions of kilowatt hours by electric railways

Brake Cylinder Protector

DIRT and water, which may enter at the non-pressure side of the piston, cannot reach the cylinder walls and packing, it is claimed, by using a brake cylinder protector that has been developed by the Westinghouse Air Brake Company, Wilmerding, Pa. The use of this protector should lengthen the life of packing cups, reduce leakage and decrease maintenance costs.



Brake cylinder protector

The protector consists of a conical-shaped, impregnated, canvas structure, devised so that at one end it is clamped between the cylinder body and the non-pressure head, where it functions as a gasket, while at the other end it is held in position against the piston by the release spring. Any dirt or water entering the cylinder is trapped by the protector, and the water is discharged through a drain opening provided in the non-pressure head. The protector, being flexible, collapses as the brake is applied.

Motors for Dusty Atmospheres

BOTH alternating and direct-current motors, built for use where fumes, dust or explosive gases are present, are included in a line announced by the General Electric Company, Schenectady, N. Y. The motors bear the designation "Class BU Form JA" and are totally inclosed.

The object of the construction is to reduce the danger from transmission of heat generated inside the apparatus from any cause whatever, whether it be sparking or explosion, to the outside in such intensity as to ignite any gases surrounding the equipment. The two-piece, cast-iron exterior is heavy enough to withstand the pressures of an internal explosion and has flanged joints sufficiently wide to cool the flame of any such explosion. No gaskets are used, as it is not intended that the motors should be gastight.

The internal mechanical and electrical features follow standard General Electric design. The electrical characteristics are primarily the same as those of standard totally-inclosed motors. The alternating-current motors are available in single-phase ratings up to 3 hp. and, in polyphase ratings up to 15 hp., at standard voltages and the more popular speeds. The direct-current motors may be either shunt or compound-wound types with the horsepower ratings from $\frac{3}{8}$ to 5 hp., also at the standard speeds and voltages.

All of these motors, either alternating or direct-current types, are designed to operate within a temperature rise of 55 deg. C., the standard for inclosed motors.

Dick Prescott Appoints an Assistant

and Surprises a Friend

DICK PRESCOTT, newly appointed superintendent of equipment of the Consolidated Railway & Light Company, finally found himself alone at the desk over which Tom Mullaney, retiring superintendent, had conducted the affairs of the Consolidated shop for many years. Mullaney's announcement of Dick's appointment as his successor had been gracious and helpful. Dick had managed, somehow, to respond to the congratulations and good wishes that were heaped upon him both by Mullaney and by the several foremen of the shop departments. Finally he was alone.

As Dick meditated for a few moments on the rapid succession of events during the past two days, he marvelled at the sudden turn with which the wheels of destiny had elevated him to a position of power and responsibility. Dick felt humble indeed as he thought of the group of foremen who had just pledged their support and co-operation. Some of them were many years his senior in age and in experience. Nevertheless, they had all recognized his leadership and his right to succeed Mullaney as head of the department.

After the foremen had left Dick consulted with Mullaney regarding an important matter which he had been turning over in his mind. Mullaney had approved heartily and Dick was now about to take his first official step as head of the department. He meditated a few minutes longer as he sat alone in the superintendent's office. Then he smiled quietly to himself as he reached for the telephone and called Steve White, carpenter shop foreman under whom he had started his apprenticeship in the Consolidated shop. Dick asked Steve to come into his office, and in a few minutes his old friend was ushered in by Miss Stevens.

Dick smiled cordially as he pointed to a chair opposite him. As Steve accepted the invitation, his face reflected his delight and gratification at the success which had been won by his former apprentice.

"Gee! Dick," he exclaimed, "this is simply wonderful. Little did you think, when you struggled so hard to improve our methods and to put new enthusiasm into this shop, that recognition and reward would come so soon. You've earned every bit of it, Dick, and I'm delighted that the company recognized your merit."

"Thank you, Steve," replied Dick, "this came as a complete surprise and I'm having difficulty in getting adjusted to the change. However, I am about to issue my first order as superintendent of the department."

"Good, Dick. What's it going to be?"

"Effective tomorrow morning, Steve White is appointed assistant superintendent of this department!"

Steve sat stunned. For a moment he lost the power of speech entirely.

Frank B. Carpenter

Wins April Prize

Description of a fixture for boring journal bearings in a lathe, which is used in the shops of the Charleston Interurban Railroad, Charleston, W. Va., was awarded the monthly prize of $25 for April in *Electric Railway Journal's* maintenance competition. Honorable mention was given by the judges to a split sleeve for protecting the ends of shafts while pressing into wheels, submitted by C. B. Hall of the Virginia Electric & Power Company, Norfolk, Va.

BORING journal bearings for electric car trucks is a common operation and the fixture for doing this work in a lathe, as described by Frank B. Carpenter, master mechanic of the Charleston Interurban Railroad, Charleston, W. Va., in the April 21 issue of this paper, presents a simple and effective solution of the problem. This was awarded the $25 monthly prize. The railway bores journal bearings in a lathe and the fixture fits to the rotating head while the boring bar is held stationary in the tool post. Two bearings are bored at one time. Clamps for holding and centering the bearings fit to beveled projections of the fixture so that the bearings are centered accurately as they are drawn down in the tightening operation. The split sleeve protection for the end of axles while being pressed into wheels, described by C. B. Hall, chief clerk of the mechanical department, Virginia Electric & Power Company, Norfolk, Va., was awarded honorable mention.

Ten Weeks More for Maintenance Contest

As announced in the April 21 issue, the time of closing the maintenance contest was extended three months. The time limit for submitting items, previously set as April 30, was extended up to and including July 31.

Those who still have material that they wish to get in before the contest closes should send it in at once so articles can be arranged to better advantage. It is hoped that all maintenance men will take advantage of this opportunity to tell others of the good work they are doing. It is evident that articles published so far represent but a few of the advanced methods that can be found in most shops.

The following are revised conditions for submitting material in the contest:

1. Any employee of an electric railway or bus subsidiary may compete.

2. The author does not need to be the originator of the idea.

3. Articles may be submitted by several persons or by a department.

4. Any maintenance practice or device for electric railway or bus repairs may be submitted.

5. Articles should be 100 to 200 words long, with one illustration, and in no event longer than 400 words with two illustrations.

6. Illustration material may be in the form of drawings, sketches, blueprints or photographs. All sheets should be marked "Maintenance Competition."

7. Manuscripts should be mailed to the Editor of ELECTRIC RAILWAY JOURNAL, Tenth Avenue at 36th Street, New York, N. Y.

8. A prize of $25 will be awarded each month for the best maintenance idea in the group published during that month. A minimum of $5 will be paid for each article accepted for publication. Manuscripts will be received until July 31, 1928.

9. Announcement of the winner each month will be made in the issue devoted to maintenance and construction (the third issue each month) following the month in which the article was published.

10. Additional details were given in this paper, issue of April 16, 1927, pages 700-701.

Frank B. Carpenter

who was awarded the monthly prize for April in ELECTRIC RAILWAY JOURNAL'S maintenance contest, is master mechanic of the Charleston Interurban Railroad, Charleston, W. Va. He has occupied this position since November, 1926. Mr. Carpenter's first electric railway experience was with the Birmingham Railway, Light & Power Company, as master mechanic. He served in the United States Artillery Corps in 1899 at the artillery district of Key West, Fla., being on special duty as assistant to the artillery engineer. Later he was appointed to the school of submarine defense, Fort Totten, N. Y., and studied electrical engineering pertaining to coast defenses.

Mr. Carpenter has had broad experience in connection with various electrical equipment, having served in the capacity of chief electrician and electrical engineer for a number of electrical companies. He designed and supervised many power plants and substations in the coal fields of Alabama, Kentucky, Ohio, West Virginia and Pennsylvania. In his present position, Mr. Carpenter has built many labor-saving devices for use in the Charleston shops in connection with maintenance of equipment, and has corrected many old methods by substituting improved ones. He is particularly interested in everything pertaining to modern methods, and ways to make an electric railway efficient.

Electric Railway Journal Maintenance Data Sheet

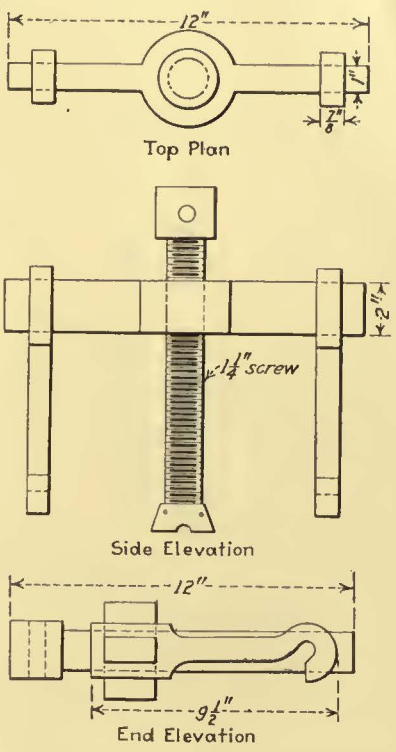
ROLLING STOCK—TRUCKS—24

Device for Straightening Brake and Door Rods*

By Benjamin H. Hall
Shop Foreman West Penn Railways, McKeesport, Pa.

BRAKE rods sometimes bend when a car splits a switch, and door rods require straightening due to truck and automobile collisions. Usually these rods are less than 1 in. in diameter. The demand for a device to straighten this class of material led the West Penn Railways to construct a screw-straightening device in its McKeesport shop. Often the bent rods can be straightened in position without removing them from the car. Otherwise it is necessary to remove doors and miscellaneous equipment in order to have the rods straightened.

The straightening device consists of a crosshead in the center of which is a 1¼-in. screw. The top of this is arranged to take a round bar to act as a handle and the bottom has a block to fit over the rod to be straightened. The crosshead carries at each end two hooked pieces that extend down and hold the rod in position while the screw pressure is applied.



Convenient device for straightening rods without removing them from cars

Submitted in Electric Railway Journal Prize Contest

Electric Railway Journal Maintenance Data Sheet

TRUCK AND WAY DEPARTMENT—26

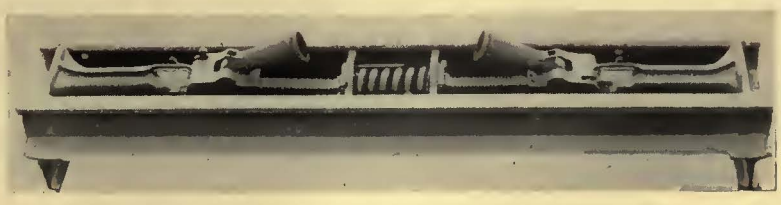
Testing Frame for Track Jacks*

By W. J. McCallum
Foreman Frog Shop Way Department Toronto Transportation Commission, Toronto, Canada

WHEN lining special trackwork use is frequently made of track jacks in a horizontal position. Jacks that otherwise operate perfectly sometimes do not work so well when used horizontally. In order to check and adjust jacks for this defect, as well as for ordinary repairs, a frame, shown in the accompanying illustration, was designed by the way department frog shop of the Toronto Transportation Commission, Toronto, Canada.

The frame consists of two pieces of 7-in. T-rail welded to short cross arms. Between the side members is a sliding head made up of a seven-ton spring with one-inch plates on either side held together with ¾-in. bolts. The plates have a boss on one side to hold the spring, and a corresponding socket on the other which retains the head of the jack.

In testing, two jacks are placed in the frame. The ram of one is run in to the limit and the other is fully out. By working one jack against the other, the spring is compressed and each can be tested to the full length of stroke.



Framework used for testing jacks in a horizontal position

Submitted in Electric Railway Journal Prize Contest

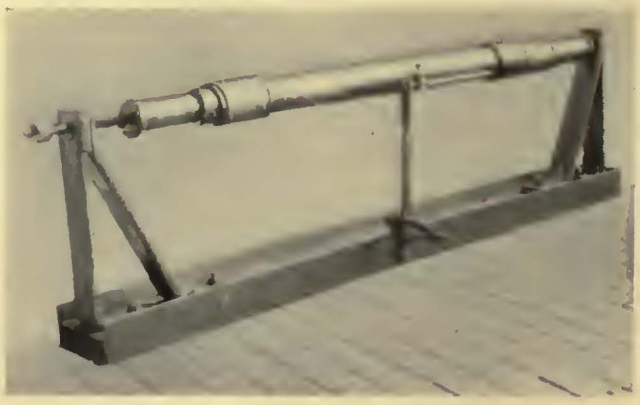
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—TRUCKS—25

Jig for Testing Bent Axles*

By C. B. Hall

Chief Clerk Mechanical Department
Virginia Electric & Power Company, Norfolk, Va.



Testing an axle for eccentricity by means of a jig made in the Norfolk shop of the Virginia Electric & Power Company

FOR testing bent axles and the alignment of wheels a jig shown in the accompanying illustrations has been constructed in the machine shop of the Virginia Electric & Power Company, Norfolk, Va. An I-Beam forms the base, with an upright at either end made of 1x3-in. bar. Centers for the axle to be tested are fitted at the top of the uprights, one of which is arranged to slide to provide for different lengths of axles. There is a screw centering adjustment at one end. A movable truing pin is clamped to the center of the base. Adjustment of the pin as desired is made with a thumbscrew.

The accompanying illustration shows an axle in position for testing. Wheel alignment after wheels are pressed on axles is also tested by sliding and adjusting the truing gin to the wheel.

Submitted in Electric Railway Journal Prize Contest

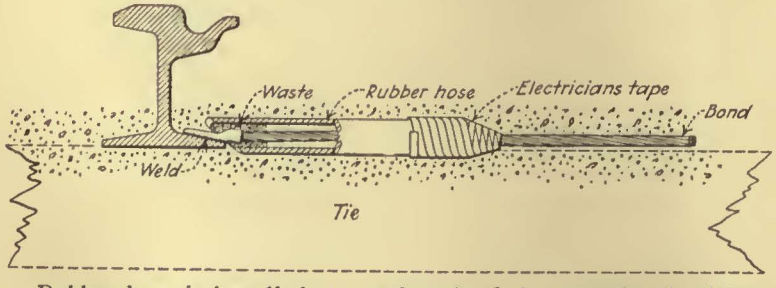
Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—27

Protection for Cross Bonding in Concrete*

By R. J. Fennell

Assistant Roadmaster Way Department Toronto Transportation Commission, Toronto, Canada



Rubber hose is installed over a length of the cross bond cables to provide for movement

BREAKING of concrete-imbedded cross bonds at the point where the cable enters the terminal, is prevented by the welding and bonding section of the Toronto Transportation Commission, Toronto, Canada, by means of the scheme shown in the accompanying illustration.

Before the terminal is welded to the rail, a 12-in. length of scrap hose is slipped over the end of each bond. The opening at the terminal end is stuffed with waste and that at the cable end is closed by winding with electrician's tape. With this method of installation, if the rail becomes loose in the concrete bed, any movement is taken up in the free length of cable within the hose and the bond will not break at the junction of the steel terminal.

Submitted in Electric Railway Journal Prize Contest

Electric Railway Journal Maintenance Data Sheet

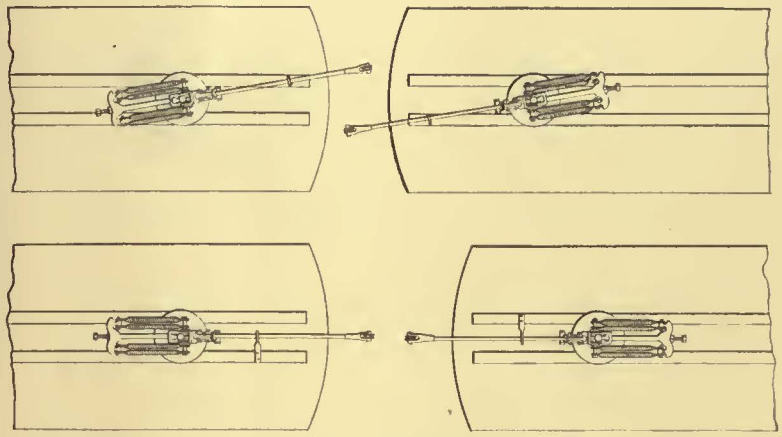
ROLLING STOCK—MISCELLANEOUS—32

Staggered Trolley Hooks Permit Placing Cars Close Together*

By Farrell Tipton
Electrician San Diego Electric Railway, San Diego, Cal.

MOST carhouses are handicapped for space in storing cars, so it is desirable to crowd them as closely together as possible. With some types of cars the trolley poles extend beyond the ends, and with the trolley hooks in the center, cars are kept a considerable distance apart in order to give clearance. This also is dangerous to workmen as the cars may be placed so close together that the trolley connections on one car will be energized by the car ahead.

To overcome these objections the San Diego Electric Railway, San Diego, Cal., staggers the trolley hooks, so that the poles will pass each other with the cars placed close together. This was accomplished with little cost by turning the hooks around from their former position and using the same installation holes.



Staggered trolley hooks permit storage of cars close together

*Submitted in Electric Railway Journal Prize Contest.

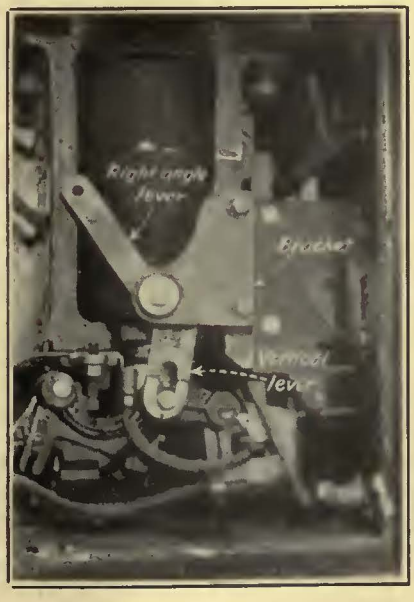
Electric Railway Journal Maintenance Data Sheet

POWER AND ELECTRICAL DEPARTMENT—1

Sectionalizing Switch Closed by Hand Lever

WITH the power layout of the Key System Transit Company it is oftentimes necessary to hold a sectionalizing switch closed for a moment or for a longer time, particularly on an isolated section of line where a short circuit has opened the sectionalizing switches at both ends. This happens when the substation feeding the section is shut down for inspection or other reasons. It is then necessary to close one of the sectionalizing switches after the short has been cleared before the other sectionalizing switch will pick up.

To effect the closure, a bracket is mounted on the main frame of the sectionalized switch solenoid. A right-angle lever at one corner throws over center a vertical lever which pulls the contactor of the switch up into the closed position. At the extreme upper end of the right-angle lever is a rod with an insulated joint which projects through a hole in the bottom of the switch box. The rod is not shown in the illustration. A lineman may pull down on this rod to close the switch. When the line is energized the switch will hold itself closed. The rod is then raised and the vertical lever thrown back off center into its original position. By means of a slot located in the lower end of the lever the rod can return to its original position without disengaging the switch contactor.



Device mounted on sectionalizing switch by which it is possible mechanically to close the contactor

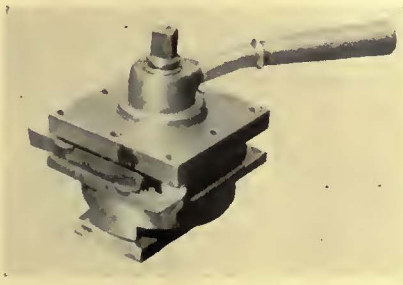
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—33

Four-Way Tool Post

FOUR tools can be held in a tool post and rotated so as to bring each into working position in a handy device originated by workmen in the 39th Street repair shop of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y. The base for this tool holder consists of two parts, a bottom bar which fits into the compound rest slide of the lathe carriage and an upper circular section. A screw which passes through these, clamps the tool holder to the lathe carriage in the same manner as with an ordinary tool post to hold it firmly in position.

The top of the four-way tool post holder is 4½ in. square and the four tools are held in position by headless setscrews. The accompanying illustration shows cutting-off tools in position, but boring tools or outside turning tools can be used equally well. When the holder is rotated so as to bring a tool into position it is held firmly by a pawl in the lower portion. This pawl is forced into a hole in the top section by a spring. A lever in the lower section when pressed down disengages the pawl. By a quick turn of the clamping stud the holder is released and can be rotated so as to bring the desired tool into position. Another turn of the lever on the holder, clamps it securely so that there is no danger of loosening. The entire outfit is self-contained and there are no detached parts to lose.



Four-way tool-post holder for use on lathe

Electric Railway Journal Maintenance Data Sheet

POWER AND ELECTRICAL DEPARTMENT—2

Automatic Shutters on Blowers for Air-Cooled Transformers*

BY M. D. SCHWEGLER

Superintendent of Power Toronto Transportation Commission, Toronto, Canada

ON AIR chambers where more than one blower operates in an air chamber of a substation considerable trouble was experienced by the Toronto Transportation Commission from broken shafts and couplings. The breakages were caused by operators closing the motor starting switch on the motor of a blower which was rotating backward due to the neglect of the substation attendant to close the cut-off shutter.

Fan shutter open in air chamber at Front Street substation of Toronto Transportation Commission

This trouble has been eliminated by installing a self-operated shutter. The vanes are counterweighted so that they are slightly off balance. The air from a running blower holds the shutter open, while the back pressure of the air chamber closes it and holds it closed when the blower is shut down. These shutters were installed about two years ago and since then no trouble has been experienced with any of the blowers.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

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Electric Railway Journal Maintenance Data Sheet

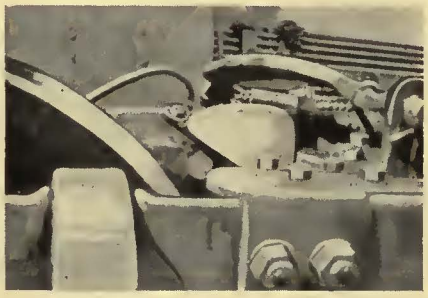
ROLLING STOCK—ELECTRICAL—46

Motor Intake Cover to Keep Out Snow*

By R. T. Chiles

Master Mechanic Cumberland County Power & Light Company, Portland, Me.

DURING the winter months, from the middle of December to the middle of April, the Cumberland County Power & Light Company, Portland, Me., is compelled to close up the ventilating intakes of its motors to prevent an accumulation of snow in them. The tying of canvas over the ventilating intakes was tried at first, but was found unsatisfactory. It also was expensive in material and labor. A light galvanized iron cover is now used, which fits over the ventilating intake. This costs 30 cents per cover and can be put on and removed easily. Its substantial construction also will enable it to last several winters. The type of cover used is applicable to both the GE-201G and the GE-203A motors.



Galvanized-iron cover fits over ventilating intakes of motor

*Submitted in Electric Railway Journal Prize Contest.

Electric Railway Journal Maintenance Data Sheet

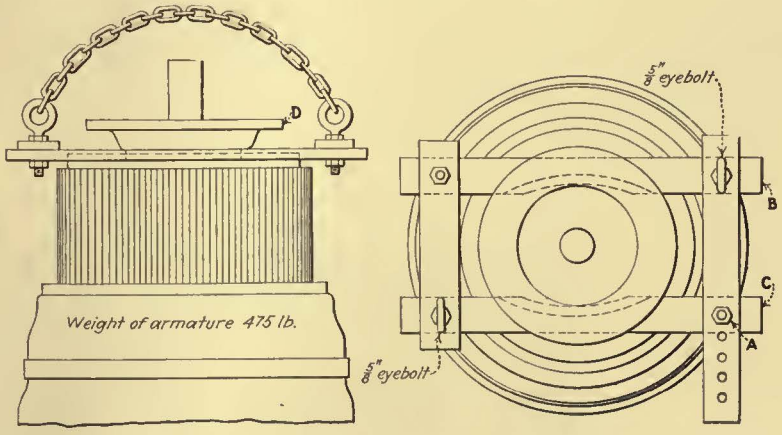
ROLLING STOCK—ELECTRICAL—48

Attachment for Lifting Armatures Quickly*

By Arthur E. Clegg

Foreman Electrical Department San Diego Electric Railway, San Diego, Cal.

WHERE armatures are dipped and baked a common method is to dip them with the commutator end up. For this a device for attaching the lifting hook, which can be fastened quickly and conveniently to the armature, is desirable. Such a device, used by the electrical department of the San Diego Electric Railway, is shown in the accompanying illustration. To attach it to the end of an armature, the bolt marked *A* is removed. This allows side pieces *B* and *C* to swing apart, giving clearance to place the device over the armature wiper ring *D*. The side pieces are cut out and beveled. By having several holes in the end cross-pieces, the sides can be adjusted so that they will fit snugly under the wiper ring. In the illustration, one of the end cross-pieces is longer than the other, allowing for a row of bolts for adjustment. The two eyebolts which fasten the equipment together form a convenient means for attaching the lifting chain.



Device for lifting armatures commutator end up

*Submitted in Electric Railway Journal Prize Contest.

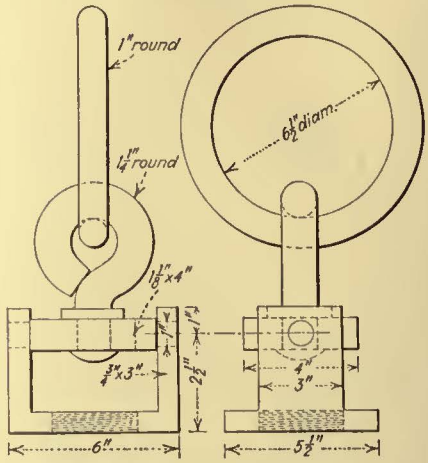
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL—47

Lifting Armatures by Pinion Nut Threads

TWO methods of lifting armatures are used in the shop of the New York, Westchester & Boston Railroad, Westchester, N. Y. In one of these the armature is horizontal and in the other it is vertical. The type of motor now in service is such that it was found cheaper and quicker to remove and install the armatures in a vertical position. The lifting nut shown in the sketch was developed for this purpose. This is made of a "U" bracket, rotating cross bar, swivel eyebolt and a ring. The "U" bracket is made from ¾x5½-in. stock. The bottom is drilled and tapped to fit the armature shaft pinion nut threads and the ends and sides are forged down to a width of 3 in. A ⅛x4-in. bar installed inside of this bracket swivels on axles of 1-in. diameter. An eyebolt made from 1¼-in. round stock is riveted loosely to the center of the bar so that it is free to rotate. The lifting is done by a 6½-in. diameter ring made from 1-in. round material fastened to the eyebolt.

The horizontal lifting is done by means of a flat leather sling. Both of these lifting methods have proved entirely satisfactory.



Device used for lifting armatures by the end of shaft

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL—49

Cutter for Dust Guard Holes

MOST electric railways make their own dust guards for journal bearings out of wood. The accompanying illustration shows a special cutting tool which has been developed in the 39th Street repair shop of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., for doing this work. The shank of the tool is arranged to fit in a drill press so that different sized holes can be cut. The lower end of the shank carries a center point. This is held down against the piece of wood by a small spring inside the shank. As the cutting tools are fed into the work the center lifts to the extent that the tools sink into the work.

Convenient tool for cutting holes in dust guards

American Association News

Way and Structures Men Hold Spring Meeting in Atlanta

MEMBERS of the A.E.R.E.A. Way and Structures Division and guests numbering 52 gathered in Atlanta, Georgia, on Monday, May 7, for a series of meetings during that week. This was the largest meeting of the division ever held and among the guests were a number of way engineers from southern properties. The Georgia Power Company acted as host and arranged an interesting program of inspection and sight-seeing trips, including an inspection of the railway property in Atlanta. The committee on this trip had an opportunity to inspect the so-called beam type of track which for a number of years has been employed successfully in Atlanta with both steel and wood ties, and to observe the condition of this track and various types of paving which have been in service for a long period of time. The storage yard, creosoting plant and track machinery of the company were also of special interest. The delegates were guests of Frank L. Butler on Tuesday evening, at a dinner held at the East Lake Country Club. On Wednesday, the entire group was taken by automobile to the camp of the Georgia Power Company at Gainesville, where several of the committee meetings were held. Among the points of interest shown the delegates was Stone Mountain, just outside of Atlanta.

All of the meetings were unusually well attended and the discussion of the various subjects was participated in by the invited guests as well as by the committee members. At the close of the meetings a resolution was passed by the Way and Structures Division expressing the appreciation of the group for the many courtesies extended them by the Georgia Power Company. Also a resolution was passed thanking Frank L. Butler, C. A. Smith and H. L. Wills, who were in charge of the arrangements and who did everything possible to make the meetings and the trips successful and enjoyable.

