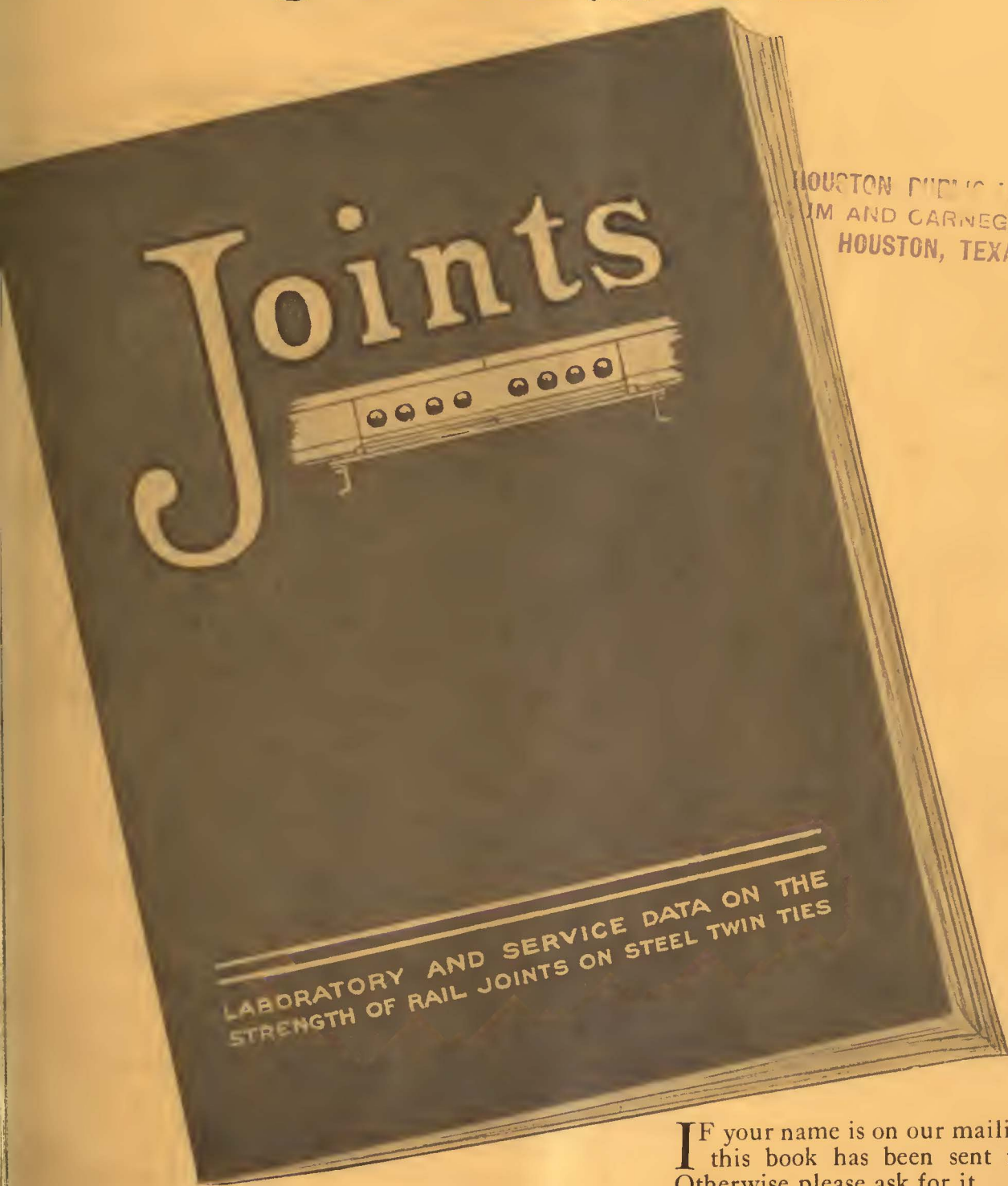


MONTHLY MAINTENANCE ISSUE

ELECTRIC RAILWAY JOURNAL



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THE INTERNATIONAL STEEL TIE Co.
CLEVELAND

Steel Twin Tie Track

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Revamp your Types 251 and 264 Unit Switch Control with Type 480 Switch Units, and other improved parts.