Following are brief reports of the several meetings of committees in this division held during the week.

No. 2—Special Trackwork

SPECIAL way and structures committee No. 2 met in the directors' room of the Georgia Power Company on Monday, May 7, with more than 40 members and guests present. Some of the more important matters discussed and acted upon by the committee were as follows:

The shape of the opening in the switch body casting and the location and shape of the pocket for the several switches under consideration by the committee were agreed upon. The throw at the center line of the lug was increased to 1⅝ in. for all of the proposed standard switches and the location of the lug was changed accordingly on each switch. Agreement was reached to brand all switch tongues on the top at the heel with radius, hand and symbol of maker. In addition, the maker may, at his option, show the tongue pattern in depressed numbers on the underside of the tongue.

There was but a brief progress report on the subject of expansion joints. Action was taken on a report submitted by Mr. Bragg on rules for the maintenance of electric or spring switches. A design of double spring frog prepared by Mr. Peabody was discussed and certain modifications suggested. In accordance with the action taken at a meeting held on Dec. 30, 1927, Mr. Alden presented a revised design for split switches, which was approved.

The specification for iron bound, hard center special trackwork was considered in detail. Each of the railway representatives present spoke of his experiences with this type of construction and expressed his opinion regarding the necessity for modifications of the specification. Each manufacturer representative present expressed his opinion regarding the necessity for modifying the present specification. After some further discussion the meeting was adjourned and reconvened on Wednesday evening at the Georgia Power Company Camp. As a result of thorough discussion the following modifications were proposed and agreed upon by the committee:

Paragraph 412—A sentence is to be added to this paragraph reading, "When necessary between switches, mates, frogs and crossing intersections, a four-bolt joint on 7-in. special trackwork and an eight-bolt joint on 9-in. special trackwork may be used unless otherwise specified."

Paragraph 407 (a)—Omit the last sentence reading, "The minimum depth of the body portion shall be 8 in." and substitute for it the following, "The minimum depth of iron under 7-in. special trackwork to be 1 in. thick."

No. 12—Rail Corrugation

COMMITTEE No. 12 met also in the directors' room of the Georgia Power Company on Tuesday afternoon, following an inspection trip of the railway property in which particular attention was given to those sections of track on which corrugation has occurred. There were 32 members and guests present at this meeting. Secretary Ewing announced that data collected for six locations in Detroit had recently been received. He asked for suggestions regarding the analysis of the data now on hand from various properties. After discussion he was requested to submit, prior to the next meeting, analyses which in his opinion would be of the greatest value. Among the more important matters discussed by this committee may be mentioned the following:

Contributing causes of corrugation and allied subjects and causes; do corrugations occur alternately or opposite when both rails are affected?; car nosing, including stresses set up in rails; analysis of rail stresses, including those set up by changes in temperature; tractive effort stresses; vertical and torsional vibrations of wheels; vertical vibration of rails; rail fatigue; area of wheel contact; rail deflection tests.

There was also a discussion of the corrugation observations taken on the inspection trip during the morning. A statement prepared by H. S. Williams of Detroit on "Stresses in Steel Rails Caused by Temperature Variation" was read and discussed. This statement was based on data obtained from the Department of Street Railways, Detroit.

The complexity and highly technical nature of the work assigned to this committee is evident from the list of subjects outlined above. It has been necessary for the committee in analyzing many of these problems to either devise new instruments or adapt existing scientific measuring devices to the particular tests at hand. The committee probably will not be in a position to make a final report for some time but at the conclusion of the meeting it was agreed that a progress report would be presented at the convention this year covering: (1) A brief statement of the previous consideration; (2) a record of meetings for the year and work done on each of the subdivisions of the assignment; (3) conclusions where any have been reached; (4) recommendations.

No. 5—Wood Preservation

WAY and structures committee No. 5 held a brief meeting at the Georgia Power Company Camp on Thursday. Due to the fact that the work of this committee had not progressed very far the attendance was small and the meeting was quite informal. A tentative report was presented by Mr. Swayze on preservatives other than creosote. Several suggestions were made for elaborating certain phases of the report and Mr. Swayze agreed to carry out these suggestions and present another report prior to the next meeting.

Mr. Smith announced that Mr. White had presented a report on wood preservatives having resistance to fire. He announced that the other three subjects—Review of Manual, Treatment of Poles and Timber in Place and Economy in use of Treated Timber were not yet ready for presentation.

In a general discussion two matters were brought up for consideration; (1) How can the committee best stimulate interest in the use of wood preservatives? (2) To what extent is it desirable to duplicate in the Manual existing specifications of the American Wood Preservers' Association or the American Society for Testing Materials? Both of these questions will be discussed at the next meeting of the committee which will be held just prior to the next meeting of the standing committee on way and structures.

Standing Committee on Way and Structures

FOLLOWING these sessions of special committees, a meeting of the Standing committee on way and structures was held at the Georgia Power Company Camp on Friday, May 11, with 34 members and guests present. Eleven of the thirteen

members of the standing committee were represented and in addition five of the seven special committee chairmen, who are not members of the standing committee, were represented.

T. H. Newbold, representing W. R. Dunham, Jr., presented the progress report of special committee No. 1 containing a number of recommendations to advance existing recommended specifications or designs to standards. The committee recommended also that Manual section W101-15 be referred to a proper committee for study and that if no revisions are required it be advanced to standard. A recommendation was also made to combine Manual section W111-25 with W13-24, making the combined section a standard. It was voted to put a footnote on Manual section W113-23 calling attention to the revised serial designations of Manual sections referred to by number in this specification. It was voted also to withdraw section W200-23 from the Manual and substitute a single page reference calling attention to the withdrawal and stating that the text may be found in the Engineering Proceedings. All of the above matters will be submitted for letter ballot to the entire standing committee.

Mr. Ryder reported briefly on the work of way and structures special committee No. 2 and stated that a written report would be prepared and submitted for consideration at a later date.

Mr. Baker stated that his committee had sent out a questionnaire to a selected list of 41 member companies, 32 of which had replied to date. He reported that this committee met on March 7 in Chicago. Mr. Baker expects to obtain replies from the nine companies that have not yet answered the questionnaire after which his committee will analyze the data and prepare a report.

Mr. Smith reported on the meeting held by his committee, No. 5, on May 10. There was some discussion of the desirability of adopting certain wood preservation specifications by reference only where they were identical with those of the American Wood Preservers' Association or the American Society for Testing Materials. The difficulty and expense of the frequent revisions of these specifications was stressed and the committee instructed to give serious consideration to this matter in its report. In connection with the matter of stimulating interest in the use of wood preservatives the general opinion seemed to be that more attention would be devoted to the economies to be obtained with wood preservatives.

Mr. Merker, representing Chairman Gailor of way and structures committee No. 6, reported that his committee had been expanded to include additional manufacturers and railway engineers and that the hearty co-operation of the American Welding Society was now being obtained through the committee appointed by President Farmer of that organization. Attention was called to the decision of the committee to change the title of the welding rod specification from "Specification for Welding Rods" to "Specification for Bare Electrodes." A specification is also being prepared covering the so-called flame test which has recently been developed and is believed to be a simple yet very practicable test for determining the welding properties of the electrodes. Mr. Merker further stated that, owing to the delay in expanding the committee and in arranging for the co-operation of the American Welding Society, it would not be possible to present more than a progress report this year.

Mr. Spencer reported in considerable detail on the work to date in investigating alloy steels other than manganese for special trackwork. He announced the results of some welding tests on both chrome nickel and manganese steel which had been made by the Canadian Steel Foundries on specimens welded by the Montreal Tramways. He also announced the results of the tests made by the Lorain Steel Company on test specimens which they themselves made up. In view of the fact that there are a number of variables entering into such tests it is not surprising that there were some inconsistencies in the results of the two sets of tests. Mr. Spencer hopes to arrange with each of the manufacturers to submit test pieces, all of which will be welded in the presence of the committee with the same types of electrodes and by the same welder. It is his plan then to have the welded specimens tested in the laboratory in the presence of the committee members. He stated that one more meeting of the committee would be held this year, but that it was not likely that a final report would be presented at the convention.

Mr. Harvey presented a copy of a tentative report of his committee which was read and discussed. Comment was made on the use of T-rails in the cross-sections of track construction used as illustrations and it was pointed out that the committee had simply followed out the procedure adopted by previous committees on this subject. It was suggested that except in the case of pavement contours suitable only for T-rail sections the association's 7-in. grooved girder rail be shown in the illustrations.

Owing to the importance of this subject and the fact that the report had not been studied by the members of the standing committee, the chairman asked each member to review the report promptly on his return home and forward to Mr. Harvey a written discussion, sending copies of the discussion to all members of the standing committee. With this information Mr. Harvey's committee will then be in a position to prepare a final draft of the report for consideration.

Mr. Hughes, chairman of the committee on bus garages, was not present and no report was submitted. Mr. Hecker submitted a copy of the advance report of the National Fire Protection Association garage committee and called attention to the modifications which had been made in the original draft through the efforts of the A.E.R.E.A. representatives. He stated that copies of this report had been submitted to way and structures committee No. 9 for comment and criticism and that during the coming year the report would again be reviewed by the National Fire Protection Association garage committee with the view of making any necessary revisions and submitting it in 1929 for final adoption. He reported also that at a recent meeting the committee had analyzed its several subject assignments and agreed upon a program of carrying out the work for the year.

Mr. Hawkins, reporting as chairman of the committee on track construction, stated that it did not desire to make any recommendations this year. Due to the interlocking membership on the corresponding committee of the American Society for Municipal Improvements, and the harmonious relationship existing between the two committees Mr. Hawkins did not believe anything should be done by the way and structures division which would in any way disturb the present satisfactory situation.

Mr. Wysor reviewed briefly the work of the committee on rail corrugation, calling attention to the meeting held earlier in the week and outlining the status of the various matters under consideration. He stated that his committee would present only a progress report covering the work accomplished during the year.

Chairman Eckroad of way and structures committee No. 13, joint railway and bus terminals, was not present nor was any report presented for the committee. Mr. George stated that he had seen no correspondence of this committee since its organization but attributed this to the fact that the committee was organized rather late in the year. Chairman Eckroad is urged to make a special effort to have at least a progress report for the convention.

COMING MEETINGS OF *Electric Railway and Allied Associations*

***May 22-24*—Indiana Public Utilities Association, Columbia Club, Indianapolis, Ind.**

***May 24*—New England Street Railway Club, annual meeting, Boston, Mass.**

***May 28-31*—National Association Purchasing Agents, annual convention and exhibit, American Royal Building, Kansas City, Mo.**

***June 4-6*—Midwest Electric Railway Association, Hotel Baltimore, Kansas City, Mo.**

***June 4-8*—National Electric Light Association, Atlantic City, N. J.**

***June 6-8*—Canadian Electric Railway Association, annual convention and exhibit, Toronto, Canada.**

***June 12-13*—American Wood Preservers' Association, Chattanooga, Tenn.**

***June 14-15*—New York Electric Railway Association, Half Moon Hotel, Coney Island, N. Y.**

***June 20-27*—American Railway Association, Div. 5—Mechanical, annual convention and exhibit, Atlantic City, N. J.**

***June 21-22*—American Railway Association, Motor Transport Division, Atlantic City, N. J.**

***June 21-22*—Wisconsin Utilities Association, Accounting Section, Hotel Pfister, Milwaukee, Wis.**

***June 28-29*—Central Electric Railway Association, Cedar Point, Ohio.**

***July 8-12*—Public Utilities Advertising Association and International Advertising Exposition, Detroit, Mich.**

***July 13*—A.E.R.A. Executive Committee, New York, N. Y.**

***July 18-20*—American Society of Civil Engineers, annual convention, Buffalo, N. Y.**

***July 25-27*—Electric Railway Association of Equipment Men, Southern Properties, Cincinnati, Ohio.**

***July 27-28*—Central Electric Railway Accountants' Association, Detroit, Mich.**

***Aug. 16-17*—Wisconsin Utilities Association, Transportation Section, Sheboygan, Wis.**

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American Electric Railway Association, 47th annual convention and exhibit, Cleveland, Ohio.

Mr. George reported that way and structures committee No. 14, rails, had submitted a final report on branding which had been sent to the standing committee for letter ballot, ten votes having been cast. This report was prepared after joint consideration by way and structures committee No. 14 and representatives of the track committee of the A.R.E.A. Mr. George announced that in two of the votes cast, one disapproved the recommendation and the other made certain suggestions for an alternate rail designation. Following a discussion both of those members withdrew their original votes and approved the report as submitted. The remaining two members were asked to submit their votes as promptly as possible. It was requested by Chairman Alden of this committee that the submission of the report to the general secretary be withheld until action had been taken by the A.R.E.A. track committee on May 30.

Mr. Clark submitted for special committee No. 15, drawings of a full size for a track checking gage and wheel checking gage. This gage is so designed as to permit readings on a scale of the actual gage of either track or wheels.

Mr. Ryder questioned the effect of the curved-head rails on the location of the gaging points on the rail and of the need for considering this in the design of a measuring device. He also called attention to the fact that the committee had apparently not considered the second half of its assignment, viz., "Check gaging point on rails and wheels to determine if present practice is correct." After some discussion it was voted that the drawing be referred back to special committee No. 15 and that it be requested to complete its assignment. In the discussion of the gage submitted Mr. Flowers and Mr. Ewing both stressed the importance of wheel coning on the centering of the wheels on the rails.

Chairman L. A. Mitchell of special committee No. 16 was not present at the meeting and no report was submitted. This committee was organized late in the year, which probably accounts for the delay in getting the work started. Chairman Mitchell is urged to make a special effort to at least present a progress report at the convention.

Chairman George then called attention to a suggestion of Mr. Smith that a study be made of the desirability of modifying the heads of the Association's standard girder guard rails to conform to the curved heads of the standard grooved girder rails. Mr. Smith moved that the matter be referred to special committee No. 14 for consideration and report. The motion was duly seconded and approved.

Those in attendance at the several committee meetings were: C. A. Alden, F. L. Butler, S. Clay Baker, B. R. Brown, David Berman, E. B. Bloom, J. A. Campbell, B. R. Chestney, Charles H. Clark, T. H. David, E. B. Entwisle, L. O. Eiffert, D. D. Ewing, H. Fort Flowers, H. H. George, C. L. Hawkins, W. H. Hayes, H. F. Heyl, A. E. Harvey, J. H. Haylow, G. C. Hecker, C. R. Kinnear, W. M. Kingston, T. J. Lavan, J. R. McKay, A. D. WcWhorter, W. H. McAloney, R. F. Marion, J. T. Moore, H. F. Merker, C. L. Moses, T. N. Newbold, A. M. Nardini, E. S. Olmsted, R. M. O'Brien, M. L. Rahner, A. T. Spencer, J. H. Sundmaker, H. F. Swayze, C. A. Smith, E. M. T. Ryder, E. R. Rath, C. R. Seybold, R. E. Tafel, A. Taurman, H. J. Tippet, J. B. Tinnon, H. S. Williams, W. W. Wysor, A. S. Wentworth, A. J. Yanger, W. S. Yeates.

News of Other Associations

Central Master Mechanics Hold Two-Day Session

EIGHTY maintenance men attended the Erie meeting of the Central Electric Railway Master Mechanics' Association on May 9 and 10. This approximated the record established at the Pittsburgh meeting a year ago, which at that time was credited with being the largest in the history of the association. The two days spent in Erie were crowded to the limit with a business session and inspection trips. During the business session which occupied the morning of the first day and a part of the afternoon the reports of a number of standing committees were presented, discussed in considerable detail and adopted with some modifications.

Further progress was made in determining equipment standards for freight cars in interchange service and for the completion of a revised list of uniform charges and standards. Standardization details relating to grab bars were discussed and the recommendations of the committee accepted. Chairman A. J. Challeen of the committee on revision of uniform charges presented a report outlining a new basis for standardizing prices of truck and car parts. The system of credits is eliminated and an allowance for the salvage value of scrapped parts made in fixing the new prices for replacements. Before the adoption of this report, however, considerable discussion was aroused. In the rules governing the condition and repair of freight cars for interchange service as adopted by the association May 11, 1927, and published in ELECTRIC RAILWAY JOURNAL for May 28, 1927, and Jan. 7, 1928, the objection was raised to the "plus 15 per cent" which rule 38 authorized to be made over and above the cost for material and labor in making repairs to foreign cars.

The committee appointed to write a set of instructions covering the proper use of cards and forms used in the interchange of equipment in cases involving damage to cars recommended the use of four forms only; a defect card, bad order card, repair card, and a uniform foreign defect and repair report. The committee stated that while it is true that several additional cards have been adopted by the association, it was the consensus of opinion that there should be published at present only the four forms mentioned, and that the members of the association should see that their foremen, inspectors and repair men become thoroughly familiar with the use of the cards. Detailed instructions for their use were incorporated in the report and the whole accepted.

The meeting voted to incorporate all existing standards, uniform charges and forms used in the conduct of interchange business in a handbook to be published by the association as soon as possible.

Following the completion of committee reports the session was thrown open for a consideration of questions relating to mechanical practices which had been previously prepared and sent to the members. Lively differences of opinion developed.

In addition to entertaining the master mechanics at luncheons on Wednesday and Thursday the General Electric Company was the host at a banquet given them Wednesday evening at the Lawrence Hotel, Erie. The dinner was made the occasion for informal remarks from F. E. Case, railway engineer of the General Electric Company, who was called on by F. J. Foote, president of the association.

Thursday was given over to an inspection tour of the Erie works of the General Electric Company, and for those who especially wished it a trip was arranged between Erie and Northeast, Pa., on a magnetic-brake equipped car belonging to the Buffalo & Erie Railway. Results of the initial tests were published in this paper for July 17, 1926 and Aug. 21, 1926. At the Thursday luncheon the place of the fall meeting was selected as Cleveland, Ohio.

Central Electric Railway Master Mechanics at Erie Works of the General Electric Company, Erie, Pa., May 10, 1928

Using Power and Light Ideas in Selling Rides*

By Walter Jackson

Fares and Motor Bus Consultant, Mount Vernon, N. Y.

GAS and electric utilities are not faced by the competition of home-manufactured products, and have the further advantage of knowing precisely how much the customers buy. Contrast this with the plight of the purveyor of public transportation, who is faced by a serious competitor, the private automobile, and who has no first-hand knowledge as to the riding habits—in time, frequency, distance—of the individual patron. No matter how many costly surveys he may make of passenger movement, the answer is a mass and not an individual one. He learns that a certain number of persons ride a given line on a given day, leave at a certain corner and disperse in a certain neighborhood. For this reason, it is much more difficult for the electric railway and bus operator to set up a proper schedule of rates such as will combine greatest revenue to the company with greatest usefulness to the public.

The gas and electric utility man has been so successful in selling at differential rates to build up an all-day load factor that he has actually reversed the original situation. Formerly, a daily load curve had the same peak aspect that the electric railway load curve has to this very day. Now, the heaviest load comes in the morning hours when industry is busiest. The gas and electric utility man has been guided by two principles in developing his variety of rates and rate structures; that of granting a lower rate in accordance with quantity purchased, and that of granting a lower rate to those who purchase when the maker has an unavoidable surplus. Furthermore, the two principles are modified by the competition factor.

Purveyors of local transport, as a class, have done very little with lower rates for wholesale use, the first principle. A cash fare for all, regardless of the distance traveled, is in use as well as a ticket rate—sometimes two such rates—which grants a lower fare to persons who invest in more than one fare at a time. However, those who pay more than one fare are not necessarily wholesale users of the service and the wholesale rate is granted without proof of consistent patronage. As to the second principle—lower rates to those who buy when the maker has a surplus—local transportation companies have made practically no move. The rate for a long ride in a crowded car is as much as that for a short off-peak ride in a car with many empty seats.

The competition factor which modifies the rate adjustments for gas and electric utilities should be considered more seriously by electric railway men than it is. Walking is a serious competitor, as are the telephone and the radio, but the overwhelming competitor is the privately operated automobile. Although the average automobile owner has little interest in detail cost, it does not follow that he will pay no attention to public transport rates that are lower and more convenient. In many cities, the use of a personal machine for travel to and from the business district has lost its savour, and transport concerns are having less difficulty in holding or gaining rush-hour business in proportion to the growth of industry.

Although wages, materials, taxes, etc., are higher now than they were a decade ago, the transport in competition with the bus and the trolley has been growing cheaper. Continuance of old rate-making practices, therefore, means that we are trying to get more money from a diminishing clientele. Transport men should not be fatalistic about the decline of off-peak traffic when it is borne in mind that there are more persons outside the store and factory and office than there are in them. In other words, the traffic to and from the job does not have to be the major traffic. It is not reasonable to complain about the loss of off-peak traffic, or failure to gain such traffic, if no use is being made of differential rates.

Fares That Classify the Patrons

City transport systems have no way of determining the amount of riding, the hourly distribution and the length of riding done by individual customers. However, there are available certain classes of rates that at least reveal the habits of riders by groups. These rates are made possible by the use of special cards, as the permit card, weekly pass, Sunday-holiday pass, and the week-end pass.

Closest to the practice of gas and electric utilities is the use of a permit card. The purchaser pays a fee of 25 cents or more a week for a card which permits him to travel for 5 cents additional per ride. The principle has proved a success on properties securing increases to 10 cents from cash fares as low as 6 cents and 7 cents, and to token rates like 8.33 cents. It has been less successful, or even a reducer of revenue, where the increase in other fares was little or nothing. Unquestionably, the permit card in its more liberal weekly, transferable form, is a better way of producing more revenue than a straight increase in fares; but as it does not do much to encourage off-peak travel, it falls short in respect to the main problem.

More widely used is the type of rate called the unlimited ride, weekly pass. The flat rate for riding has proved practicable; first, because unlimited riding in theory is closely limited in practice, and, second, because almost all extra riding with a pass comes in the non-rush hours. The most likely buyer of a pass is a person who is already a peak-hour customer. Hence, it makes no difference whether he or someone else uses his pass rides also at other times. The weekly pass is deliberately priced to bring out whatever off-peak riding is possible among its buyers. It generally costs four to six more fares than the twelve compulsory rides each week between home and job, so that the purchaser is either a person with some off-peak riding or one who feels that this type of rate will encourage him to become an off-peak rider. The pass has been most successful on medium and large properties with a large market.

Off-Peak Passes Also Encourage Riding

While the weekly pass, through its cheapness for the off-peak extra rides and its avoidance of change-making, transfers and identification checks, is a popular institution, it still falls short of building up the off-peak loads and revenues sufficiently. For this reason it is advisable to use an off-peak pass which could be sold for one-half or two-thirds of the standard pass cost to persons who ride less frequently than the worker who must ride twelve times a week. It has been estimated that the standard weekly pass produces good off-peak riding from one-third of the customers. It is possible that an off-peak pass would produce similar results with another third of the patrons.

Pittsburgh, Cincinnati, San Francisco and St. Louis, in the order named, are the metropolitan centers which have adopted the pass principle for the encouragement of Sunday-holiday riding. On these days, little of the traffic is compulsory. Therefore, it is logical that we should offer a more attractive rate. The Sunday-holiday pass also has been used successfully by short interurban lines, particularly on those entering some terminal city with many entertainment objectives.

Other variations of the pass are the week-end or the Saturday-Sunday pass, being used by a railway which serves a large terminal city, and an evening pass, being used by one railway during the summer months. A few railways have considered nickel fares for short rides within a fair-sized neighborhood center. This is a rather delicate discrimination, because any rate of fare that seems to favor a given neighborhood will be opposed by other districts. Another way of building up off-peak service is offered by the sale of single or round-trip tickets at lower rates if used between certain hours, as from 10 to 4. This plan has been effective on the trolley lines of London. Differential rates as used by gas and electric utilities are being used in other forms by electric railways, but those mentioned are the most popular for merchandising rides.

**Abstract of a paper presented before the annual convention of the Missouri Association of Public Utilities, held at Jefferson City, Mo., April 26-28, 1928.*

News of the Industry

Seven-Cent Fare Suggested in Dayton

Expert wants railway to carry out $1,000,000 program as part of general traffic improvement scheme

ROSS W. HARRIS, Madison, Wis., has reported on proposed traffic changes in Dayton, Ohio. He suggests rerouting of street cars, coupled with higher fares and better service, parallel parking only, faster signal lights, traffic lanes for automobiles and two new thoroughfares.

By making changes which he suggests Mr. Harris feels certain that automobile speed can be increased 40 per cent in the business district and street car movements downtown can be accelerated materially.

Four street car tickets for a quarter and a cash fare of 7 cents is advised to enable the companies to effect the required routing changes and make necessary improvements in service. Immediate relief of congestion and provision for future traffic needs are both inextricably linked with the street car situation, the report says.

Diagonal parking would be virtually abolished under provisions of the report and downtown thoroughfares, would have double lanes of traffic, moving at 19 m.p.h., in each direction, with the green light showing for fourteen seconds during each cycle instead of for 17½ seconds as it does at present.

Study Covered a Period of Year

On Main Street parallel parking would in turn be discontinued when the need required and that thoroughfare opened for three lanes of automobile traffic in each direction.

Mr. Harris would overcome many of the common forms of automobile and street car delay in the business section by merely speeding up the lights. He says this plan would give users of both types of transportation great relief, without inconvenience to pedestrians. Opening of Second and Fourth Streets as thoroughfares, to widen the neck of the downtown traffic bottle, is recommended.

Mr. Harris was employed jointly by the city and the electric railways early in 1927 to work out the answer to present traffic problems and provide for future traffic needs of the city's rapidly increasing population. It was felt that experienced and constructive assistance was needed to insure a program that would afford immediate relief and insure citizens against future traffic entanglements.

The official report contains 750 pages and represents nine months' work on the part of Mr. Harris and an organization staff. It is supplemented with a voluminous appendix of maps and charts.

Philip H. Worman, representing the companies, estimates the expenditure of more than $1,000,000 on the part of the local railways will be necessary permanently to establish the improved service required in the Harris traffic report. New cars alone would cost the companies about $500,000 and improvements in tracks will require the expenditure of a still larger sum.

To maintain permanently the kind of service called for in the Harris report, the City Railway would have to spend $150,000 for new cars. Likewise to comply with provisions of the report, the Peoples Railway would need twenty new cars at a cost of $200,000 and the Dayton Street Railway would have to make an outlay of $77,500. Since cars of the Cincinnati, Hamilton & Dayton Railway are the last word in car equipment, no changes of any sort would be necessary in handling the passengers on this line.

Commission Reversed in Baltimore Case

Prohibited from limiting rate of fare to be charged. Court regards 8 per cent return as none too liberal

IN A sweeping decision by Judge Joseph N. Ulman in Circuit Court No. 2, Baltimore, an injunction is granted under which the Public Service Commission is prohibited from limiting the fare rate to be charged by the United Railways & Electric Company, Baltimore. The court holds, however, that earnings of the company will be limited to 8 per cent on all the railway's property. No sooner had the court handed down its order than attorneys for the commission announced that the case would be taken to the Maryland Court of Appeals.

Under the action of the court there is nothing which would interfere with the United increasing its fare rate immediately, but Charles D. Emmons, president of the company, announced that no such action will be taken until the Court of Appeals decides the case.

The case grew out of the United's plea to be permitted to charge a straight 10-cent fare. In this action the commission refused to grant the full increase, but allowed a fare of 9 cents or three tokens for 25 cents. Up to that time the fare had been 7½ cents. The company then sought an injunction to restrain the commission from preventing it from charging 10 cents. At the same time two other petitions were filed, one by the People's Corporation and the other by the Socialist Party, each seeking a return to the 7½-cent rate.

Some of the Background

Judge Ulman spent several days in hearing the United case and then handed down his sweeping decision. Under this decision the case was to be remanded to the Public Service Commission for the purpose of taking additional action on the subject of annual depreciation allowance. It was held by the court that the rate fixed by the commission was unreasonable and illegal and that less than 7½ per cent earnings were confiscatory. It also held that an annual depreciation allowance fixed by the commission was based on erroneous and illegal standards. Instead of agreeing to resume the case and take up the questions cited by the court the commission elected to have the subject go direct to the Court of Appeals and notice of appeal was filed.

Harold E. West, chairman of the commission, said that under the ruling of the court it is to be assumed that the commission has no right to fix the rate of fare for the company.

The court said:

This cause having been set down for hearing and coming on to be heard on the pleadings and the transcript of papers and proceedings, including evidence in the case before the Public Service Commission, and having been argued by counsel for the parties, and the court being of the opinion, for the reasons stated in its opinion filed in this case, that the rates fixed by order No. 12,639 of the Public Service Commission passed on Feb. 10, 1928, and said order and prior orders limiting rates charged by the plaintiff (the United) are unconstitutional, unlawful and unreasonable and fail to allow to the plaintiff a fair return on the fair value of its property; and the defendants constituting the Public Service Commission of Maryland having elected not to have this cause remanded to them for further proceedings upon the lines suggested in the courts opinion, but to have the final decree or order entered forthwith.

It is thereupon, by the Circuit Court No. 2 of Baltimore City, judged, ordered and decreed that said order No. 12,639 of the commission be and the same is hereby vacated and set aside in so far as the same purports to limit the rates of the plaintiff; except, however, as to that portion of said order which extended the first fare zone on the Halethorpe line to the terminus of said line at Halethorpe, as to which latter provision in said order the bill of the plaintiff is hereby dismissed.

And it is further adjudged, ordered and decreed that the defendants and their successors in office be and they are hereby perpetually enjoined and prohibited against enforcing against the plaintiff the provi-

sions or order No. 12,639 in so far as the same limit or purport to limit the rates of fare to be charged by the plaintiff, and also against enforcing against the plaintiff the provisions of any prior orders of the commission limiting or purporting to limit the rates of fare to be charged by the plaintiff.

And it is further ordered that the costs in this case be paid by the defendents.

From this action on the part of the court it can be seen that the commission was upheld on only one point—that dealing with the fare to Halethorpe, and that the commission is prohibited from enforcing not only the recent order upon which the court acted but also any orders passed previously.

In the commission's original order an allowance of $883,000 was made for annual depreciation and retirement of the company's property, while the United held it should be $2,200,000, based on present value. It was held by the court that the method used by the commission in arriving at the amount it set was illegal and erroneous. It was decided by the commission that 6.26 per cent was a reasonable return. The court, however, held that the company should be allowed to earn from 7½ to 8 per cent.

Need of Community Confidence Reiterated at Port Arthur

On the occasion of a "red letter" day in Port Arthur, Tex., namely April 21, 1928, when the Eastern Texas Electric Company installed a new railway and bus service J. G. Holtzclaw, manager, made the following statement:

If a public utility is to survive and fulfill its mission, which is the rendering of good service, it must have community confidence. This confidence, this feeling of trust which is so necessary to success, is won, not by promises made, but by promises kept. This we consider a fair price and again we pay it gladly. When we took over the railway system of Port Arthur we promised new service within three months. The three months have passed quickly. Bad weather at times has threatened delay. Failure of material to arrive on schedule has resulted in temporary setbacks. But at last we can happily and proudly say that again we have fulfilled our pledge!

Parade in Commemoration of Hocker Line Revival

Eight cars were paraded over the Kansas City, Merriam & Shawnee Electric Railway, the rehabilitated Hocker Line, on May 12, officially opening the interurban road to service. The cars carried officials and patrons of the line, officials of the Kansas City Public Service Company, 200 Kansas City business men and the Kansas City Public Service Company band of 30 pieces. They left Ninth and Wyandotte Streets at 2 o'clock and traversed the line to Rosehill, Kan., its suburban terminal.

Following the parade a barbecue and picnic was held in Shawnee Park, at which M. A. Summermour, Mayor of Shawnee and chairman of the board of directors of the reorganized railway, and other officials spoke. Service on the road was resumed Sunday morning, May 13, after a ten-months suspension.

I.C.C. Against Johnson Measure

Chairman of regulatory body sees need for clarifying bill so as to remove need for commission to take jurisdiction

IN A report to the House committee made public on the so-called Johnson electric railway bill, John L. Esch, chairman of the Interstate Commerce Commission, concedes the need for clarifying the status of electric railways before the commission, but objects to the methods proposed in the bill. In brief, this bill, introduced by Representative Johnson of Indiana, proposes to classify as "commercial electric railways" all lines that approach steam railway practice in magnitude and method of operation and to subject these to the full provisions of the interstate act. Mr. Esch reports:

As a general statement it may be said that the provisions of the interstate commerce act applicable to steam railways are also applicable, with few exceptions, to electric railways. Thus the general provisions relating to the duties and obligations of the carriers, the filing and observance of rates, the joint use of terminals, acquisition of control and consolidations, the pooling of freight, the observance of the long and short haul provisions, the observance of accounting regulations, and the filing of reports, are all as applicable to such electric railways as to steam lines.

In the provisions covering the construction or abandonment of lines, through routing and joint classification, and in the general rate scheme, including the recapture clause, Mr. Esch, however, agrees that exceptions are made in the cases of electric railways. Instead of making general definitions of electric railways to be excluded from this proposed stricter ruling as is done in the bill, Mr. Esch contends that it would be better to define only the included class and to make it incumbent upon the rest to prove their right of exclusion. Mr. Esch writes as follows:

It is, of course, not an easy matter to define such a class of electric railways, and we do not believe that it could be done with sufficient accuracy without providing for the individual consideration of particular cases by the commission. The best plan that we are able to suggest is to provide that all electric railways having certain characteristics capable of accurate definition shall be included within the class, unless upon public hearing we shall find that particular electric railways coming within the definition are not as a matter of fact affected with an important national interest so far as the purposes in question are concerned.

In arriving at a proper general definition, we think we can start with the premise that participation in general freight service, rather than passenger service, is the thing that brings electric railways within the range of national interest. The next step is that only electric railways which interchange standard freight equipment in interstate commerce, with connecting steam lines, are affected by such an interest. A further step is that only such electric railways as participate in joint interstate freight rates with connecting steam lines need be included; for it seems to us that those whose service is rendered merely by switching or which are content with combination rates on through traffic, are not of such national concern.

Mr. Esch feels, however, that this definition would probably be too broad in practical operation and would include various electric railways which, in fact, are not of national concern for the purposes in these sections. To obviate this difficulty, it seems to him that provision should be made for appeal to the commission which would permit that body, after public hearing, also to exclude until further order such specified electric railways, coming within the broad definition, as are found after taking evidence, not be affected with an important national interest. In conclusion he says:

This would, it seems to us, put the burden of proving their right to exclusion upon the electric railways where it belongs, instead of reversing the process as this bill proposes and putting the burden on us of combing the entire electric railway field and discovering the particular electric railways which the public interest requires to be classified as "commercial electric railways."

New Traffic Code Recommended for Boston

A revision of many of the present traffic regulations in Boston, Mass., is recommended in a new traffic code compiled by Prof. Miller McClintock, director of Mayor Nichols' traffic survey. The new code contains most of the regular provisions of the present standard code. It also definitely establishes certain arbitrary definitions and standardizes many regulations.

One of the recommendations is that there should be a co-ordinated system of automatic traffic signals operating under progressive timing for various sections of the city. These systems have been worked out and prepared by the survey, which has also worked out special automatic traffic control plans for immediate installation in Governor Square and at the intersection of Cambridge and Charles Streets. The report recommends the designation of certain "through streets" where all vehicles would be required to come to a full stop before crossing unless otherwise directed by traffic lights or a police officer. A new division is recommended in the street commission for the special handling of traffic matters. This would be under the direction of traffic engineer. Reorganization is also suggested in the police traffic division.

Unrestricted parking is permitted in certain sections of the city and no parking is recommended in other sections within an area indicated by official signs. The delivery of goods and the collection of waste materials between 8:30 a.m. and 5:30 p.m. are forbidden except by emergency permit of the street commissioners on specified congested parts of the streets.

Legislature in Session

Illinois body takes up home rule measures and bills intended to afford means of settlement in Chicago

THE Illinois General Assembly, in special session, has under consideration three bills prepared by the city and intended to give Chicago home rule over public utilities. The special session was called primarily for this purpose and to settle the railway situation there. It convened on May 15 with a large number of members absent, and it seems doubtful whether the session will accomplish anything, owing to the fact that it is called by Governor Small following his defeat in the primary and at a time when members who have been renominated are preparing for their fall campaigns and those who have not been renominated are no longer interested in legislation.

Opponents of the Governor point out that this is the first real attempt he has made in eight years to secure legislation to provide home rule and stress the point that the legislation is sponsored by Mayor Thompson, who backed Small in the recent primary.

At the opening session Mayor Thompson and members of the local transportation committee of the City Council were present. The city's bills were introduced simultaneously in the House and the Senate after the Governor had completed the reading of a message in which he argued for home rule for Chicago and declared himself unalterably opposed to a terminable permit or any other franchise without a fixed term. The bills authorize Chicago to create a regulatory commission vested with the same power as the State Commerce Commission to govern utilities operating in the city. They also repeal the twenty-year limitation on franchises and give the Council the right to grant a franchise for any fixed period.

Two other bills are to be introduced later providing for a consolidation of the surface and elevated lines and authorizing the construction of subways by special assessment.

No Seven-Cent Fare in Detroit Now

No need exists at present to increase fares on the Detroit Municipal Railway, Detroit, Mich. This is the opinion of the Street Railway Commission, although two members of the three-man board believe an advance in fares would justify itself. Ogden Ellis, chairman of the commission, is quoted as follows:

While an increase in fare would benefit the city by allowing the department to make developments, there is no probability of an immediate raise. I am not sure that there would not be a certain amount of opposition in some quarters to boosting fares. I haven't inquired. Of course if an increase were necessary the commission has the power to act. The fact of the matter is, the fare is going to stay at 6 cents for the time being at least.

John J. Barlum, another commissioner, had much the same to say. While he is of the opinion that it would be wise to establish a 7-cent fare and maintain it for two years, for the purposes of providing service for outlying districts, purchasing new equipment and repairing old and making adequate payments into the sinking fund, there will be no change in fare before fall, he declared. He is said to feel that if the 7-cent fare could obtain over a two-year period there could be a 5-cent fare.

Enterprising Scheme to Boost Railway in Clarksville

An ingenious plan and a co-operative spirit have spelled salvation for the Citizen's Railway operating in Clarksville, Tenn. Twenty-one individuals with "interested" citizens have composed a committee which is to investigate the public sentiment and possibility of substituting buses for the two cars which operate on approximately 3 miles of line and haul about 125,000 people annually. The committee is to have a month for its investigation and recommendations and during that time the 21 citizens and firms will contribute $5 each for maintenance of the system against its daily operating deficit. They even pledged a continuance of the contributions if the report is not ready at the end of the month.

One of the pledgees stated that he would be willing to donate $250 annually to help defray any deficit provided W. E. Beach, who served without compensation as president since 1916, would continue in office. The president suggested that the service be discontinued for a period of 30 days, following the close of the city schools.

Contest in Cincinnati Extended

An extension of time up to June 30, 1928, has been allowed for the contest open to every member of the Cincinnati Street Railway, Cincinnati, Ohio, covering ideas on selling rides. In the May issue of the *News*, the official paper of the company, readers are told that their ideas might be worth $10 and that they should be sent in to the Contest Editor, 804 Dixie Terminal.

New Uniforms for East St. Louis Employees

A departure from the usual in electric railway apparel is seen in the new uniforms being worn by all platform men and supervisors of the East St. Louis Railway and Belleville division of the East St. Louis & Suburban Railway, East St. Louis, Ill. Instead of the dark serge material the new toggery is made of the popular and durable olive-drab whipcord cloth. The caps are of the semi-military style with the operator's badge on each side instead of across the front, as formerly was the custom. Four-button cutaway is the style of the coats. All buttons bear the nickeled monogram of the affiliated East Side Electric System.

A distinctive feature of the new uniforms is the service star worn on the left sleeve. Each silver star worn represents five years' service with the company, the five-star-cluster indicating that the wearer is a member of the company's Twenty-five Year Club.

Natty appearance of railway employees in East St. Louis in their new uniforms

Judah Street Extension in San Francisco Under Way

After a year's delay work has been started and is being pushed by contractors on the Judah Street extension of the San Francisco Municipal Railway, San Francisco, Cal. It is expected that cars may be running by Jan. 1. The plea of Reuben Hunts, "A taxpayer," for an injunction was denied by the California Supreme Court, the court ruling that the work could be financed out of city moneys on bond. The Municipal Railway was declared to be a unit and not a group of operating lines as contended by Mr. Hunt. Further litigation was avoided by a conference between attorneys for Mr. Hunt and City Attorney O'Toole, as a result of which it was announced that no other legal action would be brought to impede the work.

Judah Street will be paved from Forty-first to Forty-eighth Avenues. Some of the trackage has already been laid. The extension will serve the newly built Sunset district.

Electrification at New York Plan Report

Electrification of all railroad lines in New York City and its suburbs, elimination of grade crossings at the intersection of railroads and main highways, and unified management and operation of railroad transportation in the environs of New York, are some of the outstanding needs cited in the report on "Transit and Transportation" prepared by the Regional Plan of New York and Its Environs as the result of six years' study, the second section of which was made public May 14. The report says:

One of the plans calls for a new subway system for the exclusive handling of package freight, coal, building materials and waste products. This plan proposes the use of small cars of about 10-ton capacity, with demountable bodies which could be transferred from the subway chassis to motor truck chassis for short hauls on the street surface.

The second plan for freight distribution would create a system of inland freight stations in combination with industrial terminal buildings, such as have been proposed by the Port of New York Authority, and toward the carrying out of which considerable progress has been made. It is expected that these would release much of the water front of Manhattan and New Jersey for the development of steamship terminals.

The third plan calls for the construction of double-deck piers, containing two float bridges, and connected at the second story level with freight terminal buildings on the inland side of waterfront streets.

The fourth proposal suggests the establishment of a large terminal on the west water front of Manhattan, which would connect through a fleet of rapid-scheduled motor floats with all the New Jersey railroads and the New York Central Railroad.

The regional planning body does not indicate which of these proposals it considers most desirable, but definite recommendations on the subject will be contained in the regional plan itself, which is to be drafted next fall.

100 New Cars for Cincinnati

Telegraphic advices from Cincinnati on May 18 report an order placed with the Cincinnati Car Company for 100 cars to be delivered to the Cincinnati Street Railway next fall to cost $1,300,000.

Old Scale Accepted in New York State

Motormen and conductors on the Syracuse, Rochester and Utica divisions of the New York State Railways accepted the proposal of the company that the existing wage contract be renewed for another year. The contract is in contrast with an increase of 8 cents an hour asked by the men. The company claimed it was unable to meet the requested increase because of paving costs and increased competition from automobiles.

More than 2,000 men are affected by the agreement. The so-called working terms of the new contract will differ only slightly from the ones in force the last two years.

Lower Fares in Massachusetts

Trustees of the Eastern Massachusetts Street Railway have announced a reduction of fares on part of its lines in Melrose, Mass., through the issuance of thirteen-ride tickets to cost $1. The lower fares will be effective on May 23. Aldermen of Melrose recently petitioned the company for reduced fares and also asked for lower fares on two other lines with transfer privileges. These two reductions with the transfer privileges the railway management did not see its way clear to grant.

Both Sides in Fort Wayne Wage Issue

Attorneys for the Indiana Service Corporation, Fort Wayne, Ind., at a recent hearing before the Indiana Public Service Commission, said that higher fares would follow higher wages. They opposed a wage increase which had been sought by employees. Attorneys for the employees said they should be granted the wage increase regardless of the financial condition of the company. Men are seeking a scale of 65, 67½ and 70 cents an hour.

Arbitration in St. Louis

Mayor Victor J. Miller of St. Louis, Mo., on May 16 induced representatives of the St. Louis Public Service Company and the Amalgamated Association to agree to submit their differences to the Missouri Public Service Commission for arbitration. The directors of the railway must also ratify the action of the company officials at the Mayor's conference. This will be done immediately. Briefly the agreement provides:

The city, union and company will submit the wage scale to the Missouri Public Service Commission for arbitration.

Railway officials will ask the directors to authorize them to extend the present contract with the union indefinitely.

The city agreed to intervene as an interested third party and request a speedy and satisfactory settlement of the controversy.

In the meantime the existing wage scale will prevail and any award made by the state commission shall be retroactive as of June 2.

In page advertisements inserted in all of the St. Louis newspapers on May 14 the company stated its position and defended its action in demanding that the workers accept an 8.4 per cent average reduction in wages to be put into effect on June 3.

It is believed that the Missouri Public Service Commission will decide prior to June 1 the question of raising fares in St. Louis to 8 cents flat from the present rate of 8 cents cash with two tokens for 15 cents.

Rapid Transit Survey in St. Louis Approved

The ways and means and a special rapid transit committee of the St. Louis, Mo., Board of Aldermen approved May 11 Mayor Victor J. Miller's bill for a rapid transit survey at a cost of $50,000. The vote was twelve to one. The bill provides for a Transportation Survey Commission to include the Mayor, comptroller, presidents of Board of Aldermen and the Board of Public Service, a representative each of the Missouri Public Service Commission, the St. Louis Public Service Company, City Plan Commission, the director of streets and sewers and seven private citizens.

Franchise Negotiations in Jacksonville Suspended

Negotiations between the City Council and the Jacksonville Traction Company, Jacksonville, Fla., for a new franchise covering operation of the railway system have been suspended pending further investigation of the valuation and other matters by a committee of the Council.

Councilman Hamphill had introduced figures stating that the valuation of the company in 1924 had been placed at $4,136,180 in the hearing to determine whether the company was entitled to a higher rate of fare, that the citizens' committee of Jacksonville had valued the property at $4,557,132 and that the statement of the company to the state of Massachusetts placed the assets of the company at $4,783,611.

At a prevous session Mr. Knight had said that the company would accept a valuation for rate-making purposes on its property of $5,900,000 and desire authority to earn 9 per cent on that investment. He followed with a review of the action of the Railroad Commission in 1918 in allowing a 7-cent fare after the company had gone into receivership and stated that the valuation reached by the commission and the company differed only $58,000. Despite the aid given by the commission then and in 1924 in allowing increased fares, the company has not paid dividends on its common stock since 1914 and preferred stock since 1916 and lost $32,000 last year, he said.

New Office Quarters for Brooklyn Companies

New offices of the Brooklyn-Manhattan Transit Corporation and Brooklyn City Railroad were established May 14 at 385 Flatbush Avenue, the latter company occupying the third and fourth floors and the B.-M. T the six floors from the fifth to the eleventh in the Paramount Building. Formerly the two companies occupied two interconnecting buildings at Clinton and Montague Streets. The offices of the B.-M. T. had been established at 85 Clinton Street since 1905. The Brooklyn City Railroad occupied the building at 168 Montague Street since 1892.

Joint Consolidation of Harbor Operations in Los Angeles

The railroads and railways serving Los Angeles, Cal., harbor joined in applying to the Interstate Commerce Commission on May 9 for permission to consolidate their water front operations. The Los Angeles Harbor Commission will participate in the project. Under the amendment the Southern Pacific, Santa Fe, Pacific Electric and Los Angeles and Salt Lake systems will organize the Harbor Belt Line Railroad. The application explained that an expenditure of $145,000 would be necessary for the construction of new switch tracks and connections. The balance of the belt line property will be made up of contributions of line from the other railroads and the utilization of tracks owned by the harbor commission. Reference to the planning of this line was made in ELECTRIC RAILWAY JOURNAL, issue of March 3, 1928, page 373.

Stations Located for North Jersey Line

Twenty-four stations along a 16-mile right-of-way have been tentatively named by the North Jersey Transit Commission in making known further plans for a rapid transit line proposed along the Palisades ridge from Bergen Point to Fort Lee.

Four stations are proposed for Bayonne, eight for Jersey City, five for Union City and two each for West New York, North Bergen, Fairview, Cliffside Park and Fort Lee. Guttenberg, which occupies a narrow strip of territory between West New York and North Bergen, will be served by a station in West New York five blocks from the city line, and one in North Bergen three blocks from the city line. Joint stations serving two communities are planned at the Jersey City-Union City, Union City-West New York and North Bergen-Fairview city lines.

The route is planned as a subway for almost its entire length. It is laid out so as to serve an area of 20.7 square miles containing a population of approximately 500,000 persons.

Massachusetts Governor Insists on Elevated Legislation

Governor Fuller of Massachusetts is understood to be preparing to send a special message to the Legislature requesting that every effort be made to enact Boston Elevated Railway legislation at the present session, and outlining his views for consideration by the House and Senate. Since the Legislature killed all Elevated legislation in the House the Governor has declined to make his plans public, but he has much to say on the subject in speeches he has made about the need for settling the matter of whether public control of the road shall continue.

In speeches last year and early this year the Governor has threatened to keep the Legislature in session until some Elevated legislation reaches him. He has also said that if the Legislature failed to pass a bill he might feel himself forced to run for a third term as Governor, as he felt he should not leave the office until the Elevated problem is settled.

Transit—A Factor in Community Development

Supervisor of public relations at Buffalo explains company's plan for community development through helpful co-operation

A CAMPAIGN to help the city develop along sound lines through a knowledge of its advantages and a unity of thought and action has been running in cars and buses of the International Railway, Buffalo, N. Y., for several weeks. The purpose is to develop a better understanding of mutual interests in the prosperity of the community and to promote unified effort toward advancement of all interest on the Niagara frontier.

Still more recently the railway has taken another step in this campaign, soliciting the co-operation of moving picture theatres, radio stations and newspapers. As a result the Buffalo Theatre and the Hippodrome in Buffalo are displaying one of these messages at each performance. The Buffalo Evening *Times* is using daily one of these slogans on its front page and station WMAK is signing off nightly with the same message. In these latter developments the railway does not appear at all, the message simply being signed by the organization sponsoring it.

THREE-SIDED RESPONSIBILITY

Thus did Walter McCausland, supervisor of public relations of the railway, explain in part the program of his company for community betterment in a recent address before the Niagara Falls Rotary Club. Among other things he said:

The railway's place in the community may be more clearly visualized when I inform you that this last year the high-speed line between Buffalo and Niagara Falls carried 2,500,000 passengers while the new de luxe limited bus line carried 60,000 more. The International Railway also operates the local service in Niagara Falls and welcomes your comments and suggestions regarding this feature of its work.

As taxpayers you will be interested in the fact that we pay to Niagara Falls in school, county and state taxes $46,000. Last year your city was beautified and traffic conditions were greatly improved by the additional facilities supplied at the American end of Falls View Bridge. Similar improvements are now being completed at the Canadian end of the bridge.

The employees as well as the management have expressed their desire to participate in the activities of the community. Last year we made up a special fund for the organized charitable drives in the communities served by the company. The management matched their contributions dollar for dollar, and the first check drawn from the new fund was for the Niagara Falls community chest.

The speaker mentioned these things not to tell how good the company is, but merely to emphasize the mutual interest. He said further:

It may surprise many to learn that the International Railway carries daily 500,000 passengers on cars and buses of the Niagara frontier. To put the figure another way this is practically equivalent to the population of Buffalo or in the course of a year 1½ times the population of the United States.

Of this tremendous throng of daily riders, more than one-half ride within two hours in the morning and two hours in the evening.

Mr. McCausland then discussed the facilities of the company for coping with the physical problems before it.

Speaking along somewhat similar lines Mr. McCausland addressed the Mercer Club on "Some Human Aspects of the Transit Business." He referred to the $375,000 track and paving program and to the safety record of the Broadway carhouse. In concluding his address he said that International Railway Company men and management pledge themselves to the following policy:

To the Public—

To furnish an adequate system of transportation, operated by efficient and courteous employees, and to improve service to the fullest extent that such improvement can be supported by the fare collected.

To the Employees—

To pay wages adequate to the necessities of life and comfort, and sufficient to permit of reasonable savings. To provide opportunity for participation in increased earnings made possible by the increased effort of the employees, and to encourage the investment of this added compensation in such a way as to make the employees owners as well as workers.

To the Owners—

To pay a reasonable return on the actual value of International Railway Company property, in justice to those who made the company possible in the first place, and in order to keep its credit at a point which will assure the continuance of a high standard of public service.

Ten-Cent Fare Asked in Hamilton

Fares of 10 cents or three tickets for 25 cents on street cars and 15 cents on buses or two tickets for 25 cents are the rates which the Hamilton Street Railway, Hamilton, Ont., will ask when its application for an increase in fares is considered by the Ontario Railway Board. The company will also request that children's fares, at present rating at ten for 25 cents, be changed to six tickets for 25 cents. The present fare in Hamilton is 5 cents. being the only city in Canada with a 5-cent fare. Civic officials are said to appreciate the fact that the company is entitled to redress through an increase in fare, but are understood to feel that a rate of 10 cents is too high.

Recent Bus Developments

Bus Program Ahead in St. Joseph

The ordinance introduced before the City Council of St. Joseph, Mo., at the instigation of the St. Joseph Railway, Light, Heat & Power Company making it possible for the company to use buses as co-ordinate units of the railway system was passed recently. At the same time the Council repealed the ordinance against buses passed in the days of the jitney.

C. A. Semrad, general manager of the company, said that if this ordinance and one to repeal the ordinance regulating self-propelled vehicles carrying passengers for line, so as to prevent the operation of such vehicles paralleling car lines, were passed the company would establish a temporary bus line on Grand Avenue to replace the railway within two weeks after the passage of the bills.

Four buses, to cost $25,000, will take the place of the three cars which now run on the line, the shortest of the system. It is proposed so to route the buses that the tracks will be followed only from the downtown district to Tenth and Powell Streets.

Mr. Semrad declares motor vehicles as substitutes for cars on the Union line is impracticable, because of the long distance to be traveled, and the large number of passengers. The present Union line is 7 miles in length, with one smaller line at the north end and two at the south end.

Only one bus line is operated in St. Joseph at present, between the end of the Frederick Avenue car line and the state hospital. An extra charge is made for transfers.

Line in Lowell Approved

A vote allowing the Eastern Massachusetts Street Railway to operate a bus line through Andover Street to the City line has been taken by the city of Lowell, Mass. A hearing was set for May 15 on the railway's petition to run buses to the Billerica line.

Co-operating With Plane Service in Detroit

During the all-American Aircraft Show held in Detroit, Mich., from April 14 to April 21 a special bus service was established between the Airport and Convention Hall on Woodward Avenue, a distance of about 13 miles, by the Department of Street Railways. The service, which was supplemental to the regular de luxe coach operation, which the department has been operating between the hotel district and the Ford Airport for the past year, was well patronized by out-of-town visitors to the show who desired to inspect the airport. Another de luxe type coach to handle the increased volume of traffic that the Department of Street Railways is transporting to the airport was recently purchased. These two units maintain an hourly schedule for the accommodation of passengers traveling the route of the Stout Air Services, Inc., on their regularly scheduled planes between Detroit and Cleveland.

City Suggests Buses on Denver Line

The city of Denver, Colo., has asked the Denver Tramway to substitute buses for its electric railway cars on the Globeville suburban line. This suggestion followed a protest by the company of the request by the city for a contributor to the expense involved in the work of building a new viaduct leading to Globeville.

Joint Coach Service Effected in Los Angeles

A change in coach service was effective May 4, when the operation of the Wilshire Boulevard and La Brea Avenue Motor Lines was taken over by the Los Angeles Motor Coach Company, in which the Los Angeles Railway and the Pacific Electric Railway are each one-half owners. At that time the Wilshire line was extended from Fairfax Avenue along Wilshire Boulevard to Santa Monica Boulevard, in Beverly Hills. Eight new double-deck coaches, costing approximately $100,000, are being provided by the Pacific Electric Railway and the Los Angeles Railway to take care of the additional service. All of the Los Angeles Railway double-deck coaches will be used on the Wilshire Line.

Application for this joint service was referred to in the ELECTRIC RAILWAY JOURNAL, issue of April 28, 1928, page 711.

One System Suggested for Knoxville

Experts retained by city frown upon any plan that would contemplate competition provided local railway is willing to put on four suggested bus routes

CO-ORDINATION of the city's transit facilities is recommended for Knoxville, Tenn., in the report of Harland Bartholomew & Associates. The report really is the outcome of the situation created by the desire of the Knoxville Rapid Transit Company to secure operating right for local bus lines, some of which would be competitive with the railway lines of the Knoxville Power & Light Company. The Council was not disposed to proceed in the matter, however, until it had the benefit of outside suggestions. Hence the report now presented.