THE Type 480 Switch Unit has been designed to increase the life of the wearing parts and to provide a quickly removable arc chute. Only such new parts as are essential to increase life are employed. The complete switch unit is interchangeable with the 250 or the 264 units. Maintenance men will immediately recognize the value of the following features:

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2. New Micarta Duck cup washers which increase the insulation in the top of the group and permit the elimination of the fish paper, base-plate insulation. By the use of this improved insulating cap, shrinkage is practically eliminated and, hence, the possibility of terminal studs loosening is reduced.
3. Bent copper connection straps are used instead of the flat type. The use of this type of strap eliminates the necessity of copper spacing washers.

The Type 480 Unit Switch is so designed that types 251 and 264 can be converted into the improved Type 480 at little expense. We recommend that customers who wish to obtain the advantages of this design on their old equipments, purchase the necessary parts to make the change.

Each switch group should be changed over as a unit. Consult our district office salesmen for all particulars.

Westinghouse Electric & Manufacturing Company

East Pittsburgh, Pa.

Sole Offices in All Principal Cities of the United States and Foreign Countries



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It's Probably Original if It Hasn't Appeared in E. R. J.

A recent communication published in ELECTRIC RAILWAY JOURNAL contained the following statement:

"This plan is believed to be original with the writer. Steady reading of the ELECTRIC RAILWAY JOURNAL has failed to bring to his attention any such suggestion."

This expression, while naturally gratifying to the editors of this paper, is but one of the many expressions of the same kind we hear continually. It is as it should be, for unless the developments of the industry are pictured in the JOURNAL, the paper has failed to fulfill its purpose.

It is believed that with an efficient news-gathering system covering the United States and Canada, and foreign countries as well, little of importance escapes attention in its pages. This is the service this paper aims to give you—not occasionally, but every week.

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Circulation of this issue, 7,150



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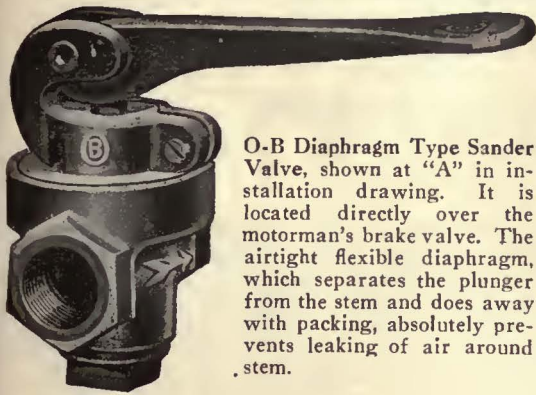
Use Westinghouse Varnish for all your dipping and baking requirements.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

*Sales Offices In All Principal Cities of the United States
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Westinghouse



O-B Diaphragm Type Sander Valve, shown at "A" in installation drawing. It is located directly over the motorman's brake valve. The airtight flexible diaphragm, which separates the plunger from the stem and does away with packing, absolutely prevents leaking of air around stem.



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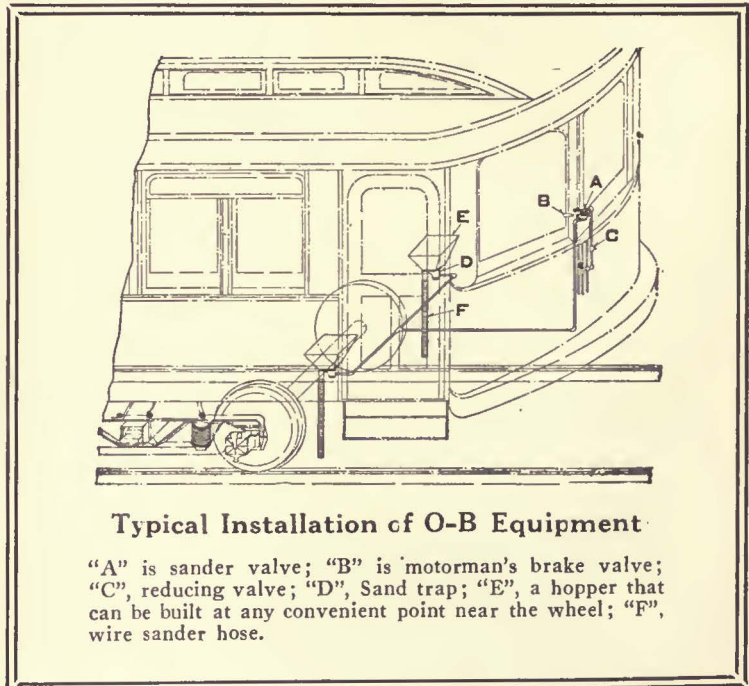
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"A" is sander valve; "B" is motorman's brake valve; "C", reducing valve; "D", Sand trap; "E", a hopper that can be built at any convenient point near the wheel; "F", wire sander hose.