The report will be placed by the Council bus committee before Power-Light officials to ascertain if the company will agree to put on the bus lines recommended for immediate installation. If Power-Light will not agree to put on four lines recommended for immediate installation, the report suggests that an independent system be enfranchised by the city.

The four lines recommended extend into the Beaumont section; into Lonsdale; out Sevierville Pike, and northward from the terminus of the Sixth Avenue car line to Whittle Springs.

The Bartholomew report outlines and recommends nine bus lines for an independent system, in case a co-ordinated bus system can not be agreed on.

The report finds in the repeated eliminations of competing lines in Knoxville's transportation history through numerous consolidations a "striking example of the experience of nearly every city where electric railways are now in operation." The report says:

> Cities have come to realize that the electric railway is a natural monopoly subject to reasonable regulations. The economic problems that brought about the unification of gas, water, electric and telephone services are identical with those supplying urban transportation. The city must be served as a unit if duplication of effort is to be avoided and convenient and efficient service provided at a minimum cost. Competition among local utility companies adds to the cost of operation and makes it impossible for the competing companies to earn sufficient revenue to keep their properties in good operating condition.

DANGER IN COMPETITION

As evidence of the economic results that might be expected should an independent bus system be enfranchised in Knoxville, the report gives the number of passengers carried on the various Power-Light lines a day and the number of seats available:

Seats	Passengers	Excess Seats	Per Cent Vacant
83,803	45,490	38,113	46

The maps in the report show that the six bus lines proposed by the Rapid Transit Company duplicate some lines for their entire length. Yale and Highland lines are the only two where duplication in whole or in part does not occur.

In order to extend transportation service into areas now needing service and not now served, the report recommends installation of six supplemental bus routes, and declares four are needed immediately.

The report recommends that the interurban bus lines carry local passengers within the city on certain routes outlined. It recommends that the terminal location of these lines be changed from State Street to a point west of Gay

Street, and somewhere in the square bounded by Main, Union, Walnut and Henley. All interurban buses then could be eliminated from Gay Street.

As stated before, the report suggests that if no agreement with Power-Light for installation of bus lines can be reached, a franchise be given to an independent company. In this connection nine routes are traced out, based on the maximum service, economy of distance and time, and grade and street conditions. It is proposed to permit buses on these routes to traverse Gay Street until Henley Street is widened and opened and the Henley Street bridge is built. It is proposed, too, to have buses on these routes follow certain loopings in the business section, so that no route will extend through the business section to an objective on the opposite side.

The railway company applied on April 23 for a charter for the Knoxville Motor Coach Company which would be the name of a subsidiary bus operating organization if the Council gives the necessary franchise.

Conference on Substitution by Bus in Ohio Territory

A committee to confer with the Buckeye Stages, Inc., on a franchise for Columbus-Westerville, Ohio, bus service has been appointed by the Westerville Council, which voted for substitution of bus for street car service. Service at present is being supplied by the Columbus Railway, Power & Light Company, but no franchise between this company and Westerville has existed since 1915. Westerville is 14 miles north of Columbus. The matter will be placed before the Ohio Public Utilities Commission.

California Commission Explains Denial of Petitions

The California Railroad Commission has denied various petitions for rehearing the application of the Key System Transit Company for a certificate to operate bus service from the City Hall in Oakland to Alameda. In so doing, however, the commission ordered that when application was made by the utility for a supplemental order approving the routes of the proposed bus service in Oakland and Alameda the matter would be re-opened for further hearing.

Would Increase Feeder Lines in Chicago

Extension of surface lines by the establishment of feeder bus routes was urged by the Chicago City Council committee on transportation at a recent meeting attended by a group of business men from the northwest side who have been petitioning the committee for some time to establish routes. Installation of four routes has been ordered by the Illinois Commerce Commission. The form of the ordinance was approved by Harry P. Weber, attorney for the Chicago Surface Lines, and James W. Breen, assistant corporation counsel.

Replacement in Atchison

Story of a Kansas town in which change-over was deemed desirable —Eleven miles of route

BUSES have relegated to oblivion the thread-bare and derided railway system operated at Atchison, Kan., by the Kansas Power & Light Company. Whether the buses are enjoying present popularity because they represent progress in transportation or novelty remains a matter for conjecture. The old mule cars in Atchison enjoyed similar public acclaim in the beginning and then became the handy butts for commedians' jokes just as the street cars have been for several years.

Thirty-four years ago Atchison held promise of stepping longside Kansas City in population and the coming of the railway was believed to herald great things for the future, and it did. The memory of those early days caused some display of sentiment among the older residents but the buses are new and shiny temptations to ride.

Probably the private auto can be blamed for the death-blow. When a considerable portion of the population became owners of motor cars, electric railway patronage went into a tail-spin that was fatal. Decreases in revenue were accompanied by an increase or at the least a standstill in operation costs.

Officials of the company were loath to spend money. Service and patronage became a game in which each kicked the other farther down the hill. At last it became necessary to make wholesale replacements or abandon the entire system. Company officials are believed to have decided on the replacement because it entailed less initial outlay than would have been needed to rehabilitate the railway.

Slightly less than two years ago two electric lines into north Atchison were abandoned, the tracks torn out and replacement made with buses. One bus was made to serve the combined territories of the two car lines by extending its route. Last summer another line was replaced with a bus. This spring the three remaining electric lines were abandoned and their territory covered by two bus routes, each bus extending its territory. The equipment of the railway was junked wholly.

The fare remains at 10 cents just as it was for the street cars, but the buses are enjoying greater patronage. They are Yellow Coaches, type X, with a capacity of 21 passengers each. Four are kept in active service while a fifth is held for emergencies. The buses cover an entire route of 11 miles on a fifteen-minute schedule.

Two of the former motormen were retired on account of their length of service, and the others were drafted as bus drivers. L. M. ("Curly") Bliss, one of the retired motormen, had been driving a street car since the system was started 34 years ago.

Interstate Legislation Goes Over Till Fall

FURTHER consideration of the Parker interstate bus bill will be postponed until Congress meets again next December. The interstate and foreign commerce committee of the House so decided in executive session May 15. In explaining this action, Representative Parker of New York, chairman of the committee, stated that there are too many conflicting ideas in the committee on the subject to achieve any harmony of opinion this session. "We can get much more satisfactory action next fall," he said. He also pointed out that even if the House passed the bill this session, the Senate would probably not to be able to do anything about it as the committees of that body which are to conduct hearings on the subject have been tied up with other bills.

Additional Service in Rensselaer

The Public Service Commission has amended the certificate of the Capitol District Transportation Company, Inc., subsidiary of United Traction Company, governing its operations in Rensselaer, N. Y., by authorizing the company to establish bus service on certain additional streets in that city. The service was requested by the Mayor of Rensselaer because of growth in the section to be served.

Ruling Awaited on Muncie Buses

Final hearing in the suit of the Equitable Trust Company, New York, trustee for the holders of mortgage bonds of the Union Traction Company of Indiana, Anderson, Ind., seeking an injunction against Sumner B. Denney and others operating bus lines in Muncie, Ind., in competition with buses owned and operated by the railway has just been concluded in Federal Court in Indianapolis. The suit was heard by Judge Baltzell some time ago and he returned a decision that the federal court had no jurisdiction in the matter. On appeal to the Circuit Court of Appeals at Chicago by the complainant, the higher court held that the issue was within the jurisdiction of the district court and remanded the case for trial.

Occupation Tax on Interstate Bus Not Valid

Municipalities may not impose a license tax on buses operating in interstate commerce, the United States Supreme Court ruled on May 14 in the case of Otis Sprout, bus operator, against the city of South Bend, Ind. This decision reverses the findings of the State Supreme Court of Indiana. Sprout, who operates a bus between

South Bend, Ind., and Niles, Mich., paid the state registration fee but refused to apply for the city ordinance. The Supreme Court says:

Exaction of the license fee cannot be sustained either as an inspection fee or as an excise for the use of the streets of the city. It remains to consider whether it can be sustained as an occupation tax. A state may, by appropriate legislation, require payment of an occupation tax from one engaged in both interstate and intrastate commerce and it may delegate a part of that power to a municipality.

But in order that the fee or tax should be valid, it must appear that it is imposed solely on account of the intrastate business; that the amount exacted is not required because of the interstate business done; and that one engaged exclusively in interstate commerce would not be subject to the imposition. The Supreme Court of Indiana, far from construing the ordinance as applicable solely to buses engaged in intrastate business, assumed that it applied to buses engaged exclusively in interstate business and that Sprout was so engaged. The privilege of engaging in such commerce is one that a state cannot deny. A state is equally inhibited from conditioning its exercise on the payment of an occupation tax.

Discontinuance of Line in Santa Barbara Approved

The Santa Barbara & Suburban Railway has been authorized by the California Railroad Commission to discontinue operation of its State Street bus line in Santa Barbara on five days notice to the public.

Bus Line Proposed in Amsterdam

A hearing was held before the Public Service Commission May 15 on the application of the Fonda, Johnstown & Gloversville Railroad to reopen the case for consent to abandon the Vrooman Avenue line in Amsterdam, N. Y. The commission approved the former application of the company for abandonment in an order on Sept. 1, 1926, but this order was rescinded on Nov. 10, 1926, when the commission permitted the company to increase its passenger fares in Amsterdam from 8 to 10 cents. The commission held at that time that the company should continue to operate the Vrooman Avenue line for a time under the new rates to ascertain whether further operation would be profitable.

At the latest hearing the company presented figures indicating that there was an operating loss on all of its lines in 1927 of $33,493, notwithstanding the increased fares, and that the revenues on its Vrooman Avenue line decreased from $32,338 in 1925 under the 8-cent fare to $30,314 in 1927 under the 10-cent fare. According to the company's figures, 715,780 fewer passengers were carried on all of its railway lines in 1927 than in 1926.

It was stated by J. Ledlie Hees, president of the company, that an application would be made to the city authorities for consent to operate a bus line in the territory where abandonment is now proposed.

Financial *and* Corporate

Reorganization of Massachusetts Line Underway

Milford & Uxbridge Street Railway changes name under new management. Extensive rehabilitation plans projected

A REJUVENATED era in rapid transit by both electric car and bus is hopefully looked for by residents in the vicinity of Milford, Framingham, Hopedale and Uxbridge, Mass., as the result of the reorganizing under new management this month of the old Milford & Uxbridge Street Railway, which has been authorized by the State Board of Public Utilities to assume the name of the Milford, Framingham, Hopedale & Uxbridge Street Railway.

The property of the company was sold in February in the Massachusetts Supreme Judicial Court to the Citron-Byer Company. The old Milford & Uxbridge lines had been in a receiver's hands since early in 1926 and while it often appeared that another old New England electric railway would abandon service it now has every appearance of becoming a successful venture once more.

On May 1 the lines were taken over by the new owners and almost immediately a petition was filed to change the name. Under the reorganization plan the new owners were authorized to issue first mortgage bonds of a par value of $125,000 and common stock valued at $125,000, giving the new owners an opportunity to realize new capital of $250,000 for the improvements planned. Walter L. Adams, receiver of the company, was named president of the new company. He will also act as general manager. Israel Citron is treasurer. Mr. Adams is a resident of Milford who has long been interested in putting the line on its feet financially.

One of the officers speaking of the reorganization said:

We are interested in putting this service back on a firm foundation not only from a personal financial standpoint but from a community's standpoint. Today a community without rapid transit is lost. While bus operation is successful in some ways it cannot take the place of trolleys in cheap, fast, mass transportation. The new name was decided upon as it gives each of the principal communities in which it operates, equal recognition. All that we need now is the co-operation of the public.

Incidental to the reorganizing of the railway the new owners have organized the Milford, Framingham & Uxbridge Coach Company. It is capitalized at present for $50,000. Through motor coaches the company hopes to co-ordinate with railway service feeding the railway lines and succeeding rail service where it is found necessary to abandon it. Mr. Adams is president of this concern and Attorney Frank P. Ryan, Worcester, is secretary-treasurer.

While loss of patronage forced the old management to increase fares in several zones the new company has already taken steps to effect a universal 10-cent fare with transfer privileges. It hopes that the volume of business will overcome the loss where a 13-cent fare has been in effect. The company, it was pointed out, has an annual payroll of about $100,000.

In general the new owners have discontinued several round trips, added others at different hours, speeded up the time, perfected timetables and are planning modern roadbed improvements and equipment economies. All lines taken over by the new company are being operated and a survey during the next few months will determine the policy in maintaining them further. Purchase of new cars is under consideration.

Merger in Ohio Declared Operative

The merger of the Penn-Ohio Edison Company and the Northern Ohio Power Company was declared effective on May 15. Under the plan, each share of Northern Ohio capital stock was exchangeable for two-thirds of a share of Penn-Ohio common plus an option to purchase one-third of a share of the latter company on a sliding price scale. Stockholders who have deposited may exchange deposit receipts at the office of the Bankers Trust Company for Penn-Ohio stock and options. Other stockholders have until June 11 to make the exchange.

New Preferred Offered by Illinois Power & Light Corporation

A new offering of 364,740 shares of Illinois Power & Light Corporation, Chicago, $6 cumulative preferred stock was announced on May 3 by a Chicago syndicate headed by Blyth, Witter & Company, and including Field, Glore & Company, Utility Securities Company and E. H. Rollins & Sons. Of the total shares offered, the Illinois Power & Light Corporation has reserved 74,740 shares for exchange or sale directly by the corporation. Proceeds from the sale will be used to retire the $33,000,000 7 per cent cumulative preferred stock.

Lincoln Road Returned to City

The Illinois Public Utilities Company, operating the electric railway service in Lincoln, Ill., the last three years, has given notice that it will turn the property back to the city. C. E. Steinfort, manager, told the Council that the line had been losing money constantly and that the company had decided to relinquish the property to the municipality. The Council has not indicated what action it will take.

Sale of Indiana Road at Foreclosure Protested

Protest against the manner in which the property of the Indianapolis & Cincinnati Traction Company, Rushville, Ind., was sold at the receiver's auction and a request for the Public Service Commission to disapprove the transfer were contained in a petition filed with the commission on May 10 by George A. Voight, Jeffersonville, Ind., holder of $17,000 in bonds. He alleged that the sale of the property was advertised improperly and to the disadvantage of persons interested; that the price received was much less than a fair value of the cost of replacement, and that the lines actually are in good condition. Sale of the lines without the approval of the commission made the transaction void, he asserted. He wants operation stopped until an investigation has been made by the commission.

Service Abandoned on Nebraska Interurban

Acting on authority of the Nebraska Railway Commission, the Omaha, Lincoln & Beatrice Railway abandoned its service May 12. Junking of its rails will not be completed, however, until the Interstate Commerce Commission permits abandonment of the service on a part of its rails to the steam railroad companies for handling freight to and from industry tracks. Originally planned as an interurban to connect the three cities named in its corporate title, the road was never built beyond the suburbs of University Place and Bethany, out of Lincoln. In its decision the commission found that it was without authority and unreasonable to require the company to operate at a loss.

Authority was given the Lincoln Traction Company to serve that portion of the vacated territory it did not previously reach by adding three new buses. These will be used to give extended service in the agricultural college line, for another mile, and to reach all portions of Bethany by extending its bus service from the south section to the northern limits.

New Haven Optimistic

Earning capacity of Springfield and Worcester systems is expected to improve as a result of rehabilitation

CO-ORDINATION will give the best service at the lowest cost and result in the most net revenue. This opinion is expressed in the report of the New York, New Haven & Hartford Railroad for the year ended Dec. 31, 1927, by E. J. Pearson, president. He said that earnest consideration had been and was being currently given to the operation of the electric railway properties and to the changing conditions of highway transportation by automobiles and buses which might affect the earning power of the electric railways. It seemed fairly clear that electric railways were still the most efficient and economical method of handling the peak-hour travel in cities and that buses were better adapted to the handling of suburban traffic—into, out of and between cities.

The effort of the managements of the railways had been directed toward coordinating city operation by street cars with suburban operation by buses and the whole with the bus operation of the New England Transportation Company and the rail operation of the New York, New Haven & Hartford Railroad.

During the year, the Springfield Street Railway, the Worcester Consolidated Street Railway and the Berkshire Street Railway had caused to be refunded a part of their respective bonded indebtedness. Material economies had been effected by the electric railways through increased use of one-man safety cars of the latest design, equipped with front entrances and automatic rear exists. These cars were lighter than the old type of two-man cars, consequently used less power and through a modern device of automatic exits reduced delays to a minimum.

Operating revenues from rail service of the Connecticut Company, one of the largest subsidiaries, decreased in 1927 more than $650,000, due largely to the favorable weather conditions for continued use of privately owned automobiles during the winter months; this was offset in part by an increase in revenues from bus operations of approximately $200,000. Economies in operation resulted in practically the same net income as last year.

On the lines of the New York, Westchester & Boston Railway 13,032,323 passengers were carried during the year, an increase of 1,346,301. An extension of the road from Mamaroneck to Harrison, a distance of 1.76 miles, was opened for business on July 3, 1927. Extension of the road to Rye, a distance of 1.9 road-miles, is under construction, and will be opened for business about July 1, 1928.

Beginning in April, 1927, the New York & Stamford Railway gradually discontinued service on all of its lines. In September, 1927, operation had been suspended on all except one line, which was discontinued as of Dec. 31, 1927. Motor coaches are now being operated by the County Transportation Company, a subsidiary, in place of terminated trolley service.

No additional shares of the Worcester Consolidated Street Railway's first preferred stock have been exchanged for preferred shares of the New England

INCOME ACCOUNTS, ELECTRIC RAILWAY SUBSIDIARIES OF NEW YORK, NEW HAVEN & HARTFORD RAILROAD

	Connecticut Company		Berkshire Street Railway		New York, Westchester & Boston		New York & Stamford		Springfield Street Railway		Worcester Consolidated Street Railway	
	Year 1927	Comparison with 1926 Increase or *Decrease*	Year 1927	Comparison with 1926 Increase or *Decrease*	Year 1927	Comparison with 1926 Increase or *Decrease*	Year 1927	Comparison with 1926 Increase or *Decrease*	Year 1927	Comparison with 1926 Increase or *Decrease*	Year 1927	Comparison with 1926 Increase or *Decrease*
Operating revenues:												
Passenger	$13,500,927	*$431,063*	$765,442	*$44,945*	$1,975,293	$235,950	$204,167	*$219,400*	$2,826,272	*$204,175*	$3,069,922	*$57,021*
Other	684,107	*33,583*	33,253	*7,018*	176,134	3,772	2,747	*792*	65,158	*45,472*	119,119	*92,481*
Total	$14,185,034	*$464,647*	$798,695	*$51,964*	$2,151,427	$239,722	$206,914	*$220,192*	$2,891,431	*$249,648*	$3,189,041	*$149,502*
Operating expenses:												
Maintenance of way and structures	1,791,498	*186,402*	107,643	*36,911*	197,106	67,895	37,212	*29,862*	255,747	*84,697*	255,234	*109,923*
Maintenance of equipment	1,990,985	*9,296*	180,837	51,781	290,204	37,632	67,539	*67,267*	398,782	7,635	504,574	*14,932*
Transportation	6,559,397	*214,373*	378,919	*40,976*	714,859	108,779	97,568	*86,223*	1,443,567	*101,812*	1,543,813	*113,033*
Other	1,221,284	55,719	82,379	24,912	296,801	37,366	76,124	4,892	316,750	*25,546*	434,714	72,501
Total	$11,563,166	*$354,351*	$749,779	*$1,193*	$1,498,972	$251,674	$278,444	*$178,460*	$2,414,846	*$204,420*	$2,738,337	*$165,388*
Net operating revenue	$2,621,868	*$110,295*	$48,915	*$50,770*	$652,455	*$11,951*	†*$71,530*	*$41,731*	$476,584	*$45,227*	$450,704	$15,885
Tax accruals	698,934	*91,897*	31,022	*3,608*	229,149	*8,292*	15,243	†*,495*	57,611	*14,658*	$85,980	*2,946*
Operating income	$1,922,934	*$18,397*	$17,893	*$47,161*	$423,305	*$3,658*	†*$86,774*	*$34,236*	$418,972	*$30,569*	$364,723	$18,849
Non-operating income	56,984	*14,669*	2,239	585	15,186	5,708	35,018	32,739	15,116	7,830	25,066	1,399
Gross income	$1,979,918	*$33,067*	$20,133	*$46,575*	$438,492	$2,050	†*$51,755*	*$1,497*	$434,088	*$22,738*	$389,789	$20,248
Deductions from gross income	1,451,900	*25,620*	*313,569	10,987	*2,303,492	108,802	*$107,168	*7,825*	242,738	21,830	387,881	23,611
Net income	$528,017	*$7,446*	†*$293,435*	*$57,563*	†*$1,864,999*	*$106,752*	†*$158,924*	$6,328	$191,349	*$44,569*	$1,908	*$3,362*

Italics denote decreases.
†*Deficit.*
*Berkshire Street Railway—deductions from gross income include $210,724 interest accruing to New York, New Haven & Hartford Railroad but not included in income account.
New York, Weschester & Boston—deductions from gross income include $1,215,594 interest accruing to New York, New Haven & Hartford Railroad but not included in income account.
New York & Stamford—deductions from gross income include $53,033 interest accruing to New York, New Haven & Hartford Railroad but not included in income account.

Investment and Security Company since last year's report. The New Haven guaranty is on 1,115 shares of par value $111,500 of which the New York, New Haven & Hartford Railroad owns 279 shares of a par value of $27,900, leaving the guaranty on $83,600 in the hands of the public. The New England Investment has been unable to earn and pay interest on its gold notes owned by the New Haven road.

The improvement of the Springfield property has progressed during the year, 50 new cars and nine motor coaches having been purchased. The former freight station at Bond Street, Springfield, has been remodeled into an up-to-date coach garage, and a new garage has been constructed at Palmer, Mass. Heavy expenditures have been made for track improvements and construction of new track. Other expenditures have been made which will result in efficiency and economy in operation.

The rehabilitation of the Worcester property mentioned in last year's report has progressed during the year. Fifty new cars and twenty motor coaches have been acquired and twenty-one cars have been converted for one-man operation. A new carhouse and new motor coach garage have been constructed at Worcester. Large amounts have been expended for track changes and new track construction.

While the benefits of these improvements in Worcester and Springfield are not fully reflected during 1927, when the rehabilitation is complete they should result in restoring earning capacity.

Sale of New York Road Under Foreclosure Rescinded

The sale of the property of the Second Avenue Railroad, New York, for $500,000 to Arthur W. Hutchins, representing the holders of $3,116,000 of receiver's certificates, has been rescinded under an agreement that the bid could be withdrawn if the Transit Commission refused to approve the Second Avenue reorganization plan. This was disclosed in a report filed recently in the Supreme Court by John C. Clark, appointed referee in 1921 to sell the railroad upon the foreclosure of the receivership certificate liens. He said that approval had been denied in February.

The foreclosure suit was brought by the committee of certificate holders who obtained the decree of sale after the court held that their liens were superior to those of the holders of $5,000,000 in bonds. To initiate the reorganization plan the committee offered $500,000 for the property, of which $230,000 was to pay accident and other claims and $270,000 the expenses of the proceedings.

The reorganization plan, which failed of endorsement by the Transit Commission, provided for the formation of two companies, one to hold the realty, consisting of the carhouse property bounded by 96th and 97th Streets and First and Second Avenues, and the other to operate the road. Each was to have a financial structure of $750,000 in bonds and 31,400 shares of no-par value stock, ten shares of the latter going to the certificate holders for each $1,000 of certificates. The last report of the road mentioned in the referee's statement was for the year ended June 30, 1926, when the net receipts were $1,650,680 and the net profits $53,318.

Committee Approves Washington Merger

Companies would consolidate as Capital Transit Company on basis of $50,000,000 valuation

THE House Committee on the District of Columbia on May 14, voted a favorable report on the resolution to authorize the merger of railway and bus corporations operating in the District of Columbia. The vote was eight to five, several members of the committee reserving the right to change their votes on the floor of the House when the bill comes up for debate.

Representative Gibson offered an amendment providing that the Capital Transit Company, the new corporation provided for in the unification agreement between the Washington Railway & Electric Company, the Capital Traction Company and the Washington Rapid Transit Company be incorporated by an act of Congress, rather than under the provisions of subchapter four, chapter eighteen, of the code of laws of the District of Columbia, as specified in the resolution and in the agreement.

Representative Combs said that no amendment could be incorporated in the agreement by the committee because the committee had only the right to approve or disapprove the agreement. He said that if the committee amended the agreement its four weeks' work would be "scrapped" and it would be necessary to hold the hearings over again. The committee voted the amendment in, then moved to reconsider, and ended by voting out the resolution unamended.

Under the provisions of the resolution the Capital Transit Company, the new company, would acquire properties and stocks or securities and succeed to the powers and obligations of the Capital Traction Company and the powers and obligations of the Washington Railway & Electric Company directly connected with, or relating to, the operation of electric railways, buses and other forms of public transportation.

Provisions of the law making it incumbent upon the railways to bear the expense of crossing policemen, the laying of new pavement, the making of permanent improvements, renewals, or repair to streets and bridges over which street cars operate would be repealed. The Capital Transit Company, however, would be called upon to bear the entire cost of paving repairs, etc., incident to track repairs, etc., and one-fourth of the cost of paving, repaving and maintenance of paving between tracks and for 2 ft. outside the outer rails, and the excess cost of public bridges due to the existence of tracks thereon.

The agreement provides that a valuation of $50,000,000 be placed upon the properties of rate-making purposes.

Traffic, Fare and Wage Figures

The number of revenue passengers, including bus passengers, reported by 210 companies to the American Electric Railway Association for March, 1928, compared with March, 1927, is as follows:

March, 1928	850,090,214
March, 1927	862,218,344
Decrease, per cent	1.41

The rate of decrease is smaller than has been reported in recent months and indicates that traffic conditions are improving.

Average cash fares in cities of 25,000 population and over were:

	Cents
April 1, 1928	8.1186
March 1, 1928	8.1186
April 1, 1927	7.9403

There was no change in the average basic fare in American cities during the month of March.

The average maximum hourly rates paid motormen and conductors in two-man service by companies operating 100 or more miles of single track:

Month	Average Rate Cents	Index Number 1913=100 Per Cent
April 1, 1928	57.38	210.57
March 1, 1928	57.38	210.57
April 1, 1927	56.97	209.06

No changes in wages were reported during March.

Suit to Sell Ohio Interurban Right-of-Way

Suit to sell the right-of-way of the old Cincinnati, Milford & Loveland Traction Company in Madeira, Ohio, has been filed in the Common Pleas Court at Cincinnati. The action was brought for alleged non-payment of taxes on the right-of-way.

Increase in Net Income on Brooklyn System

For the nine months ended March 31, 1928, the total operating revenues of the Brooklyn-Manhattan Transit System, Brooklyn, N. Y., were $35,404,376 against $34,732,911 for a similar period last year. Operating expenses increased from $22,477,848 to $22,906,048 in the 1928 period. After the consideration of income deductions, the net income for this year's period was $4,764,700 compared with $4,686,588 last year.

Massachusetts Line Being Scrapped

The lines of the New Bedford & Onset Street Railway, New Bedford, Mass., are being scrapped. The property was sold in the summer of 1927 and ceased operations Sept. 30, 1927. At the time of the sale it was stated that the new owners, whose identity was not revealed, had planned to continue operation of the line.

Personal Items

H. H. George in Cleveland

Official long connected with New Jersey company accepts new post of superintendent of research in Ohio city

HOWARD H. GEORGE, assistant to the chief engineer of the Public Service Production Company, Newark, N. J., has been appointed superintendent of research of the Cleveland Railway, and has taken up his new duties with that company. Mr. George is well known in the industry, particularly among engineers. For years he has been active in American Electric Railway Engineering Association work, and for the past five years has served as chairman of the committee on way and structures. He has represented the American Electric Railway Association

H. H. George

sectional committee on tie specifications of the American Engineering Standards Committee, and also that on specifications for special trackwork materials. Until the time of his transfer from the Public Service Railway of New Jersey to the Public Service Production Company, an affiliated company, he was one of the representatives of the American Society of Civil Engineers on the welded rail joint committee. He is also a member of the committee of judges of the ELECTRIC RAILWAY JOURNAL'S maintenance contest and of the A.E.R.E.A. rules revision committee.

Mr. George began his career in the electric railway industry in 1906 with the Public Service Railway. Thereafter until June, 1925, he served that company successively as field engineer, division engineer, assistant to chief engineer and engineer of maintenance of way. In this capacity he was in charge of all engineering and supervision on new construction on bridges, buildings, track and ferries. In 1925 he was transferred to the Public Service Production Company, the construction subsidiary of the Public Service Corporation. The first year he served as superintendent of commercial construction, but for the last two years he has held the position of assistant to the chief engineer, in responsible charge of several large construction projects, among them the construction of the Federal Trust Building and the East Park Street extension to the Newark Terminal Building, and Route 1 extension, Section 2 of the New Jersey State Highway in Jersey City, N. J.

During the World War Mr. George served as a first lieutenant and as captain in the Engineer Corps, first with the 305th Engineers, 80th Division, and later with the 55th Engineers, during which latter service he was engineer officer in charge of building construction on the Chateaureaux storage depot project. Just prior to the signing of the armistice, he was transferred to Base Section No. 4 at Havre as engineer officer in charge of railroad construction.

A. L. Drum to Head Detroit United Successor

A. L. Drum, who has been operating manager of the properties of the Detroit United Railway, Detroit, Mich., for the past three years under the receivership of the U. S. District Court, will be president of the new successor company under the reorganization, to be known as the Eastern Michigan Railways, to be formed to operate the rail and bus properties. It is planned to turn over the property to the new company about Aug. 1. The foreclosure sale will, it is stated, be made to discharge the lien of the bondholders, and will provide for the claims which are found by the court to rank prior to the bondholders' lien.

Ample provision will be made for working capital and financial credit to enable the new company to acquire new cars, extend track and secure additional buses to serve the traveling public in the greater Detroit metropolitan district. This includes the interurban rail and bus service to Toledo, Port Huron, Pontiac, Flint, Lansing and Grand Rapids, and the local railway and city bus systems in Pontiac and Flint.

Mr. Drum as manager and receiver and his representatives have applied themselves intensively to the problems of the Detroit United since their entrance into the situation there. And they have built constructively and well. The plan they have laid out gives promise for the future, since it is based not only on the wide experience of Mr. Drum in his general practice as consultant but on the experience had with this particular property.

To the work on the Detroit United Mr. Drum brought a splendid knowledge of engineering and management built up over a long period of years. More recently he has been engaged as a consultant in business for himself as head of A. L. Drum & Company, but his entrance into electric railway work dates back to the period following immediately after he was graduated from the Massachusetts Institute of Technology. His first work was in the power station of the Boston Electric Light Company. Later he engaged for a time in journalism, but his real flair was for engineering and so he returned to the utility field as manager of the Middleboro gas and electric plant in Middleboro, Mass. But the Middle West beckoned and Mr. Drum became general manager and construction engineer for the Indiana Union Traction Company. Then followed a succession of important posts too numerous to mention, but among them the position of general manager and construction engineer for the Chicago & Milwaukee Electric Railroad, which ultimately led to the formation of A. L. Drum & Company with offices at Chicago, and the participation of that firm and of Mr. Drum as experts in some of the most important construction and engineering projects carried out in recent years in the United

A. L. Drum

States, many of which connections contemplated the retention of the firm in valuation cases and other similar proceedings in which expert engineering, financial and management knowledge was a requisite.

R. H. Wyatt Made Officer of Louisville & Interurban

Richard H. Wyatt, who has served as acting manager of the company since 1925, has been elected vice-president and general manager of the Louisville & Interurban Company, a subsidiary of the Louisville Railway, Louisville, Ky.

The office is a newly created executive position, according to the announcement, and it was desired to have an executive in direct charge of the road's operations. Samuel Riddle and Frank H. Miller, vice-presidents of the Louisville Railway, served in a similar capacity for the interurban until their terms expired in February. Mr. Riddle is now secretary of the interurban.

Mr. Wyatt entered the service of the Louisville Railway as a boy 45 years ago, and has held many positions since that time. When the interurban system

was started in 1904 he was appointed general express agent and, after a few years, general freight and passenger agent. He was promoted to the office of general superintendent in 1921, and to his recent place of acting manager in 1925.

Obituary

Raymond B. Keating

Raymond B. Keating died on May 12 at the West Penn Hospital after a brief illness. He was vice-president of the West Penn Electric Company, West Penn Railways, and the West Penn Power Company, as well as their subsidiaries, including the Wheeling Traction Company. He was also a director and vice-president of the Monongahela-West Penn Public Service Company of Fairmont, W. Va.

In 1907 he became assistant secretary of the Electric Properties Company, New York. Subsequently he was made secretary, treasurer and director of the Lackawanna & Wyoming Valley Railroad and its subsidiaries. He served in these capacities throughout the reorganization of the group of companies and the formation of the Scranton & Wilkes Barre Traction Corporation. Concurrently he was secretary and treasurer of the Electric Powers Security, Niagara Falls, N. Y. During this period he served as secretary and treasurer of the Merchants & Manufacturers Exchange, New York City.

In 1914 Mr. Keating became vice-president of the West Penn System at its New York offices and in August, 1915, returned to Pittsburgh to continue his active duties with this company.

Mr. Keating began his business career about 1900, being connected with public utility concerns affiliated with the Philadelphia Company.

JOHN CONNOR, familiarly termed "Johnny" throughout the organization of the Philadelphia Rapid Transit Company and pretty broadly in the city of Philadelphia itself, died on May 11. At the time of his death he was traffic manager of the Yellow Cab Company, now under the control of the Philadelphia Rapid Transit Company. Mr. Connor started life in the coal regions and went to Philadelphia when a youngster to become a messenger boy. He joined the Quaker City Cab Company in 1909 as a telephone operator. Six years ago he became identified with the Yellow Cab Company.

J. H. MCWHORTER, brother of A. D. McWhorter, general superintendent of the Memphis Street Railway, Memphis, Tenn., died on April 29. He had been connected with the Galena Signal Oil Company, Atlanta office, as lubricating engineer for the past ten years. Previous to that time, he was in the mechanical department of the Georgia Power Company. Mr. McWhorter had many friends in the railway industry. He leaves a widow.

Manufactures *and the* Markets

Boston, Revere Beach & Lynn Electrifies

Complete electrification is now in progress on the Boston, Revere Beach & Lynn Railroad. Complete plans for the electrification and how it is being financed were published in ELECTRIC RAILWAY JOURNAL on December 10, 1927. Electric equipment for the change-over will be furnished by the General Electric Company. Sixty-two two-motor equipments will be installed on the passenger cars, and four-motor equipments will drive the work cars.

Each of the passenger car equipments will consist of two 60-hp., 600-volt motors with light-weight multiple control. Each work car will be equipped with four motors of the same type but with platform type control. Electric headlights will be used on all cars. Air brake equipment will be of the double-end, electro-pneumatic type. The electric equipment will be installed on the present coaches and the work will be done in the railroad's shops. Meanwhile, the use of electricity will be extended to the waiting rooms where electric turnstiles will be placed in service without waiting for electric train operation.

Two of the electric substations will be fully automatic, one containing a 1,000-kw. synchronous converter and the other, two synchronous converters of the same size. The third substation will be of the portable type, carrying a 1,000-kw. manually-controlled converter. Power will be purchased from local power companies and distribution will be made over a 600-volt catenary line. Simple, direct suspension will be used in the yards and sidings. Under the direction of the engineering and management organization of Hemple & Wells, numerous other improvements will be made, including the remodeling of the stations and the modernization of all equipment.

Exhibitograph No. 9

EXTRA!

Space for A.E.R.A. Show Assigned

The goal set by the Exhibit Committee has been reached.

At its meeting on May 16 the committee assigned 99,170 sq.ft. space to 175 exhibitors.

With four months still to go and with new applications arriving all summer, the exhibit feature of the convention promises to be

BIGGER AND BETTER

than ever before.

There is still desirable space available. If you wish to show this year, Mr. Manufacturer, don't delay your application. Get in touch with A.E.R.A. Headquarters, 292 Madison Avenue, New York City.

Largest Portable Substation for Brazil

Designs have been completed on the world's largest portable railway substation, which is being constructed by the Westinghouse Electric and Manufacturing Company for the Paulista Railroad, Brazil. This station will be used on the 150-mile electrified line between Jundiahy and Rancao. When completed, the station will include two cars with a total weight of approximately 150 tons and its capacity will be 2,000 kw. It will draw power at 88,000 volts from a transmission line and will supply 3,000 volts direct current to the trolley wire.

New Equipment for Indianapolis & Cincinnati Traction

Reorganization plans providing for the separation of the Indianapolis & Cincinnati Traction Company into two corporations, one devoted to transportation and the other to light and power distribution, have been announced by Charles T. DeHore, Cincinnati, and Teroy E. Eastman, Toledo, who bought the property at receiver's sale in Rushville.

The Shelbyville-Greensburg and the Rushville-Connersville lines will be known as the Indianapolis & Southeastern Railway, while the light and power business will be incorporated as the Southeastern Indiana Power Company.

The new operators plan an outlay of $250,000 for freight cars, station facilities, motor stock cars, stock pens, improvement of high-tension lines and extension of light and power business. Twelve freight trailers will be purchased in addition to a like number now in operation, and freight motors will be increased from four to six.

Good Year for Westinghouse—Bookings Off Slightly

The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., reports for the year ended March 31, 1928, consolidated net income of $15,639,172 after depreciation, taxes and interest, equivalent to $6.59 a share on the 2,370,063 combined preferred and common shares ($50 par). This compares with $16,138,441, or $6.81 a share on the combined preferred and common shares in the preceding fiscal year. The reduced volume of new business offering during the year, as compared with the

preceding year, and reduced sales prices for many products, are reflected in the reduction in sales billed. These two factors contributed to reduce the net manufacturing profit for the year. The value of unfilled orders at the close of the year, after adjustments, was $47,742,204 compared with $55,298,890 at the close of the preceding year. During the year inventories were reduced $11,072,535. Expenditures for new plants and for additions and extensions to existing plants during the past six years aggregate $39,715,000.

The consolidated income account of the company and proprietary companies compares as follows:

	1928	1927
Sales billed	$175,456,815	$185,543,087
*Cost of sales	161,347,357	169,764,086
Net manufacturing profit	$14,109,459	$15,779,001
Other income	3,031,704	2,585,614
Gross income	$17,141,163	$18,364,615
Interest charges	1,501,991	2,226,174
Net income	$15,639,172	$16,138,441
Preferred dividends	319,896	319,896
Common dividends	9,156,152	9,156,952
Surplus	$6,163,124	$6,662,588
Previous surplus	$54,161,834	51,715,396
Total surplus	$60,324,958	$58,377,985
Miscellaneous credits	.....	.....
Additional reserves for federal tax, 1917-21	.....	.....
Pittsburgh Meter surplus, May 19, 1926	.....	786,247
†Premiums and discounts	.....	2,787,786
Miscellaneous debits	.....	642,118
‡Reserve for possible adjustment, book value	1,770,975	.....
Patents, charters, franchises, etc., written down to nominal value	4,621,784	.....
Add balance of reserve previously appropriated for federal tax not required	3,000,000	.....
Final surplus	$56,932,198	$54,161,834

*Factory cost, including depreciation of property and plant and all distributions, administration and general expenses and taxes.

†In connection with redemption of 7 per cent and 6 per cent bonds of Westinghouse Machine Company and issue of new 5 per cent bonds.

‡Of investments in affiliated companies, for pensions, and for notes and accounts receivable and miscellaneous charges, less profit realized on the same of certain investments.

Standard Coal Contract Perfected

As a result of a recent joint meeting of representatives of the National Association of Purchasing Agents and the National Coal Association, buyers and sellers of coal will shortly be able to use a standard contract form that should prove mutually satisfactory. The new form is a revision of the standard coal contract form developed by the National Association of Purchasing Agents and which had been in use for some time.

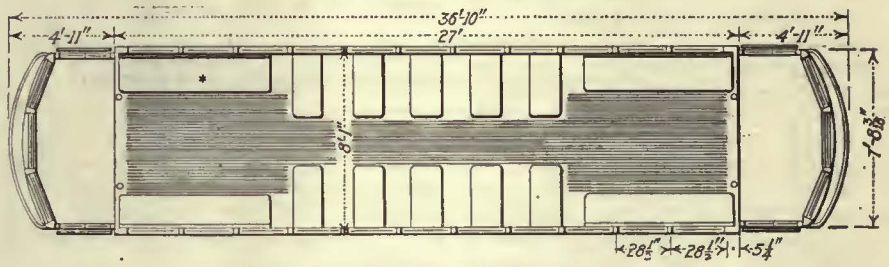
Truscon Buys Hydraulic Pressed Steel

Hydraulic Pressed Steel Company, Cleveland, Ohio, has been purchased by the Truscon Steel Company, Youngstown, Ohio, and will be operated as its pressed steel division. The entire plant is being completely modernized, giving the Truscon Steel Company one of the largest capacities for furnishing pressed and deep drawn steel of every description. Full productive capacity will be available shortly.

Two Cars for Fitchburg & Leominster

Recently two interurban, one-man, two-man cars were delivered to the Fitchburg & Leominster Street Railway, Fitchburg, Mass., from the Wason Manufacturing Company, Springfield, Mass. These cars are duplicates of the four furnished by the same company in April, 1927. The length of the cars is 36 ft. 10 in. and the width is 8 ft. 2⅜ in. They are of the semi-steel construction with arch roofs and end doors. There are seats for 44 passengers in each car. Complete specifications are given in the table below.

One of the Fitchburg & Leominster Street Railway cars recently completed by Wason Manufacturing Company



Floor plan of Fitchburg & Leominster cars

Type of unit	One-man, two-man; motor; passenger; interurban; double end; double truck
Number of seats	44
Builder of car body	Wason Mfg. Co., Springfield, Mass.
Date of order	12-27
Date of delivery	3-28
Bolster centers	17 ft. 8 in.
Length over all	36 ft. 10 in.
Length over body posts	27 ft. 0 in.
Truck wheelbase	5 ft. 4 in.
Width over all	8 ft. 2⅜ in.
Window post spacing	28½ in.
Body	Semi-steel
Roof	Arch, canvas-covered
Doors	End, folding, hand operated
Air brakes	General Electric
Axles	A.E.R.E.A. standard
Car signal system	Faraday high voltage
Compressors	CP-27-B
Conduit	Flexible metal
Control	K-35-KK, double end
Couplers	Metropolitan
Curtain Fixtures	Curtain Supply Co.
Curtain material	Double-faced Fabrikoid
Destination signs	Hunter illuminated
Fare boxes	Railway's standard
Floor covering	Wood mat
Glass	DTA
Hand brakes	Peacock
Hand straps	Buffalo light metal
Heaters	Gold Car Heating & Lighting Co.
Headlights	Golden Glow RM-96
Headlining	¼-in. Agasote
Interior trim	Statuary bronze
Journal bearings	Plain
Journal boxes	Brill
Lamp fixtures	Electric Service Supplies Co.
Motors	Four GE-265A, inside hung
Registers	Railway's standard
Sash fixtures	J. L. Howard
Seats	Brill 201-B reversible
Seat spacing	2 ft. 4½ in.
Seating material	Genuine brown Spanish leather
Steps	Folding
Step treads	Kass safety
Trolley catchers	Ohio Brass
Trolley base	US-20
Trucks	Brill 177-E1-X
Ventilators	Brill exhaust
Wheels	Rolled steel, 27 in. diameter

ROLLING STOCK

Detroit Department of Street Railways, Detroit, Mich., has received one urban Twin Coach.

Washington Railway & Electric Company, Washington, D. C., has obtained permission from the Utility Commission of the District of Columbia to purchase five new X type motor buses from the Yellow Coach Manufacturing Company.

Lincoln Traction Company, a subsidiary of the Lincoln Gas & Electric Light Company, Lincoln, Neb., has accepted delivery of three Mack four-cylinder city type buses of 29-passenger capacity.

Community Traction Company, Toledo, Ohio, is submitting to the City Council on May 21, a plan which will permit the company to purchase 100 to 125 additional motor coaches. If the plan is approved it will also give the company a practical monopoly of both bus and street railway service.

CHICAGO & JOLIET ELECTRIC RAILWAY, Joliet, Ill., has added a Mack four-cylinder 25-passenger city type bus to its fleet.

PITTSBURGH MOTOR COACH COMPANY, Pittsburgh, Pa., has received seven suburban express model Twin Coaches.

LOS ANGELES RAILWAY, Los Angeles, Cal., has received four mechanical drive urban coaches and one parlor coach from the Twin Coach Corporation.

SPRINGFIELD STREET RAILWAY, Springfield, Mass., has ordered six new Yellow buses, 33-passenger capacity, to be used on the Springfield-Palmer line and on the Bircham Bend line. The trolley service on these two lines will be abandoned just as soon as the new buses are delivered.

LEHIGH VALLEY TRANSIT COMPANY, Allentown, Pa., has received one Mack six-cylinder 29-passenger bus equipped with a special body.

SEATTLE MUNICIPAL STREET RAILWAY, Seattle, Wash., has ordered five Mack, 29-passenger buses and seven Studebaker, 21-passenger buses.

TRACK AND LINE

SPOKANE UNITED RAILWAYS, Spokane, Wash., will rebuild 1,000 ft. of track on East Third Street for the East Fifth Street line. The north end of the Astor line will also be replaced. The railway has under consideration the proposed paving of Seventeenth Street, Rockwood to Ray, where its Lincoln Park line is affected. The company is still obtaining estimates of cost to see if the job can be included in this year's work.

OREGON ELECTRIC RAILWAY, Portland, Ore., will soon take bids to build 68½ miles of track between Albany and Milwaukee, Ore., at an approximate cost of $1,000,000.

READING TRANSIT COMPANY, Reading, Pa., is completely rebuilding 1,350 ft. of double track on Carsonia Avenue in the borough of Mount Penn. Aside from the installation of new rails and ties, the poles will be moved from the center of the avenue to the curb and the entire street area will be covered with a bituminous-bound macadam.

SHOPS AND BUILDINGS

COLUMBUS ELECTRIC & POWER COMPANY, Columbus, Ga., plans a 40,000-hp. hydro-electric project on the Chattahoochee River. The cost will be $700,000.

BOSTON ELEVATED RAILWAY, Boston, Mass., plans a substation on Warren Street to cost approximately $40,000.

BOSTON & MAINE RAILROAD, Boston, Mass., will make improvements in its car repair shops at Keene, N. H., to cost about $175,000.

WISCONSIN POWER & LIGHT COMPANY, Madison, Wis., plans a power plant to cost $250,000.

ELECTRIC RAILWAY MATERIAL PRICES—MAY 15, 1928

Metals—New York

Copper, electrolytic, cents per lb	14.1625
Lead, cents per lb	6.10
Nickel, cents per lb	35.00
Zinc, cents per lb	6.40
Tin, Straits, cents per lb	52.625
Aluminum, 98 or 99 per cent, cents per lb	23.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	53.00
General service	31.50

Bituminous Coal

Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons	4.175
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.825
Franklin, Ill., screenings, Chicago	1.65
Central, Ill., screenings, Chicago	1.575
Kansas screenings, Kansas City	2.50

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive, ⅝ in. and larger, cents per lb	2.80
Tie plates (flat type), cents per lb	2.15
Angle bars, cents per lb	2.75
Rail bolts and nuts, cents per lb	3.90
Steel bars, cents per lb	1.875
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft	$1.10

Hardware—Pittsburgh

Wire nails, base per keg	2.65
Sheet iron (24 gage), cents per lb	2.825
Sheet iron, galvanized (24 gage), cents per lb.	3.625
Galvanized barbed wire, cents per lb	3.35
Galvanized wire, ordinary, cents per lb	3.10

Waste—New York

Waste, wool, cents per lb	16–20
Waste, cotton (100 lb. bale), cents per lb.:	
White	16–19.50
Colored	11–16

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb	10.7
White lead in oil (100 lb. keg), cents per lb.	13.75
Turpentine (bbl. lots), per gal	$0.575
Putty, 100 lb. tins, cents per lb	5.50

Wire—New York

Copper wire, cents per lb	16.125
Rubber-covered wire, No. 14, per 1,000 ft	5.40
Weatherproof wire base, cents per lb	16.75

Paving Materials

Paving stone, granite, 5 in., f.o.b. New York—Grade 1, per thousand	$150
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	$2.70
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	51.00
Paving brick 3x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.375
Cement, Chicago consumers' net prices, without bags, f.o.b.	2.05
Gravel, ¾-in., cu.yd., delivered	3.375
Sand, cu.yd., delivered	.125

Old Metals—New York and Chicago

Heavy copper, cents per lb	11.875
Light copper, cents per lb	10.375
Heavy yellow brass, cents per lb	7.125
Zinc, old scrap, cents per lb	3.25
Lead, cents per lb. (heavy)	4.875
Steel car axles, Chicago, net ton	$16.25
Cast iron car wheels, Chicago, gross ton	13.75
Rails (short), Chicago, gross ton	15.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	27.50
Machine turnings, Chicago, gross ton	7.25

TRADE NOTES

NATIONAL BRONZE COMPANY, Montreal, Canada, has been purchased outright by the Robert Mitchell Company, Montreal. The purchase involves no new financing for the Robert Mitchell Company.

HASKELITE MANUFACTURING CORPORATION, recently moved to larger quarters at 120 South LaSalle Street, Chicago, Ill. Its new offices are now on the same floor as the Vitrolite Company, and other Meyercord interests.

WESTERN RED CEDAR ASSOCIATION, Minneapolis, Minn., has appointed John P. Wentling director of its research division. His wide experience and extensive training will be available to all users of wood poles. As incoming director of the research division, he urges pole users to avail themselves of the services of this division in helping to work out any of their pole problems.

CELORON COMPANY, Bridgeport, Pa., announces the appointment of R. W. Wales as factory representative on molding powders and resins.

LINDE AIR PRODUCTS COMPANY, New York, N. Y., has opened a district sales office at 48 West McLemore Avenue in Memphis, Tenn. H. N. Smith will be district manager in charge.

NATIONAL INDUSTRIAL ADVERTISERS' ASSOCIATION will hold its annual conference at the Hotel Chase, St. Louis, Mo., on June 11, 12 and 13.

ANCHOR POST FENCE COMPANY, Baltimore, Md., has elected W. F. Brannon president, succeeding the late Herbert G. Thomson.

GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has elected as a director Henry C. McEldowney, president of the Union Savings Bank and the Union Trust Company, Pittsburgh, Pa.

INTERNATIONAL GENERAL ELECTRIC COMPANY has elected as vice-presidents, R. Arthur Baldwin, European manager, and Otto Pruessman, vice-president of the Tokio Electric Company, Tokio, Japan.

ADVERTISING LITERATURE

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has issued a folder on the subject "A 'Tool' of Modern Railroad Efficiency," which elaborates on the advantages of gas-electric car equipment and goes into considerable detail on the latest achievement in this field—the Westinghouse torque governor control which is a successful means for utilizing the full power of the engine at all speeds. Complete details on this may be found in D.M.F.-5073.

TRICO FUSE MANUFACTURING COMPANY, Milwaukee, Wis., has announced bulletin 206-B describing Trico powder-packed renewable fuses. It contains data and tests on overload time-lag and watt-loss saving.

MARTINDALE ELECTRIC COMPANY, Cleveland, Ohio, has issued a folder announcing a 27 per cent average price reduction on commutator stones.

OHIO BRASS COMPANY, Mansfield, Ohio, has published a 33-page supplement Number 1 to catalog Number 20. It includes the listings of all new O-B devices brought out since the issuing of Catalog 20.

When the Fire Truck Swings 'round the corner

that's a time your motorman needs a

PEACOCK Staffless Brake

Who-oo-oo ! Up and down the scale a siren wails—people scurry right and left—autos crowd out the way—and the fire truck whirls around the corner.

Your car is on a slight grade—there is considerable slack in your air brake rigging—perhaps the power is off. What then? It's a tense situation.

If your motorman has a Peacock Staffless he can set his brakes, even if the shoes are well worn and there is unusual slack to be taken up, for a Peacock Staffless has a winding capacity of 12 feet of chain. It has three times the braking capacity of the ordinary hand brake. It can be relied on in emergency.

The Peacock Staffless is standard equipment on practically all modern cars. Is it on yours? Remember installation and maintenance costs are small.

The Peacock Staffless

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canada:—Lyman Tube & Supply Co., Ltd., Montreal

Outline route map of Public Service Coordinated Transport, serving more than 230 communities in New Jersey; photographic inset of Goodyear Pneumatic Cord Bus Tire, exclusive tire equipment on this Company's fleet of more than 1400 buses.

GOODYEAR

Copyright 1928, by The Goodyear Tire & Rubber Co., Inc.

FOUR MILLION MILES *every month for* PUBLIC SERVICE

One of the largest utility enterprises in America is the Public Service group operating in New Jersey.

It provides electricity for 650,000 users in 207 municipalities, and gas to about 700,000 users. It operates street cars, ferries, and buses.

Buses operated by Public Service Coordinated Transport are equipped 100% with Goodyear Pneumatic Cord Bus Tires.

* * *

Public Service Coordinated Transport has been using Goodyear Tires for nearly four years now.

Its more than 1400 buses average more than 4,000,000 bus tire miles per month on Goodyear Tires.

"With extremely satisfactory results," says the latest report on this Goodyear Bus Tire installation.

* * *

Goodyear tires are extremely satisfactory for safety—because Goodyear Bus Tires have the All-Weather Tread, the deep-cut, sharp-edged, diamond-shaped blocks that grip fast and hold hard on wet, slimy, slippery pavements, resisting side-slip and skidding.

Extremely satisfactory for traction—because the All-Weather Tread takes hold in any going, carrying forward full distance at every turn of the wheel.

Extremely satisfactory for wear—because of the tough, slow-wearing Goodyear compound in the tread and sidewalls and SUPERTWIST cord fabric in the casing—that extra-durable, extra-elastic material discovered and developed by Goodyear for Goodyear Pneumatic Cord Tires.

* * *

Extremely satisfactory for economy, too, because Goodyear Bus Tires, made of SUPERTWIST and made with the All-Weather Tread, give maximum safety, traction, and cushioning qualities over a long, long mileage of dependable, trouble-free, uninterrupted revenue miles.

Because Goodyear Pneumatic Cord Bus Tires give this economical, efficient performance in every motorbus service, you, too, should equip 100% with Goodyear.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service

BUS TIRES

Put the battery job up to WILLARDS

Extra strength in every part—accurate workmanship—careful testing of every bit of material—the experience of 25 years of battery building—these are features that fit the Willard for the hard job of bus service.

There are no easy days—no easy miles—in the life of the bus battery. Here's a job that needs weight, reliability, long life—the qualities you get in the Willard Threaded Rubber Battery.

With its heavy plates and long-lived Threaded Rubber Insulation, this battery has built a world-wide reputation for bringing every bus in on time—every trip, and for saving money both by the *month* and by the *mile*.

Willard Batteries

TALK ABOUT YOUR PASSENGER COMFORT *look here*

THEY say that a story in pictures leaves nothing untold.

Then glance at these photographs of one of the buses operated out of Muskogee, Oklahoma, by Wardway, Inc.

A Bender Body, of course. Seats 31 passengers. Note the folding aisle seats. And every seat comfortable as a Morris chair. We make them ourselves. No cramped positions. No uneasy shifting about for comfortable sitting posture. Full observation bay in rear. Unusual amount of baggage loading space. Easy to put baggage away. Easy to get it down.

Note the card and reading tables provided in rear. Complete lavatory. Ice cold water installation. Even refrigerator and buffet equipment for serving hot or cold sandwiches and drinks!

Does a bus body like this mean more new passengers? A more friendly feeling with steady ones? More of that intangible thing they call good will?