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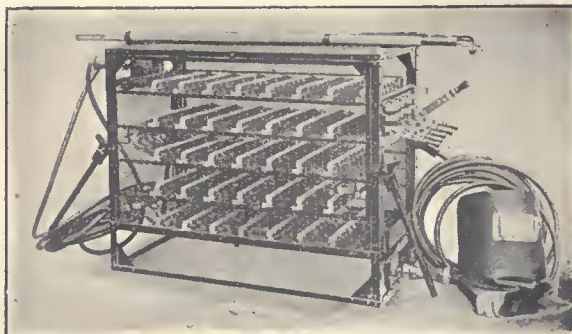
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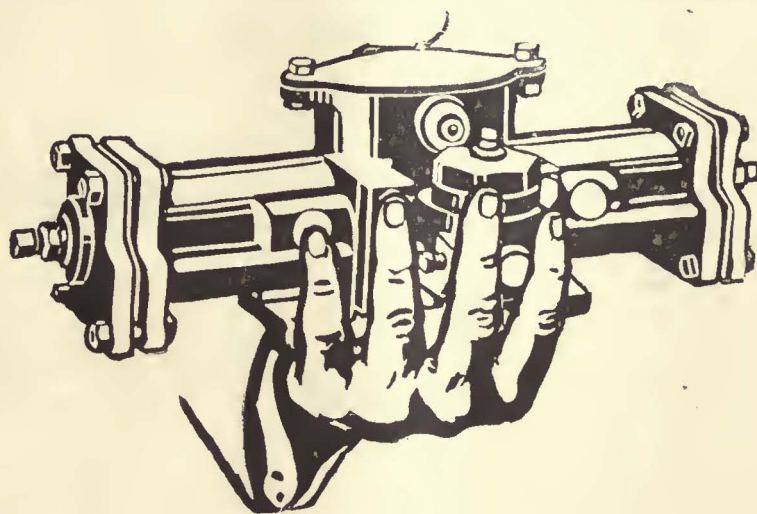
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Mr. Superintendent of Equipment

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- DOOR AND STEP CONTROL
- OPERATING MECHANISMS
- MOTORMAN'S SIGNAL LIGHTS

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All new cars are specified to have pneumatic door control, and existing cars are being equipped as expeditiously as possible. Why? Because pneumatic door operation has proven to be speedier—safer—and more economical in maintenance.

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Originators and Manufacturers

Principal Office: 50 Church Street, New York

Philadelphia—Colonial Trust Building Chicago—McCormick Building
Works—Rahway, New Jersey

Manufactured in Canada by Dominion Wheel & Foundry Co., Ltd., Toronto, Ont.



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- (B)—Thirty-five feet of water at our loading docks permit sea-going vessels or barges to be loaded and dispatched expeditiously.
- (C)—Freight rates and quickness of dispatch by sea or land (or both) are resultantly lower and quicker.