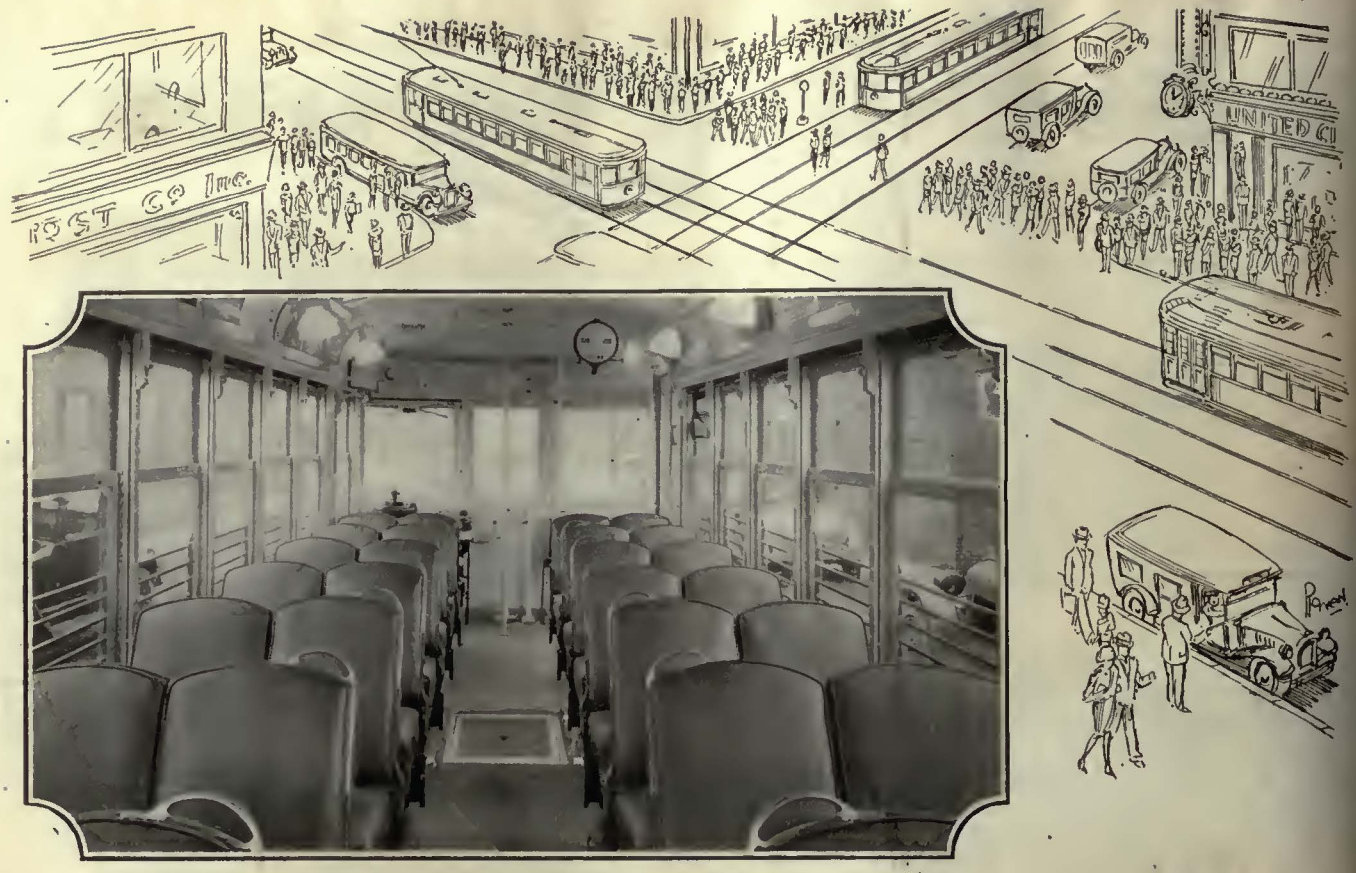
Ask Wardway, Inc.

Standard bodies and special bodies built to specifications. We shall gladly send our representative to discuss your needs and then design and build exactly to your order.

THE BENDER BODY COMPANY

W. 62nd and Denison — Cleveland, Ohio

BENDER BODIES



Easy chair luxury that invites *new* passengers to the E W & L line—*old cars made new by* H & K Seats!

"THE greatest innovations," says an Elmira newspaper, speaking of the car remodelling of the Elmira Water, Light and Railroad Company line, "are the leather seats with spring cushions which eliminate much of the jar, and the battleship linoleum on the floor—"

The new seats are Hale & Kilburn Walkover design No. 392 with leather upholstery, divided concave spring edge backs and deep double deck spring edge cushion.

With seats such as these and a few inexpensive minor changes—linoleum perhaps and a little fresh paint here and there—you can create an entirely new up-to-date car out of an old one—new comfort, new luxury, new atmosphere, new passenger-creating attractiveness.

Do you require new cars? Why not make new cars out of your old ones—with H & K Seats? Worth your while to send for the latest H & K catalog describing every type of up-to-date seat best suited to meet your remodelling needs.

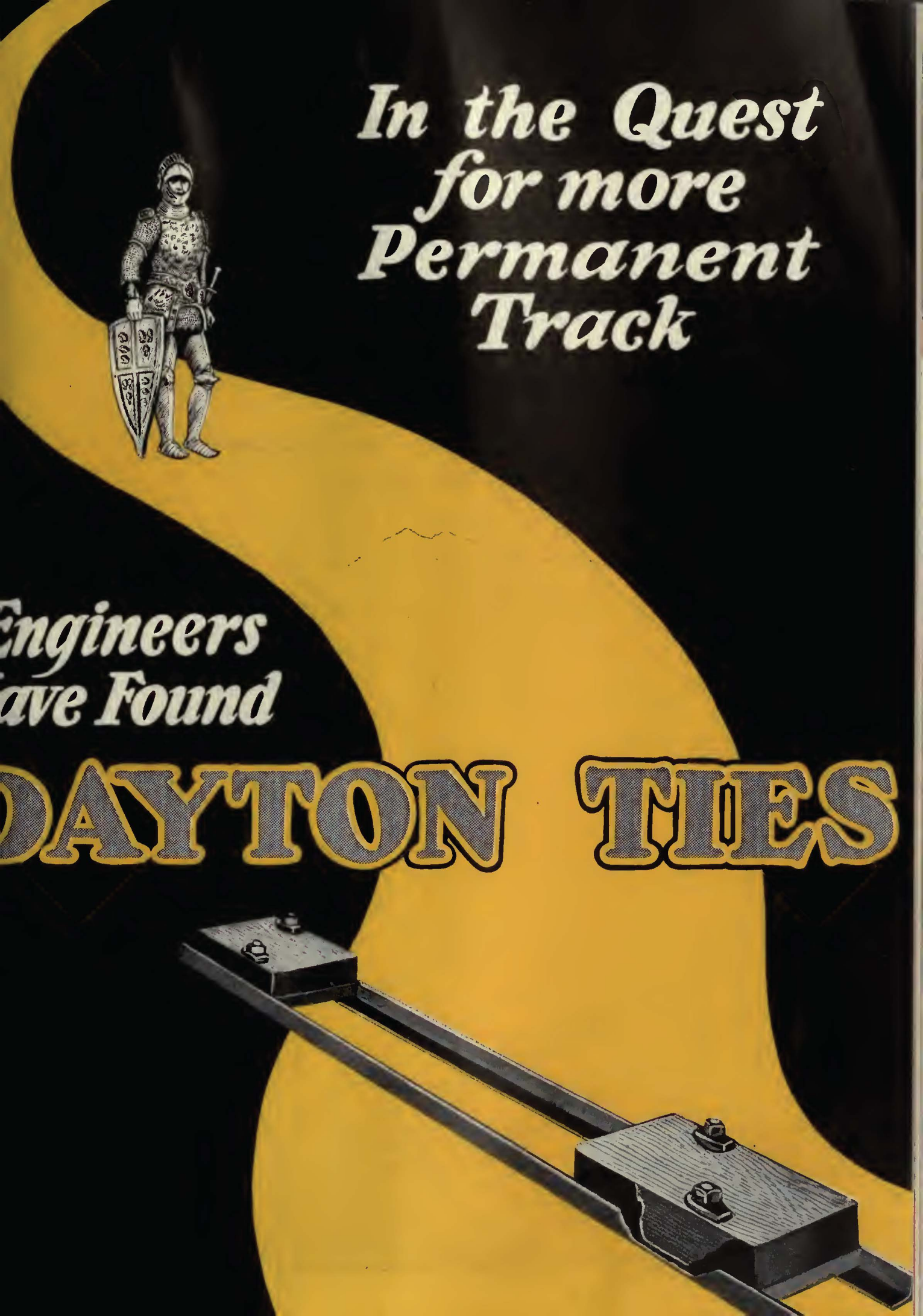
HALE & KILBURN COMPANY

General Offices and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co. Grayber Bldg. New York
Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta
Frank F. Bodler, 903 Monadnock Bldg., San Francisco
T. C. Coleman & Sons, Starks Bldg., Louisville
W. L. Jefferies, Jr., Mutuel Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 46 Front St., Portland, Oregon
C. S. Wright Co., 66 Temperance St., Toronto, Ont.

Hale and Kilburn SEATS


In the Quest
for more
Permanent
Track
ngineers
ave Found
DAYTON TIES

Dayton Tie Track Is More Nearly Permanent

For years street railway engineers have sought for more permanent track.

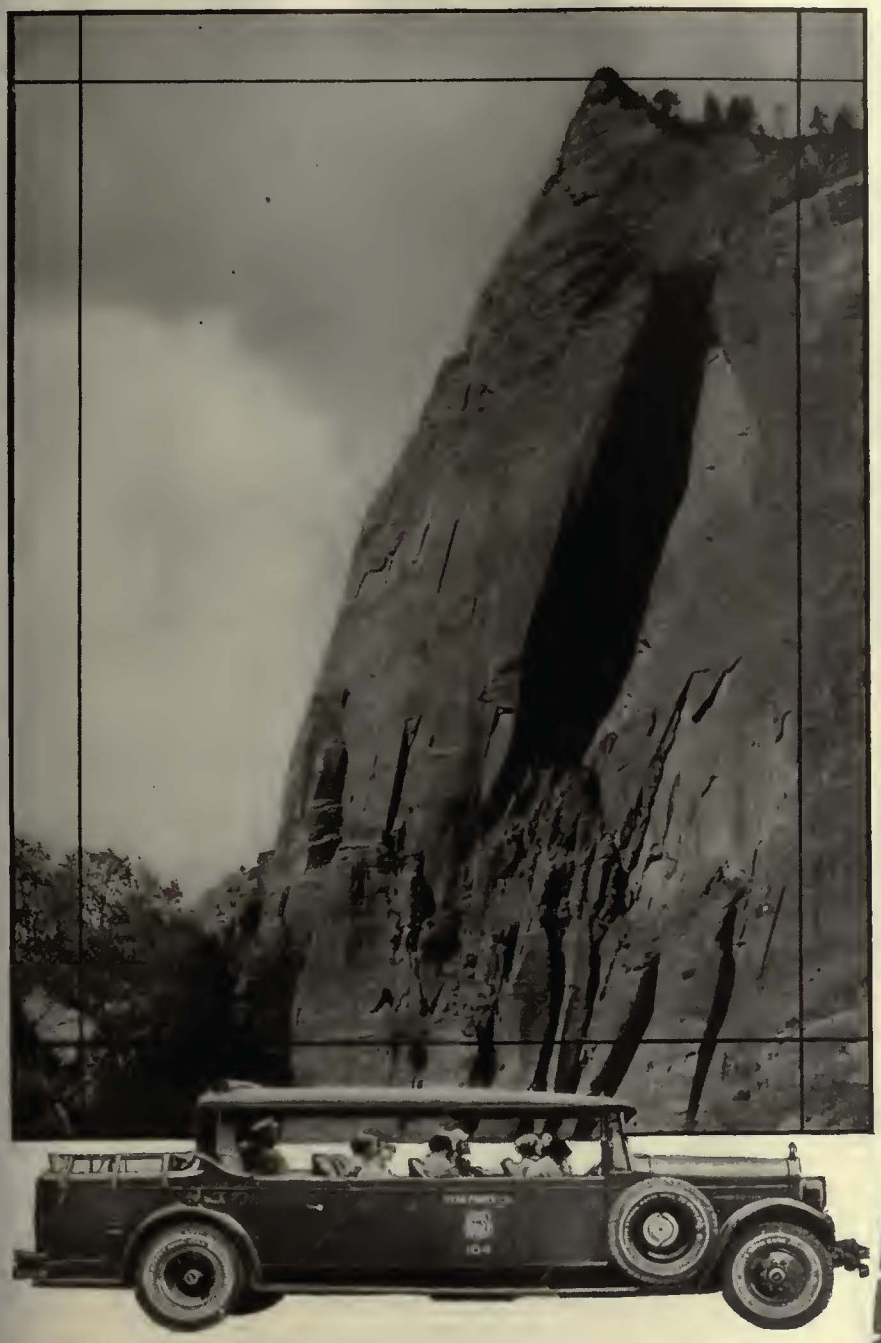
Track that would, through lasting qualities, bring about real economy.

Engineers of over 150 properties have found Dayton Tie Track.

Dayton Ties protect the concrete in which they are embedded—the combination lasts four or five times as long as the usual track without maintenance

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO

UNITED STATES TIRES ARE GOOD TIRES



UNITED STATES
RUBBER COMPANY

Trade US Mark

The motorcoaches of the Utah Parks Company carry thousands of tourists through the wonderland of Zion National Park. At the left is shown a view of Zion Canyon, one of the most striking beauty spots of America.

The Union Pacific System equips its Utah Parks motorcoach fleet with tires which have proved their ability to deliver low cost mileage and to assure safety, comfort and uninterrupted service to its patrons—U. S. Royal Cord Motorcoach Tires.

U.S. ROYAL CORD Motorcoach Tires

No Better Tires Made Today

FARE TOKENS

CONSIDER the high quality of die-work in Scovill tokens. Think of the experience accumulated in over 100 years of production of fine coins, medals and planchets. Bear in mind that Scovill's facilities for volume output of tokens are unequaled. No wonder Scovill is known throughout the electrical railway field as a dependable source of supply. The brass and nickel silver are fabricated in the Scovill plant. The tools, dies and special machinery are designed and built within the Scovill organization. And every manufacturing process is under strict laboratory control.

Scovill means SERVICE to all who require parts or finished products of metal. Great factories equipped with the last word in laboratories, and modern machinery manned by skilled workmen, are at your disposal. 'Phone the nearest Scovill office.

SCOVILL

MANUFACTURING COMPANY - - Waterbury, Connecticut

NEW YORK — CHICAGO — BOSTON — SAN FRANCISCO
DETROIT — PHILADELPHIA — LOS ANGELES — ATLANTA
PROVIDENCE — CLEVELAND — CINCINNATI
IN EUROPE — THE HAGUE, HOLLAND

Member, Copper and Brass Research Association

8 FITZJOHNS for Marinette & Menominee

Illustrated here is a fleet of eight FitzJohns recently sold to the Menominee and Marinette Light & Traction Co.

FitzJohn Pay Enter Grand Type Bodies—mounted on Reo GB chassis.

They will operate between Menominee, Mich., and Marinette, Wis. Winters are severe, weather is trying, roads become heavy. Body as well as chassis endurance is essential.

FitzJohn Bodies were selected after exhaustive investigation by the operator.

FitzJohn Bodies Are Quality Jobs.

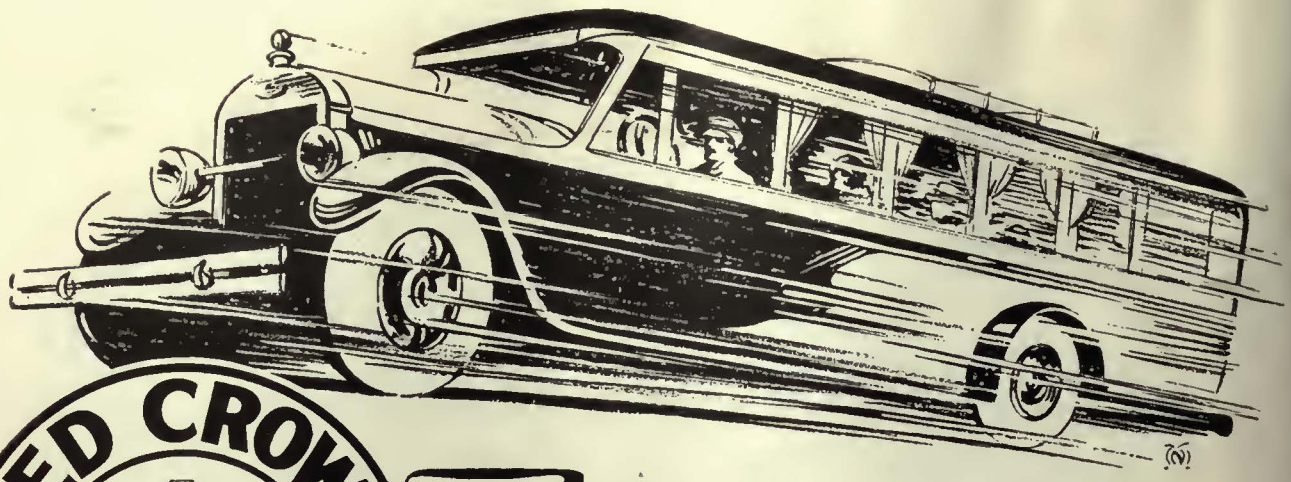
Luxury
Economy
Sturdiness

FitzJohn

FITZJOHN Manufacturing Company

Exclusive Bus Body Builders

MUSKEGON, MICHIGAN



RED CROWN GASOLINE

All that gasoline can contribute

Power of the kind that sends a loaded bus rushing up formidable hills . . . pep of the sort that makes possible the speed for maintaining schedules . . . acceleration that fairly leaps, yet gathers speed with the smoothness of a well oiled bearing—these are the things which Red Crown Gasoline helps your bus motor to achieve.

Red Crown Gasoline

is essentially a Power-Mileage gasoline—refined expressly for use in the modern internal combustion engine. The test of day-by-day operation proves it to be the most efficient and economical motor fuel for buses. And whether the tanks are filled in Indiana or Kansas, North Dakota or Illinois, the quality of Red Crown Gasoline is always uniform.

Let Red Crown prove these claims. Try it in one of your buses. Compare its performance and economy with the fuel you are now using.

STANDARD OIL COMPANY

(INDIANA)

General Offices: 910 S. Michigan Ave. Chicago, Illinois

ILLINOIS	INDIANA	S. DAKOTA	MICHIGAN	MISSOURI
Chicago	Evansville	Huron	Detroit	St. Louis
Decatur	Indianapolis	IOWA	Grand Rapids	Kansas City
Joliet	South Bend	Davenport	Saginaw	St. Joseph
Peoria	N. DAKOTA	Des Moines	WISCONSIN	MINNESOTA
Quincy	Fargo	Mason City	La Crosse	Duluth
KANSAS	Minot	Sioux City	Milwaukee	Mankato
Wichita			Green Bay	Minneapolis

805

EVERY operator is interested in solving his particular tire problem. No matter how tough the job is, General tackles it with the experience gained in supplying the big share of the truck and bus tire market. ~ ~ This factory experience is available through the General dealer who knows how to properly fit the tire to the job. The result is always the greatest uninterrupted mileage.

THE GENERAL TIRE AND RUBBER COMPANY, AKRON, OHIO

The Heavy Express Special

Specially built to stand up under the load at express speed, the Heavy Express Special carries through on any job. Operators everywhere are swinging to it.

The Mark of Leading Tire Stores Everywhere

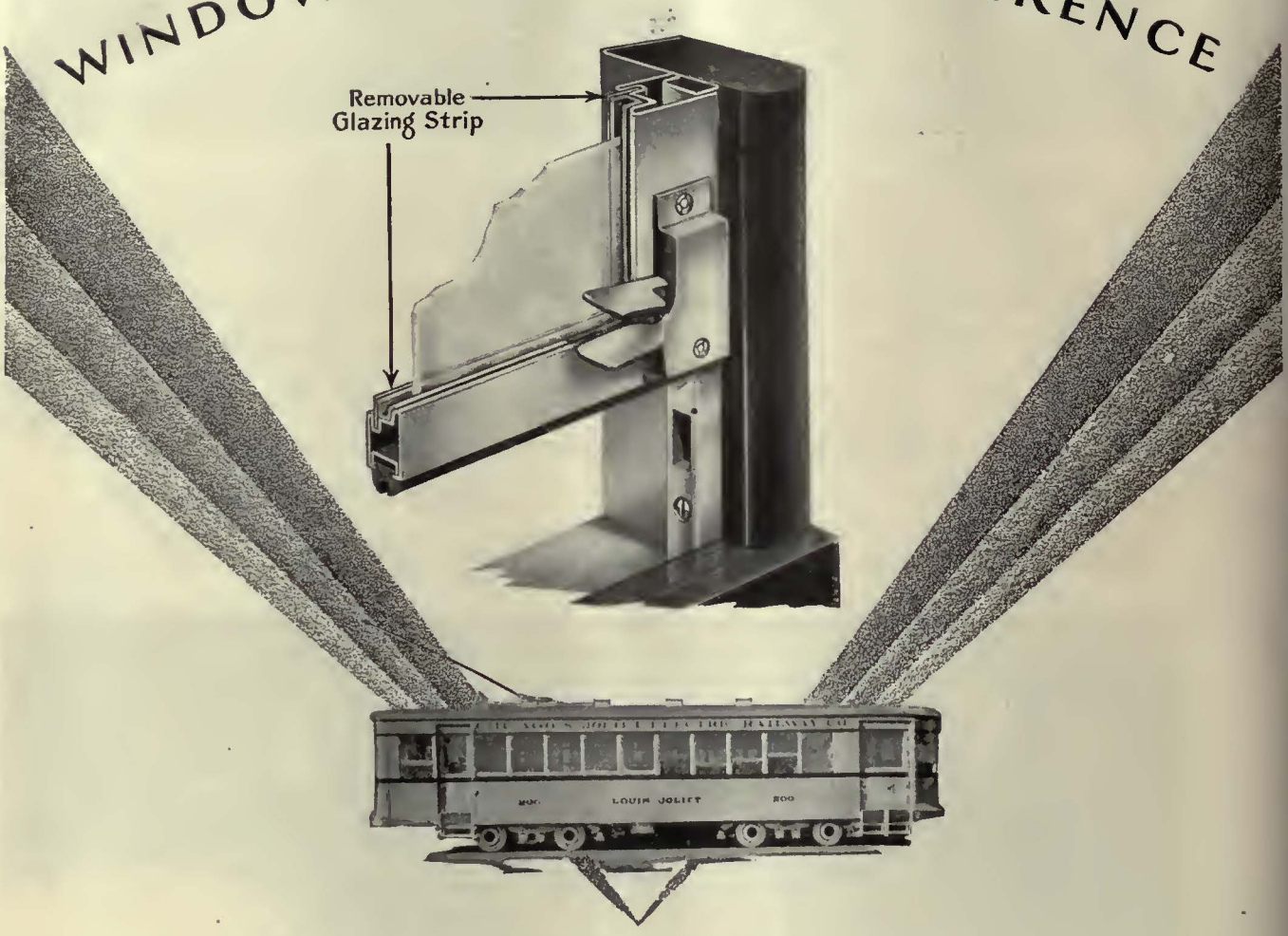
The

GENERAL

TIRE

—goes a long way to make friends

WINDOWS DO MAKE A DIFFERENCE



Every Edwards Feature— *Plus* this New Advantage

On thousands of electric railway cars and motor coaches, Edwards Metal Sash are proving that Edwards Quality pays. The same high quality is fully maintained in this new sash—Edwards Metal Sash with Removable Glazing Strips.

But this *new* advantage is added—with the Removable Glazing Strips reglazing can be done in as short a time as two and one-half minutes—*without removing sash from the opening.*

It takes only a few seconds to remove the glazing strips. Replace the glass, slide the strips into place, and the window is ready for service.

No costly delays while the car or motor coach is pulled into the shop. Your glass cost sheets will tell an interesting story of lower replacement costs.

Detailed specifications and complete information sent on request.

Illustrated is a new aluminum car of the Chicago and Joliet Electric Railway Company equipped with Edwards Metal Sash with Removable Glazing Strips. Cummings Car and Coach Co., builders.

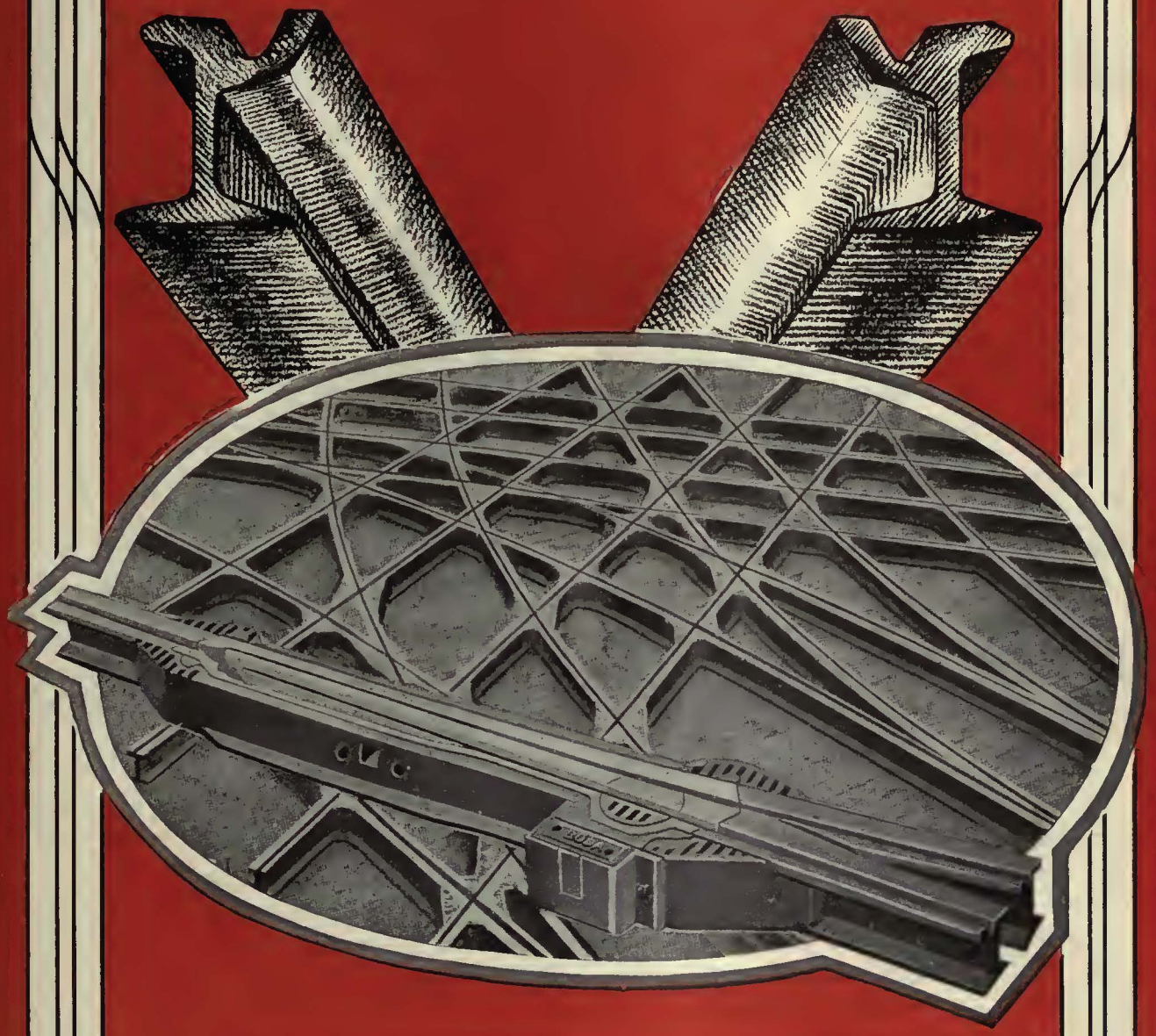
O. M. EDWARDS CO.
New York Syracuse, N. Y. Chicago
Canadian Representatives:
Lyman Tube & Supply Co., Ltd., Montreal and Toronto

TRADE PAOWNYC MARK
EDWARDS

Edwards Metal Sash

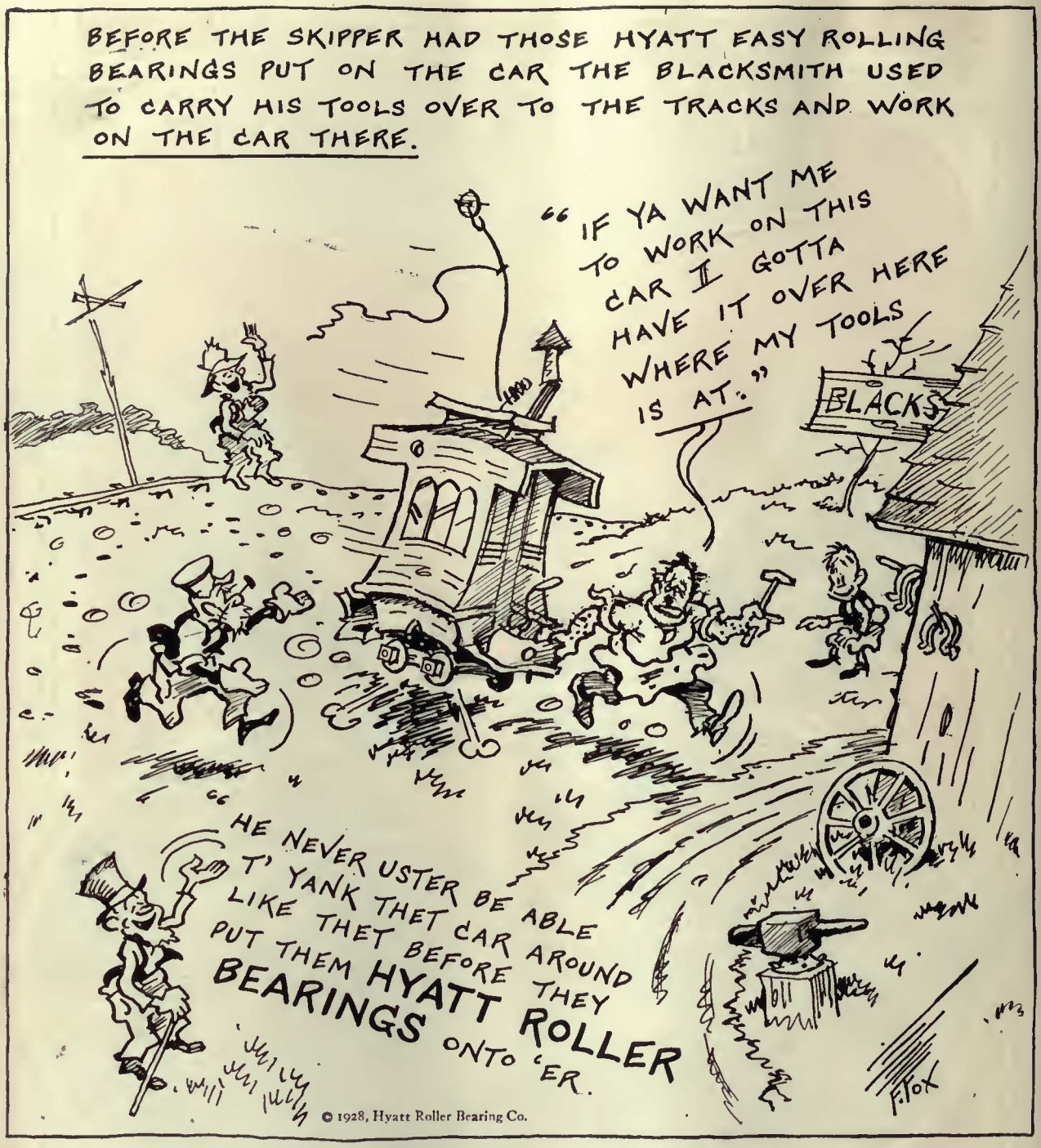
BUDA

ESTABLISHED
1881



THE BUDA COMPANY

HARVEY [Chicago Suburb] ILLINOIS



Smooth rolling Hyatts mean . . . riding comfort . . . quieter running . . . easier starts . . . less power . . . lubricant economy . . . freedom from journal box attention. These operating advantages . . . and contributing factors to public good will . . . are worth investigating.

HYATT ROLLER BEARING COMPANY

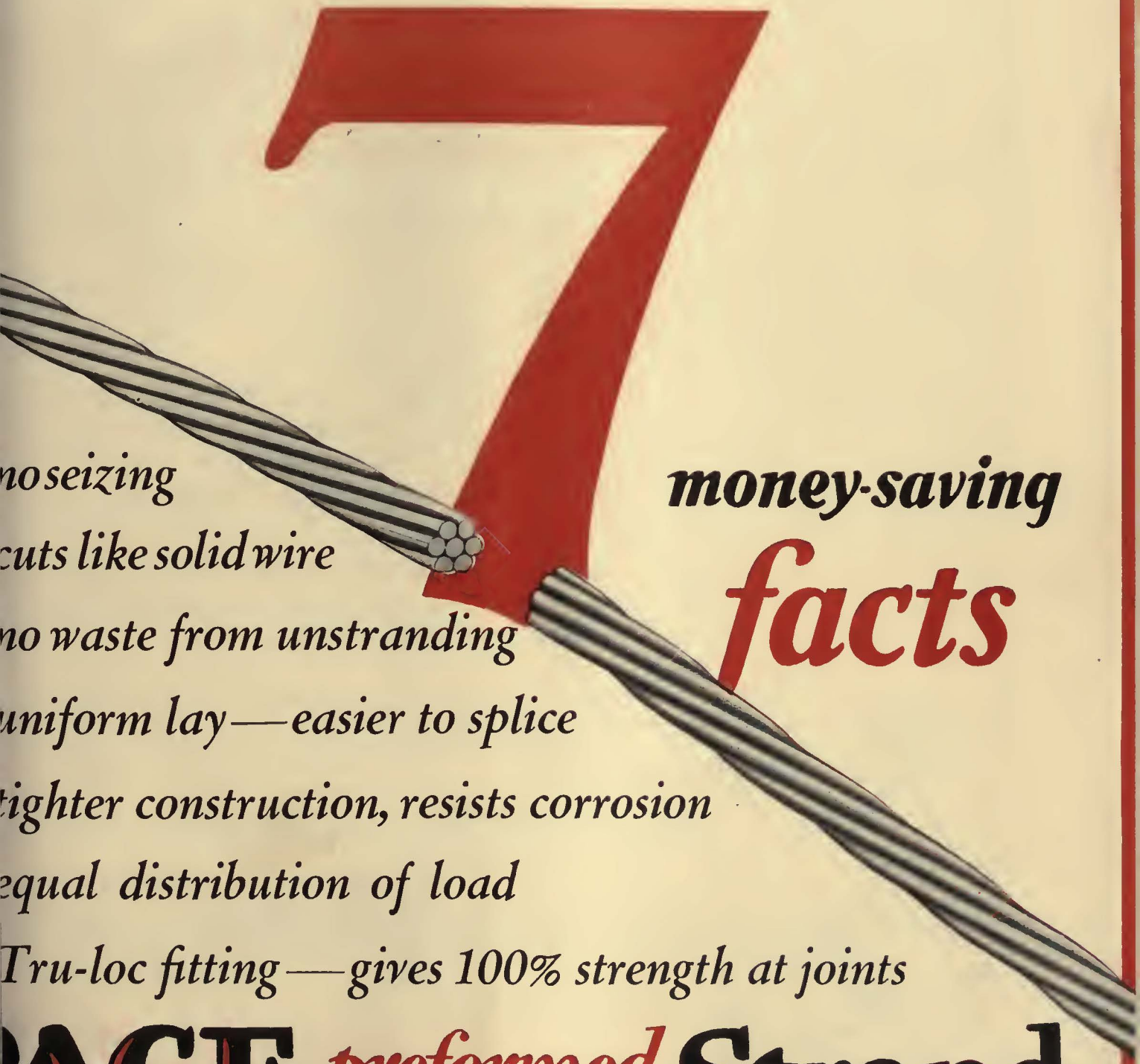
Newark Chicago Detroit Pittsburgh Oakland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

Consider these –



7 money-saving facts

no seizing

cuts like solid wire

no waste from unstranding

uniform lay—easier to splice

tighter construction, resists corrosion

equal distribution of load

Tru-loc fitting—gives 100% strength at joints

PAGE *preformed* Strand

tperforms because it is preformed

Now a *strand* that cuts like *bar*

Requires no seizing—resists unstranding—does not "bird-cage" and kink

Page Preformed Strand is made from preformed wires—the first basic improvement in 100 years of strand manufacture.

The wires of Page Preformed Strand are laid in place — not twisted. Because they are not twisted the wires are free from locked up stress. There is no tendency for the wires to fly apart. You can cut Page Preformed Strand like bar. No seizing is required, there is no wastage from frayed ends.

Another important thing, Page Preformed Strand lies dead. It is easy to handle. There is no tendency for it to "bird-cage" and kink.

It will pay you to investigate. The coupon brings sample and bulletin. Mail it today.

PAGE STEEL AND WIRE COMPANY
An Associate Company of the American Chain Company, Inc.
BRIDGEPORT, CONNECTICUT

District Offices: Chicago, New York, Pittsburgh, San Francisco

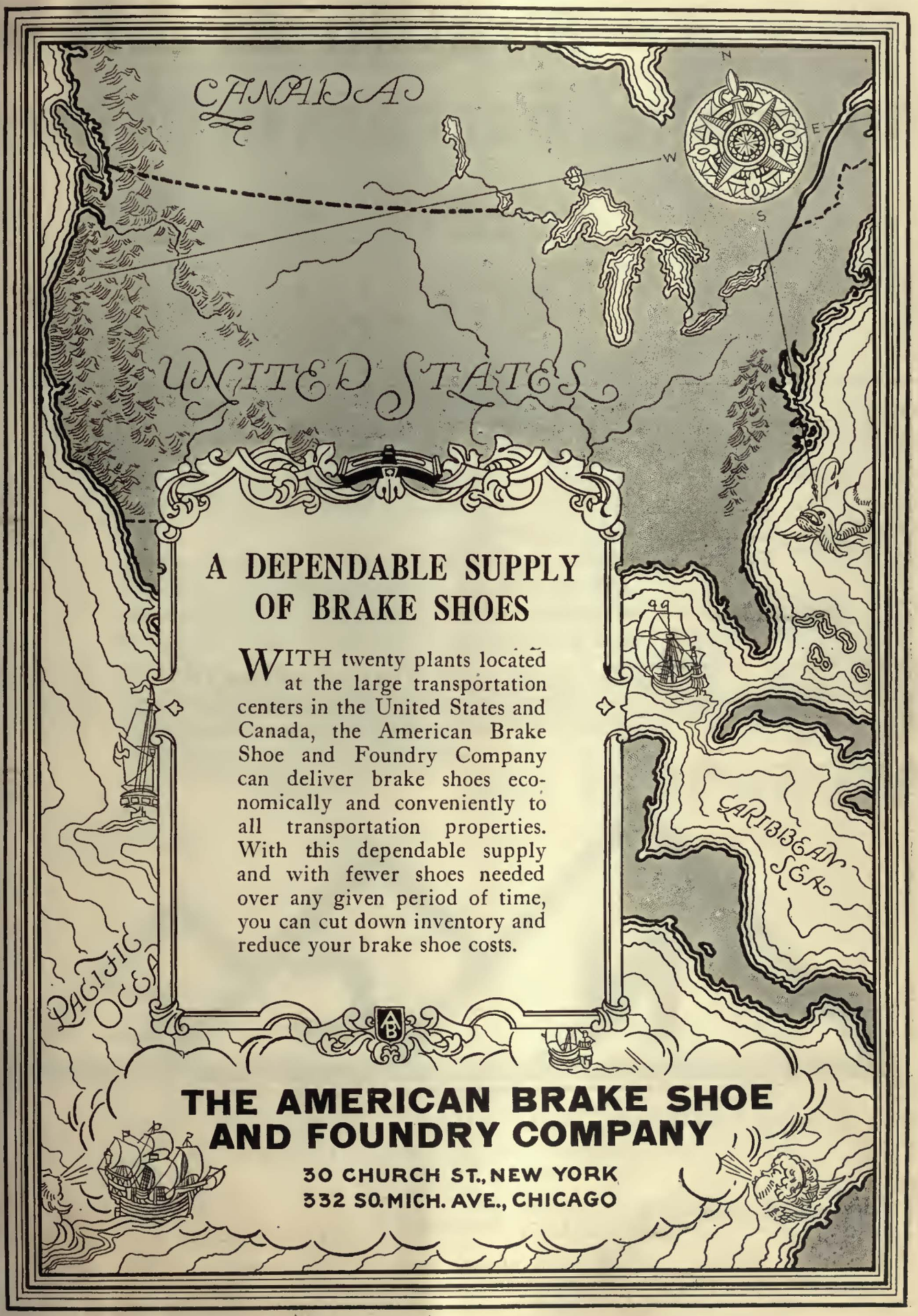
Manufactured under license arrangements with the American Cable Company, Inc.

Page Steel and Wire Company
Bridgeport, Connecticut

Gentlemen:

Better strand that costs less interests me. Send your bulletin and a sample of PAGE PREFORMED STRAND.

PAGE *preformed* Strand



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WITH twenty plants located at the large transportation centers in the United States and Canada, the American Brake Shoe and Foundry Company can deliver brake shoes economically and conveniently to all transportation properties. With this dependable supply and with fewer shoes needed over any given period of time, you can cut down inventory and reduce your brake shoe costs.

THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

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First in America to make carbon brushes

SO FAR as we have been able to ascertain, the first carbon brushes made in America were manufactured in the original National Carbon Company plant in Cleveland, in 1887. For eleven years before that date the company had been making arc lamp carbons, battery carbons and similar products. This experience in the handling of carbon was turned to immediate advantage when the first experiment with carbon brushes proved a startling success. Brushes were made for the Thomson-Houston Co., the Edison Company, General Electric Company, Westinghouse Electric & Manufacturing Co., Western Electric Co., the American Engine Co., Eddy Electric Mfg. Co., and the Bullock Electric Co., now the Allis-Chalmers Mfg. Co. Many other companies that were active during the early days of the electrical industry were also supplied.

Proud as we are of this record, we are still prouder of our present clientele, including as it does the vast majority of manufacturers of electrical apparatus, and of producers and users of electrical current.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide UCC *and Carbon Corporation*

Carbon Sales Division

Cleveland, Ohio SILVER STRAND CABLE TRADE MARK REGISTERED San Francisco, Cal.

Branch Offices and Factories

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AMCRECO -POLES- are dependable poles

You can depend on an Amcreco creosoted yellow pine pole—

1. For strength.

Because of its full size; the natural strength of pine; the careful selection, handling, storing, and inspection for soundness which these poles receive; and the effective treatment which maintains their original strength indefinitely.

2. For long life.

Because of the careful selection, handling, storing and inspection which insure soundness and also because of the effective treatment which prevents deterioration.

3. For economy.

This is the natural result of the strength and long life of these poles. Their strength permits the minimum size for a given requirement, their long life distributes the first cost over the maximum period of service, and their maintained strength minimizes maintenance and repairs.

These statements are more than mere sales claims. They are backed by the largest organization in the wood preserving industry—one with a long record of achievement. When you specify Amcreco Poles you not only get a dependable product—you have the satisfaction of dealing with a dependable producer.

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He considers first and foremost your interests.

He is truthful and honest in his dealings with you.

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He holds a fellowship in a select association with exacting standards of membership.

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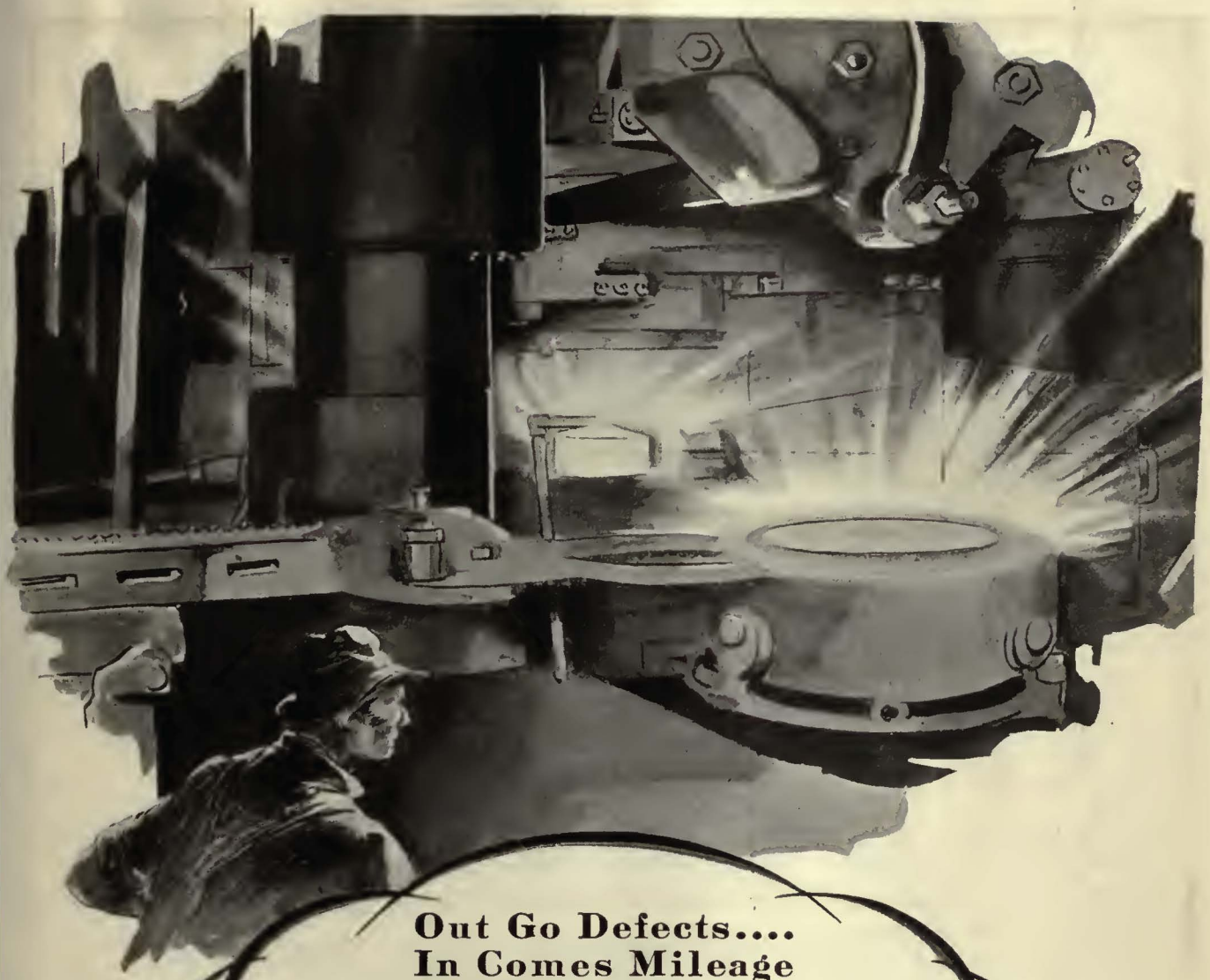
The A.B.P. comprises a group of business papers that reaches 54 fields of trade and industry. Membership requires the highest standards in every department of publishing, circulation, editorial, and advertising.

The advertisers in this publication demonstrate by their presence here that they are awake to modern methods of selling as well as production—methods that cut costs and standardize operations.



Out Go Defects....
In Comes Mileage

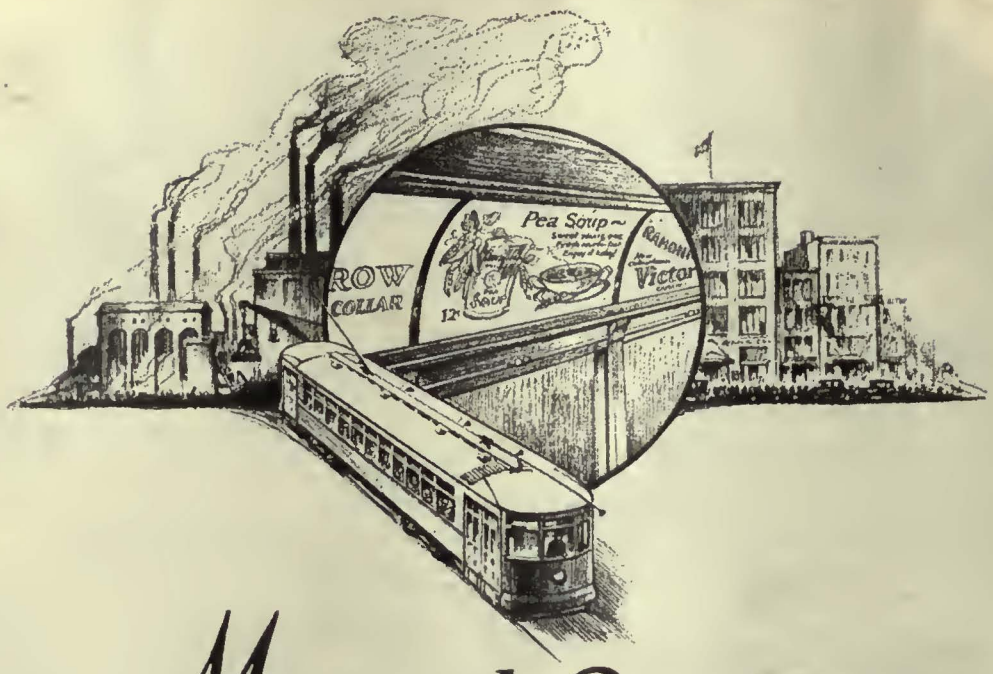
Here a ten-thousand-ton hydraulic press is transforming GARY "wheel blocks" into GARY "wheel blanks."

Defects are forged out—and extra mileage forged in. The hub is formed, the flange and rim partially formed. The blank is being made ready for the rolling operation where further reduction and refinement is to take place.

The course of GARY WROUGHT STEEL WHEELS from block to finished product is a steady one toward mileage. Our wheel engineers are at your service.

Illinois Steel Company
General Offices: 208 South La Salle Street
Chicago, Illinois

GARY
WROUGHT STEEL WHEELS



Mutual Service

TO the manufacturers and distributors of America and the street railway systems that transport the millions of America's potential buyers, Collier offers a mutual service.

This service has brought the street railway riders in thousands of cities and towns throughout the country to look upon car cards as extremely useful and pleasing features of up-to-date street car service. It has given national and local advertisers a medium thru which they can get their messages to selected territories easily, economically and convincingly.

Our business is one of service—service to the street railway industry, service to America's national and local advertisers, service to the millions of people who daily ride on street cars.

Barron G. Collier
INCORPORATED,

CANDLER BUILDING,
NEW YORK, N. Y.

Reduce Power Cost— Raise Voltages to Normal

Type EAS

Type EAS

Types EAS rail bonds are brazed to the rail using either the portable welding furnace or the bonding car. The loop of these bonds may be offset at any angle, making the bond suitable for application to a wide variety of rail joints, including joints with heavily beaded splice bars. The Champion type is supplied with a heavy copper sheath that grips the strands beyond the zone of the weld. Either Champion or standard type are electrically efficient, "service-praven" bonds.

NEW impetus has been given the electric railway industry. New motors, new drives, new designs in types of cars and equipment!

The proper functioning of these new motors and drives depends to a large extent on proper rail bonding. Just any old bond won't do.

Regardless of the type of Erico bond, all are noted for their ease of application, their tenacious adherence to the rail, *their ability to reduce power cost and raise voltages to normal.*

Normal voltages secured through right rail bonding results in faster schedules, lower motor maintenance costs and increased revenues.

That is why it is well worth while for you to investigate Erico Rail Bonds. Write today for details.

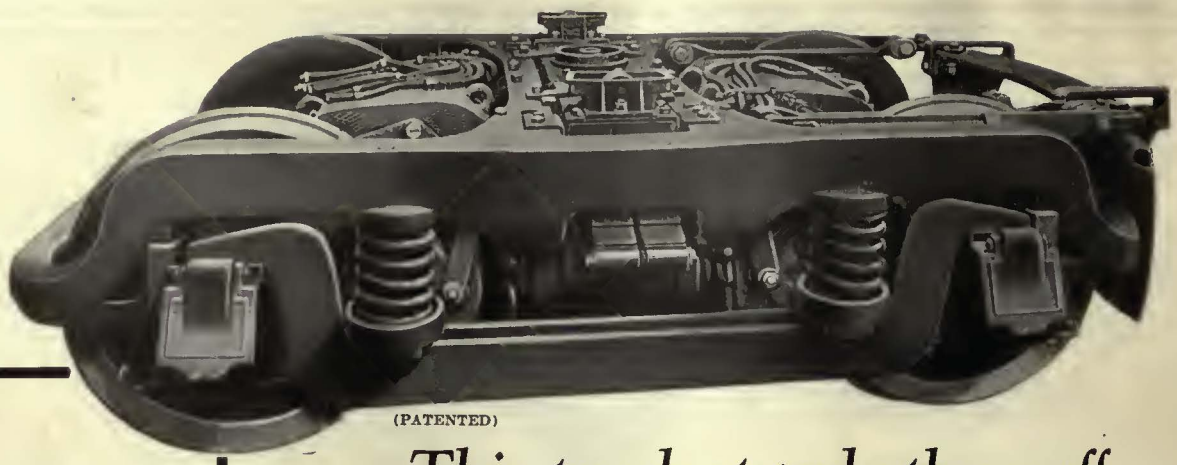
THE ELECTRIC RAILWAY IMPROVEMENT CO.
2070 E. 61st Place
CLEVELAND, OHIO

Type EASW

These bonds are applied with the loop extending out perpendicular to the rail. The flexibility of this bond, together with the copper sheathed Champion terminal, contributes greatly to the trouble free service these bonds give. Like EAS type, EASW bonds are electrically efficient because when applied each has a contact area eight times the conductor area—the ratio of conductivity of copper to steel.

Type EASW

ERICO
RAIL BONDS AND BONDING OUTFITS



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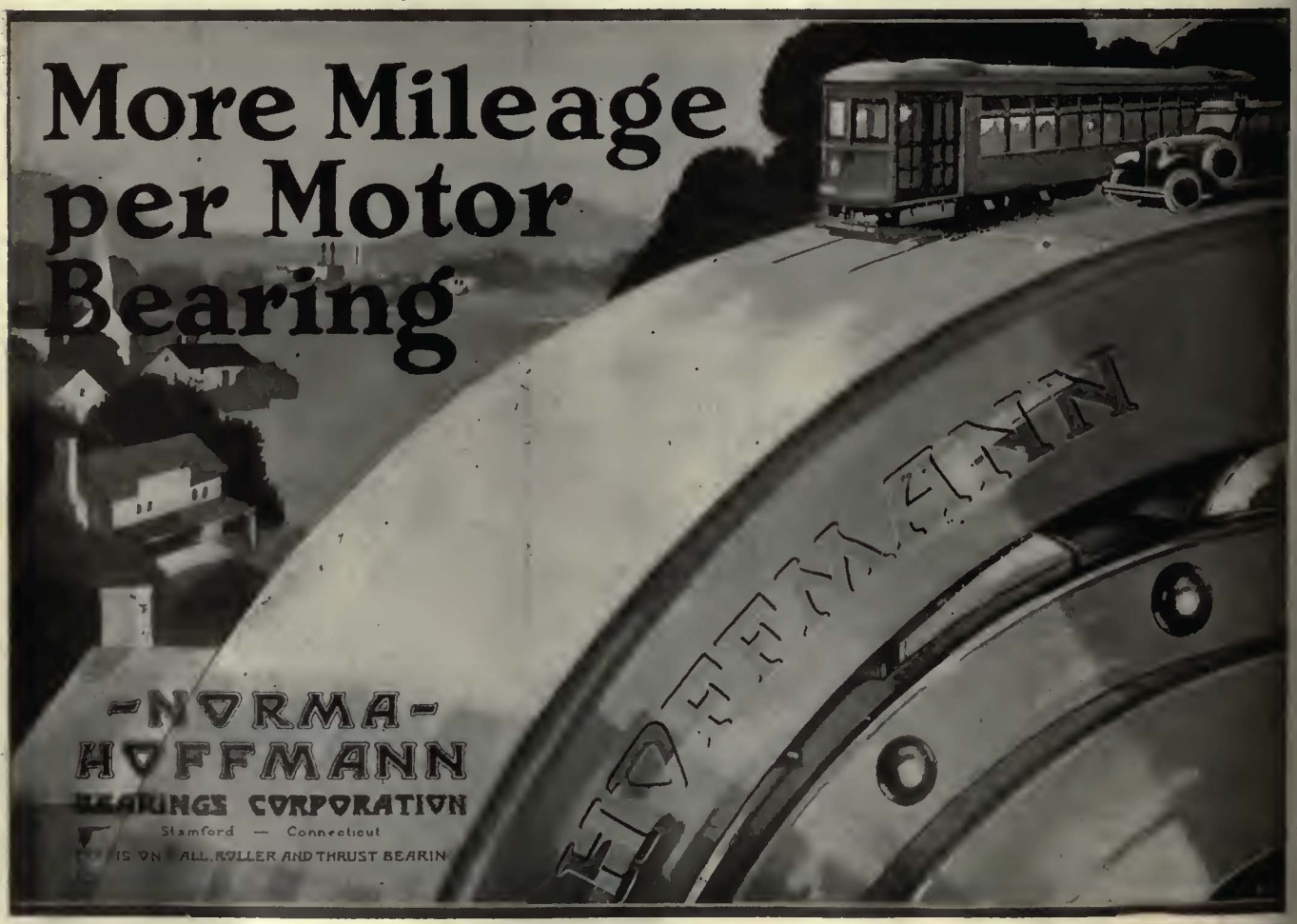
Cast steel frame, including cross and end transoms, a single strong unit.

Pedestals cast integral with frame. Removable hardened spring steel liners protect them from wear.

This truck stands the gaff of high-speed interurban service!

It's a Commonwealth Motor Truck. And the long service it gives at remarkably low maintenance has made it standard with many of the most progressive railways.

COMMONWEALTH STEEL COMPANY
GRANITE CITY, ILL.



You can't go Wrong!

Page doesn't stop at tagging gas welding wire and electrode bundles—in addition, every piece is plainly stamped. No matter how much lots may become mixed in your shop, the mark identifies every piece.

You can depend on the PAGE identification mark, too, for every piece is carefully processed. And it is shop tested to assure proper working qualities "on the job."

Prove for yourself PAGE has taken the guess out of gas welding wire and electrodes. Your name and address will bring a sample.

PAGE STEEL AND WIRE COMPANY
Bridgeport, Connecticut

District Offices: Chicago, New York, Pittsburgh, San Francisco
An Associate Company of the American Chain Company, Incorporated, Bridgeport, Conn.

PAGE-ARMCO PROCESSED
Welding Wire and Electrodes

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Balsam-Wool

insulated cars provide comfort and add to profits

IN addition to its insulating efficiency Balsam-Wool contributes to passenger cars an economy that should be especially attractive to railway officials.

A saving of several hundred pounds per car can mean but one thing—lower operating costs.

Balsam-Wool is light-weight—because it is composed of millions of dead air cells. Technically it is 95% "still" air. This is the feature which accounts for its higher insulating efficiency and its light-weight.

Operating economy is important, but comfort for passengers—both winter and summer—promotes greater patronage—larger dividends. The Balsam-Wool insulated car is quieter, easier to heat in winter and more comfortably cool in summer.

Interested railway executives will be sent samples and complete information on request.

WOOD CONVERSION COMPANY
Insulation Division of Weyerhaeuser Forest Products
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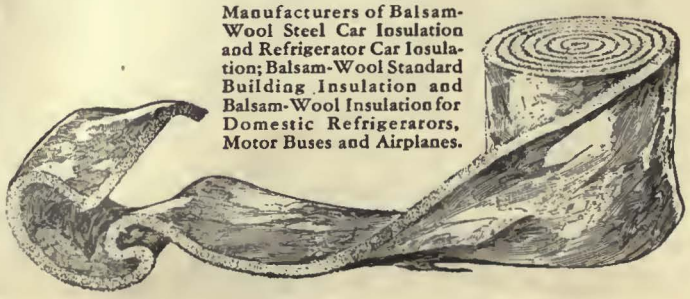
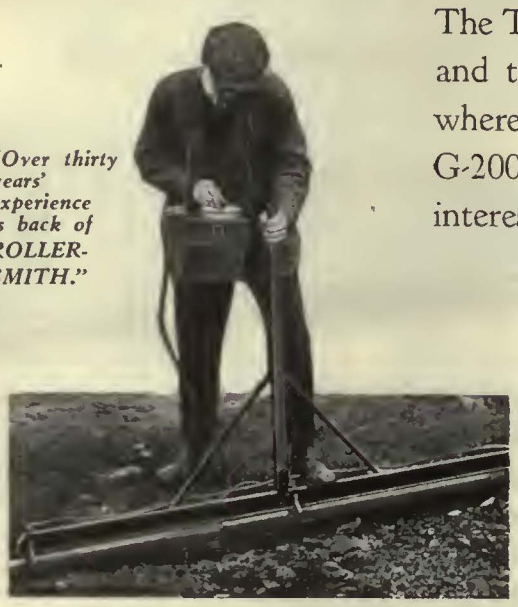
Manufacturers of Balsam-Wool Steel Car Insulation and Refrigerator Car Insulation; Balsam-Wool Standard Building Insulation and Balsam-Wool Insulation for Domestic Refrigerators, Motor Buses and Airplanes.



ROLLER-SMITH BOND TESTERS

are known and used all over the world

They are the Standard with which all others are compared



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

The Type SBT is recommended for all ordinary work and the Super-Sensitive Type BBT for conditions where there is little or no current in the rail. Bulletin G-200 should be in the hands of every man who is interested in bond testing.

Your copy is ready.

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How to Secure a Lustrous Gloss Finish!

For applying a thoroughly atomized wet coat of heavy bodied lacquer enamel in order to secure a finish of lustrous gloss, the "Binks No. 105, Type DD" Spray Gun is recommended. Write for detailed information.

In car shops, the value of essential advancements in finishing methods and equipment is recognized. Here Binks Spray Painting Equipment is rapidly standardizing itself.

Particularly significant is the Binks latest development in Material Pressure Containers. Perfect, individual control of air and material insures marked improvement in the work. Write for details.

Before you plan additions to your equipment, investigate Binks. Try these newer accessories. Make your own tests and comparisons—then standardize on Binks like other car shops have done. Write for Bulletins on Car Shop spray painting.

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THE big reason why hundreds of railway companies, cities and towns have installed Elreco Poles is their strength and economy.

Their capacity for withstanding tremendous shocks and of supporting excess wire loads, if necessary, makes the strong appeal.

In addition they are open to inspection from top to bottom; are easy to maintain. Trolley wires, lighting wires, lighting units—even traffic signals—are supported on one pole.

The enormous economies resulting from three or four companies dividing the cost of installation and maintenance is at once evident.

Let us tell you about the many advantages of Elreco Tubular Steel Poles. Write.

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This Test Tells Your Compressor's Future

Dependable air supply has a lot to do with your profits—but you can't X-ray your portable compressor to find out how good it is.

That is why the water test was created. This test is easy to make, but it reveals clearly the amount of vibration in your portable—the biggest factor causing wear and trouble.

Just fill an ordinary glass to the brim with water, and place it on the compressor frame. Do not block the wheels or brace the machine in any way.

Then start up and run full speed; let the machine load and unload, and watch the glass. *Under this test the smooth running Sullivan Vibrationless Compressor causes scarcely a ripple on the surface of the water.*

Vibrationless operation with its many advantages, is something you are now entitled to in portables. Catalog 3283-F will tell you about "Vibrationless" Compressors.

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Perfect Automatic Lubrication

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Some carry loads as high as 700 lbs. The sightseer asking "Upon what food does he feed to get such strength?" expects the answer to be "Raw Meat."

But the real answer is *Khiyar*—meaning *raw cucumbers* . . . . more than three pounds daily is his summer ration. Proving again that the big point in anything is not what you put into it—but what you get out of it.

That's why we don't talk about the ingredients of Morganite brushes.

What does it matter whether they be curd, or carbon, or cucumbers as long as they'll carry any loads and reduce your annual brush **cost.**

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CREOSOTED

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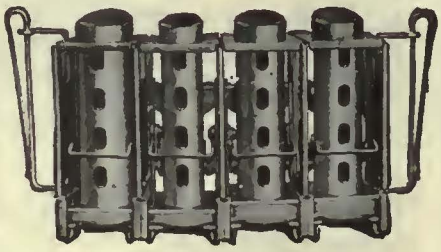
Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 4000 already in use.

When more than two coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tickets.



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TRENTON TOWER

This 3-Section

is not only more convenient, but stronger than the older type.

The top section is reinforced by the intermediate section. The 3-section design makes it possible to raise the platform 16 inches higher and drop it 12 inches lower than can be done with the old-style 2-section tower.

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They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

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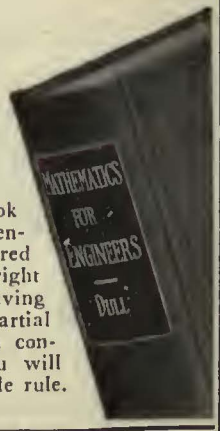

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Structural simplicity, combined with lasting strength and fine appearance, makes the Bates-Truss Pole ideal for all forms of overhead construction. Let us quote you on poles, structures or towers.

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with Chilled Rims and Chilled Back of Flanges For Street and Interurban Railways

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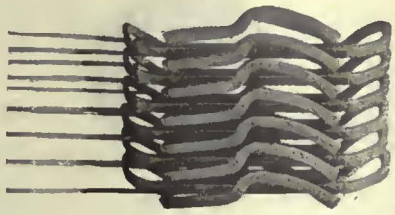

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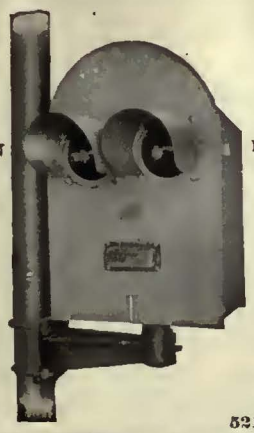

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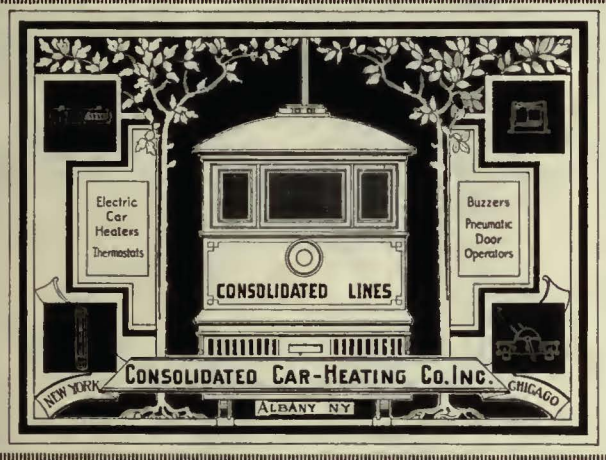

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PACIFIC COAST REPRESENTATIVE: U. S. STEEL PRODUCTS COMPANY, SAN FRANCISCO, LOS ANGELES, PORTLAND, SEATTLE.

Fenders and Wheel Guards
Brill Co., The J. G.
Cincinnati Car Co.
Star Brass Works

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Flashlights
National Carbon Co.

Floodlights
Elec. Service Supplies Co.
General Electric Co.

Floor, Sub.
Haskelite Mfg. Corp.

Floors
Haskelite Mfg. Corp.

Forgings
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Columbia Machine Works
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton,Jr.& Co., Inc.

Frogs, Track (See Track Work)

Frogs, Trolley
Electric Service Supplies Co
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Funnell Castings
Wm. Wharton, Jr. & Co., Inc.

Fuses and Fuse Boxes
Columbia Machine Wks.
Consolidated Car Heating Co.
General Electric Co.
Westinghouse E. & M. Co.

Garage Equipment
Columbia Machine Works & M. I. Co.
Westinghouse Tr. Br. Co.

Gas Electric Drive for Buses & Trucks
General Electric Co.

Gas Producers
Westinghouse E. & M. Co.

Gasoline
Standard Oil Co.

Gasoline Torches
Economy Electric Devices Co.

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

Gear Blanks
Bethlehem Steel Co.
Carnegie Steel Co.
Brill Co., The J. G.
Standard Steel Works Co.

Gear Cases
Columbia Machine Wks.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia Machine Wks.
Electric Service Supplies Co.
General Electric Co.
National Railway Appliance Co.
Tool Steel Gear & Pinion Co.

Generators
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gongs (See Bells and Gongs)

Grinders and Grinding Supplies
Metal & Thermit Corp.
Railway Trackwork Co.

Grinders, Portable
Railway Trackwork Co.

Grinders, Portable Electric
Railway Trackwork Co.

Grinding Bricks and Wheels
Railway Trackwork Co.

Ground Wires
Page Steel & Wire Co.

Guard Rail Clamps
Lorain Steel Co.
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 Supplies Co.
Ohio Brass Co.

Harps, Trolley
Columbia Machine Works & M. I. Co.
Elec. Service Supplies Co.
General Electric Co.
National Bearing Metals Corp.
Ohio Brass Co.
Star Brass Works

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Headlining
Columbia Machine Wks.
Haskelite Mfg. Corp.

Heaters, Bus
Nichols-Lintern Co.

Heaters, Car (Electric)
Consolidated Car Heating Co.
Economy Electric Devices Co.
Gold Car Heating & Lighting Co.
Railway Utility 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
Sullivan Machinery Co.

Hose, Bridges
Ohio Brass Co.

Hose, Pneumatic
Westinghouse Traction Brake Co.

Instruments, Measuring, Testing and Recording
American Steel & Wire Co.
Economy Electric 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.
United States 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.
Irvington Varnish & Ins. Co.
Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co. Inc.
United States Rubber Co.
Westinghouse E. & M. Co.

Insulation Slot
Irvington Varnish & Ins. Co.

Insulator Pins
Elec. Service Supplies Co.
Ohio Brass Co.

Insulators (See also Line Material)
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 (See also Cranes, Hoists and Lifts)
Buda Co.
Columbia Machine Wks.
Elec Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
S. K. F. Industries, Inc.

Lamps, Guards and Fixtures
Elec. Service Sup. 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.

Lanterns, Classification
Nichols-Lintern Co.

Letter Boards
Haskelite Mfg. Corp.
Nichols-Lintern Co.
Cincinnati Car Co.

Lighting Fixtures, Interior
Electric Service Supplies

Lightning Protection
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.
Electric Railway Equipment Co.
Electric Service Sup. Co.
General Electric Co.
National Bearing Metals Corp.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Lorain Steel Co.
Wm. Wharton, Jr. & Co., Inc.

Locomotives, Electric
Cincinnati Car Co.
Cummings Car & Coach Co
General Electric Co.
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricating Engineers
Standard Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Standard Oil Co.
Universal Lubricating Co.

Manganese Parts
Bemis Car Truck Co.

Machinery, Insulating
Amer. Insulating Mach. Co.

Manganese Steel Castings
Lorain Steel Co.
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.
Lorain 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)

Motors, Generators & Controls for Gas Electric Buses
General Electric Co.

Motors, Electric
General Electric Co.
Westinghouse E. & M. Co.

Motorman's Seats
Brill Co., The J. G.
Cincinnati Car Co.
Electric Service Sup. Co.
Hale-Kilburn Co.

Nuts and Bolts
Bemis Car Truck Co.
Bethlehem Steel Co.
Cincinnati Car Co.

Ohmmeters
Roller-Smith Co.

Omnibuses (See Buses)

Ovens
Young Bros.

Oxy-Acetylene (See Cutting Apparatus)

Packing
United States Rubber Co.
Westinghouse Traction Brake Co.

Paint Spraying Units
Binks Spray Equipment Co.

Paints and Varnishes (Insulating)
Electric Service Sup. Co.
Irvington Varnish & Ins. Co.
Mica Insulator Co.

Paints & Varnishes, Railway
National Ry. Appliance Co.

Panels, Outside, Inside
Haskelite Mfg. Corp.

Pavement Breakers
Sullivan Machinery Co.

Paving Material
American Brake Shoe & Foundry Co.

Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Drew Elec. & Mfg. Co.
Elec. Service Supplies Co.

Pinions (See Gears)

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.

Pole Line Hardware
Bethlehem Steel Co.
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.

Poles, Metal Street
Electric Railway Equipment Co.

Poles, Ties, Posts, Piling and Lumber
American Creosoting Co.
Bell Lumber Co.
International Creosoting & Construction Co.
J. F. Prettyman & Son
Wood Conversion Co.

Poles & Ties, Treated
American Creosoting Co.
Bell Lumber Co.
International Creosoting & Construction Co.
Wood Conversion Co.

Poles, Trolley
Bell Lumber Co.
Electric Service Sup. Co.

Poles, Tubular Steel
Electric Railway Equipment Co.
Electric Service Sup. Co.

Portable Grinders
Buda Co.

Potheads
Okonite Co.
Okonite-Callender Cable Co. Inc.

Power Saving Devices
Economy Electric Devices Co.
National Railway Appliance Co.

Pressings, Special Steel
Cincinnati Car Co.

Pressure Regulators
General Electric Co.
Westinghouse E. & M. Co.
Westinghouse Traction Brake Co.

Pumps, Air Lift
Sullivan Machinery Co.

Pumps, Vacuum
Sullivan Machinery Co.

Punches, Ticket
International Register Co.

Rail Braces and Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Illinois Steel Co.
Rail Joint Co., The

Rail Joints—Welded
Lorain Steel Co.
Metal & Thermit Corp.

Rails, Steel
Bethlehem Steel 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.

Registers and Fittings
Brill Co., The J. G.
Cincinnati Car Co.
Electric Service Sup. Co.
International Register Co.
Morey Meters, Inc.

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)
Westinghouse E. & M. Co.

Replacers, Car
Cincinnati Car Co.
Electric Service Sup. Co.

Resistances
Consolidated Car Heating Co
General Electric Co.

Resistance, Wire and Tube
American Steel & Wire 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, Car
Haskelite Mfg. Corp.

Roofs, Car & Bus
Haskelite Mfg. Corp.

Rubber Specialties of all Kinds
United States Rubber Co.

Sanders, Track.
Brill Co., The J. G.
O. M. Edwards Co., Inc.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.

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

Sash, Metal, Car Window
Edwards Co., Inc., O. M.
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Electric Service Sup. Co.

Seating Materials
Brill Co., The J. G.
Fitzjohn Mfg. Co.
Hale-Kilburn Co.
Haskelite Mfg. Corp.

Seats, Bus
Brill Co., The J. G.
Hale-Kilburn Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.

Second Hand Equipment
Electric Equipment Co.

Shades, Vestibule
Brill Co., The J. G.
Cincinnati Car Co.

Short Circuit Finders
Ideal Commutator Dresser Co.

Shovels
Brill Co., The J. G.

Shovels, Power
Brill Co., The J. G.

Side Bearings (See Bearing 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.

Signal Systems, Highway Crossing
Nachod & U. S. Signal Co.

Slack Adjusters (See Brake Adjusters)

Slag
Carnegie Steel Co.

Sleet Wheels and Cutters
Columbia Machine Wks.
Cincinnati Car Co.
Electric Ry. Improvement Co.
Electric Railway Equipment Co.
Electric Service Supplies Co.
National Bearing Metals Corp.

Smokestacks, Car
Nichols-Lintern Co.

Snow Plows
National Railway Appliance Co.

Snow-Plows, Sweepers and Brooms
Brill Co., J. G.
Columbia Machine Wks.
Cummings Car & Coach Co

Snow Sweeper, Rattan
Brill Co., J. G.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Buda Co.
Wm. Wharton, Jr. & Co., Inc.
Lorain Steel Co.

Spikes
American Steel & Wire Co.
Illinois Steel Co.

Splicing Compounds
United States Rubber Co.
Westinghouse E. & M. Co.

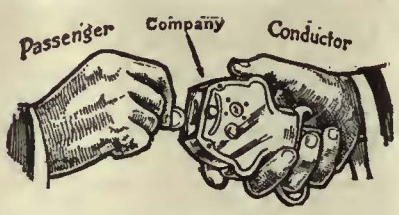
Splicing Sleeves (See Clamps and Connectors)

Springs
National Railway Appliance Co.

Springs, Car and Truck
American Steel Foundries
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works Co.

(Continued on page 64)

Let the Passenger Audit



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give 25% more reason than ever before for adopting them."

Ideal Commutator Resurfacers have always been the fastest cutting, longest lived and most reliable dressers, and now they are 25% more efficient than ever.

85% Copper Grindings
15% Resurfacer and Carbon Brush Grindings

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Name ..... Position .....
Company .....
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EMPLOYERS! *Consult* these columns for good men.

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0131

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THE NICHOLS-LINTERN CO.
7960 Lorain Ave. Cleveland, Ohio

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Electrical Wires & Cables
John A. Roebling's Sons Co. Trenton, N. J.

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ALPHABETICAL INDEX TO ADVERTISEMENTS

Thia index is publiahed as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errora or omissions.

WHAT AND WHERE TO BUY—Continued from page 62

Sprinklers, Track and Road
Brill Co., The J. G.
Cummings Car & Coach Co

Steel and Steel Products
American Steel & Wire Co.
Illinois Steel Co.

Steps, Car
Brill Co., The J. G.
Cincinnati Car Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stones (Commutator)
Ideal Commutator Dresser Co.

Stop Signals
Nichols-Lintern Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Electric Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Strand
American Steel & Wire Co.
Roeblings Sons Co., J. A.

Street Cars (See Cars, Passenger, Freight, Express, etc.)

Superheaters
Babcock & Wilcox Co.

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

Switch Stands and Fixtures
Ramapo Ajax Corp.

Switches
General Electric Co.

Switches, Selector
Nichols-Lintern Co.

Switches and Switchboards
Consolidated Car Heating Co.
Electric Service Sup. Co.
Westinghouse E. & M. Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Synchroscopes
Roller-Smith Co.

Tampers, Tie
Railway Trackwork Co.

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

Tee Rail Special Track Work
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

Telephones and Parts
Electric Service Sup. Co.

Telephone & Telegraph Wire
American Steel & Wire Co.
J. A. Roeblings Sons 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.

Ties, Mechanical
Dayton Mechanical Tie Co.

Tie Plates
Illinois Steel Co.

Ties and Tie Rods, Steel
International Steel Tie Co.

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

Tires
General Tire & Rubber Co.
Goodyear Tire & Rubber Co., The
United States Rubber Co.

Tokens
Johnson Fare Box Co.
Scovill Manufacturing Co.

Toogue Switches
Wm. Wharton, Jr. & Co., Inc.

Tool Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Columbia Machine Wks.
Electric Service Sup. Co.
Railway Trackwork Co.

Torches, Acetylene (See Cutting Apparatus)

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

Towers and Transmission Structures
Bates Exp. Steel Corp.
Westinghouse E. & M. Co.

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 Wks.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

Trackless Trolley Cars
Brill Co., The J. G.

Transfers (See Tickets)

Transformers
General Electric Co.
Westinghouse E. & M. Co.

Tread Safety Stair Car Step
Cincinnati Car Co.

Tree, Wire
Okonite Co.
Okonite-Callander Cable Co.

Trolley Bases
National Bearing Metals Corp.
Ohio Brass Co.

Trolley Bases, Retrieving
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
Westinghouse E. & M. Co.

Trolley Material (Overhead)
Electric Service Sup. Co.
General Electric Co.
National Bearing Metals Corp.
Ohio Brass Co.
Westinghouse E. & M. Co.

Trolley Wheel Bushings
National Bearing Metals Corp.
Star Brass Works

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
American Brass Co.
American Steel Foundries
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Page Steel & Wire Co.
Roeblings Sons Co., J. A.

Trucks, Car
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Commonwealth Steel Corp.
Cummings Car & Coach Co

Truss Planks
Haskelite Mfg. Corp.

Tubing, Yellow and Black Flexible Varnish
Irvington Varnish & Ins. Co.

Turbine, Steam
General Electric Co.
Westinghouse E. & M. Co.

Turnstiles
Electric Service Sup. Co.
Perey Mfg. Co., Inc.

Turntables
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.

Vestibule Linings
Haskelite Mfg. Corp.

Voltmeters
Roller-Smith Co.

Welded Rail Joints
Electric Ry. Improvement Co.
Lorain Steel Co., The
Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welders, Portable Electric
Electric Ry. Improvement Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welders, Rail Joint
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.

Welding Processes and Apparatus
Electric Ry. Improvement Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welding Steel
Electric Ry. Improvement Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welding Wire
American Steel & Wire Co.
Railway Trackwork Co.
Roebling's Sons Co., J. A.

Welding Wire and Rods
Page Steel & Wire Co.
Railway Trackwork Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Griffin Wheel Co.

Wheels, Car Steel & Steel Tire
American Steel Foundries
Bemis Car Truck Co.
Illinois Steel Co.
Standard Steel Works Co.

Wheels, Trolley
Columbia Machine Wks.
Electric Railway Equipment Co.
Electric Service Supplies Co.
National Bearing Metals Corp.
Ohio Brass Co.
Star Brass Works

Wheels, Wrought Steel
Illinois Steel Co.

Whistles, Air
Ohio Brass Co.
Westinghouse E. & M. Co.
Westinghouse Traction Brake Co.

Window Guards & Fittings
Cincinnati Car Co.

Wire Connectors (Solderless & Tapeless)
Ideal Commutator Dresser Co.

Wire Splicing Pliers
Ideal Commutator Dresser Co.

Wire, Copper Covered Steel
Page Steel & Wire Co.

Wire Rope
Amer. Steel & Wire Co.
Roebling's Sons Co., J. A.

Wires and Cables
American Brass Co.
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Okonite Co.
Okonite-Callender Cable Co.
Page Steel & Wire Co.
Roebling's Sons Co., J. A.
Westinghouse E. & M. Co.

Wood Preservations
American Creosoting Co.

A Big Success in Little Rock

1927 was the most successful year in the history of the Arkansas Power and Light Company, Little Rock, Arkansas. As reported in the *Electric Railway Journal,* May 5, the very favorable net profits which accrued were attributed to their modernization program, started with the purchase of eight double-truck cars built by the American Car Company and followed by thirty single-truck cars purchased from the same company in 1926.

Increased speed, lower maintenance and added comfort are factors in which these Brill Modern Cars are performing an important part.

The attractive earnings in Little Rock are typical of the profit producing possibilities of Brill Modern Cars as successful competitors of the family automobile.

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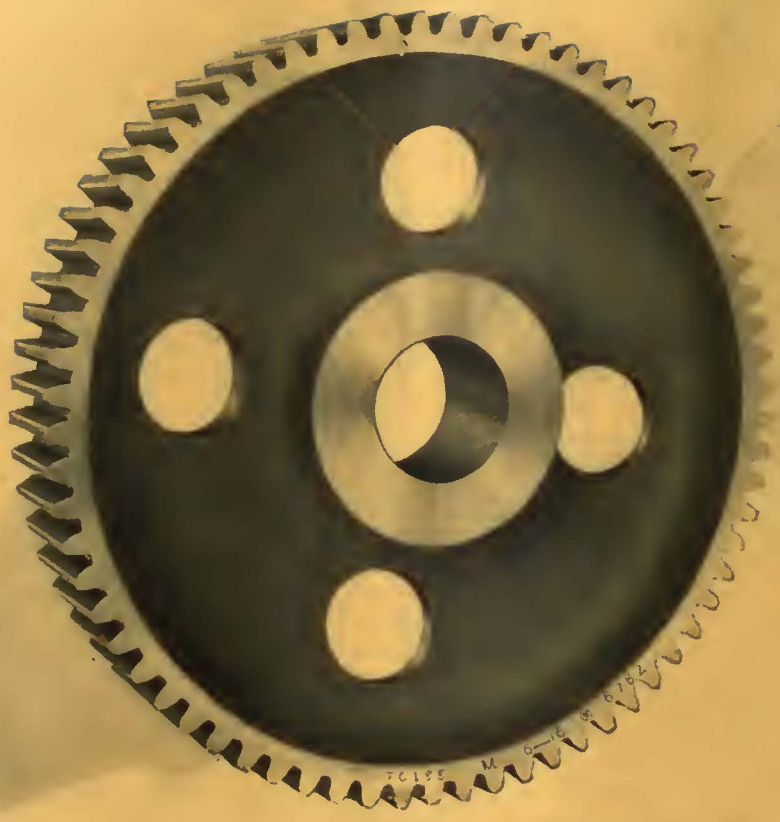

1925--G-E Gears Installed
1926--G-E Gears Standard
1927--G-E Gears Standard

The Chicago Surface Lines chose G-E improved Grade M gears and pinions for a large part of its 1925 requirements. As a result, G-E gearing was specified for all 1926 requirements, and now in 1928, General Electric gearing continues to be the standard.

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