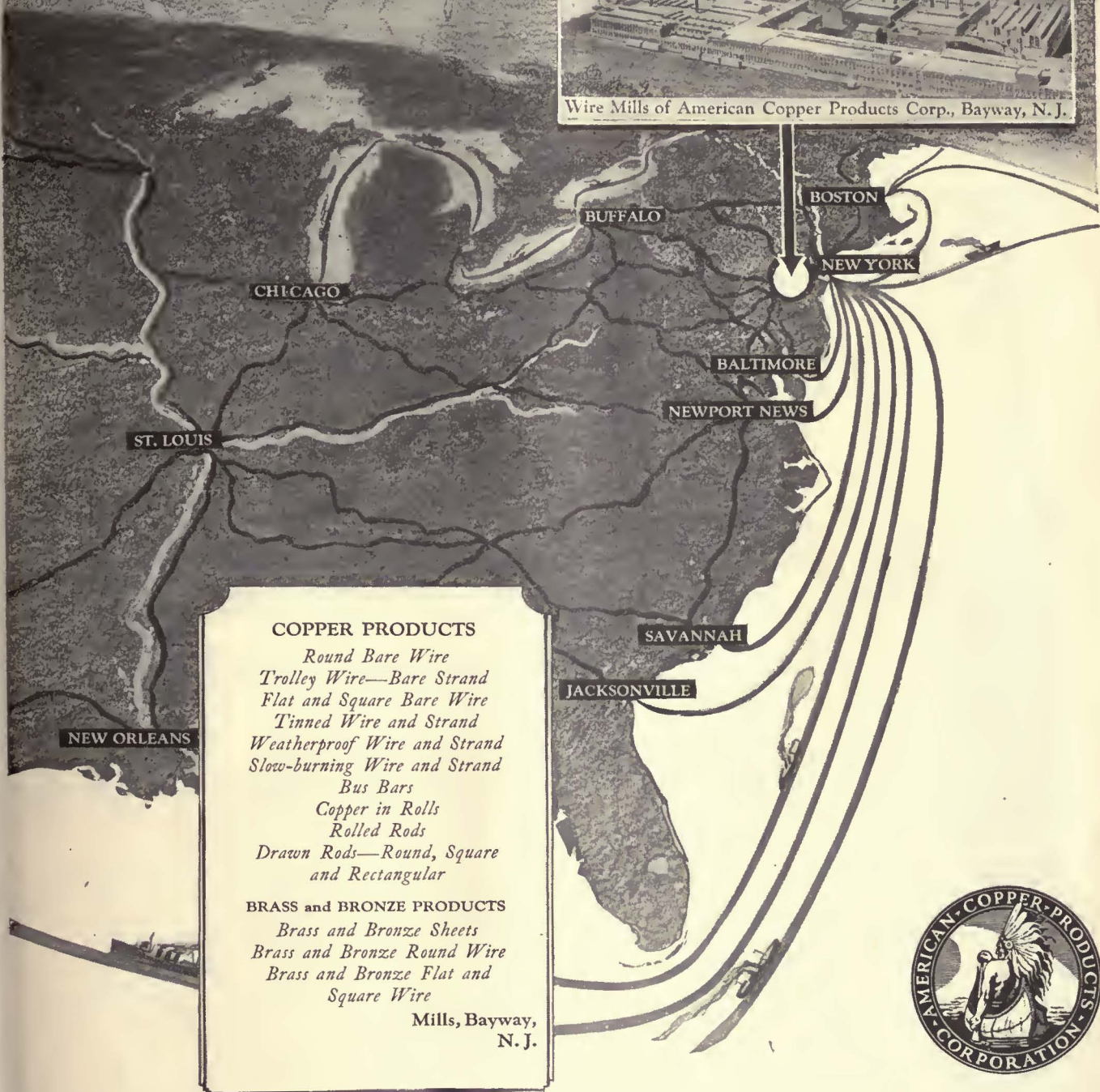
Cost of delivery and promptness of delivery, as affected by these facts, so often represent real purchasing economy, that they deserve equal consideration with price, quality and plant facilities on important orders for copper equipment.

We urge recognition of this fact upon all purchasers of copper wire.



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their importance to buyers of copper wire



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Drawn Rods—Round, Square and Rectangular

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Mills, Bayway, N. J.



AMERICAN COPPER PRODUCTS CORPORATION
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ELRECO POLES

Our patented "wire lock" swedge joint affords maximum strength

Tubular steel poles have long been recognized as superior in mechanical strength. The only shape that develops full strength in every direction is the circular tube.

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Furthermore, the edge of the outer tube at the joint is chamfered as shown, so there is no pocket to collect moisture or dirt, and start corrosion.

Elreco Tubular Steel Poles require practically no maintenance. There is no easier pole to paint.

ELRECO Combination Railway and Lighting POLES

Elreco Poles in combination with highly ornamented G.E. Novalux Lighting Units, are being widely used to replace unsightly wooden poles, to eliminate duplication of facilities and to reduce costs.

Lowest Cost

Least Maintenance

Lightest Weight

Greatest Adaptability

Electric Railway Equipment Co.
Cincinnati, Ohio

New York City, 30 Church Street



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NOW IN SERVICE ON MORE THAN 60 RAILWAY PROPERTIES



Longer Life **Less Weight**
Same Field Strength
Less Terminal Trouble
Quicker Conduction of Heat
Less Affected by Moisture

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Consider these long-life features in addition to that of saving half the weight of all the field coils of every car in many cases a weight reduction of more than 1000 lb.

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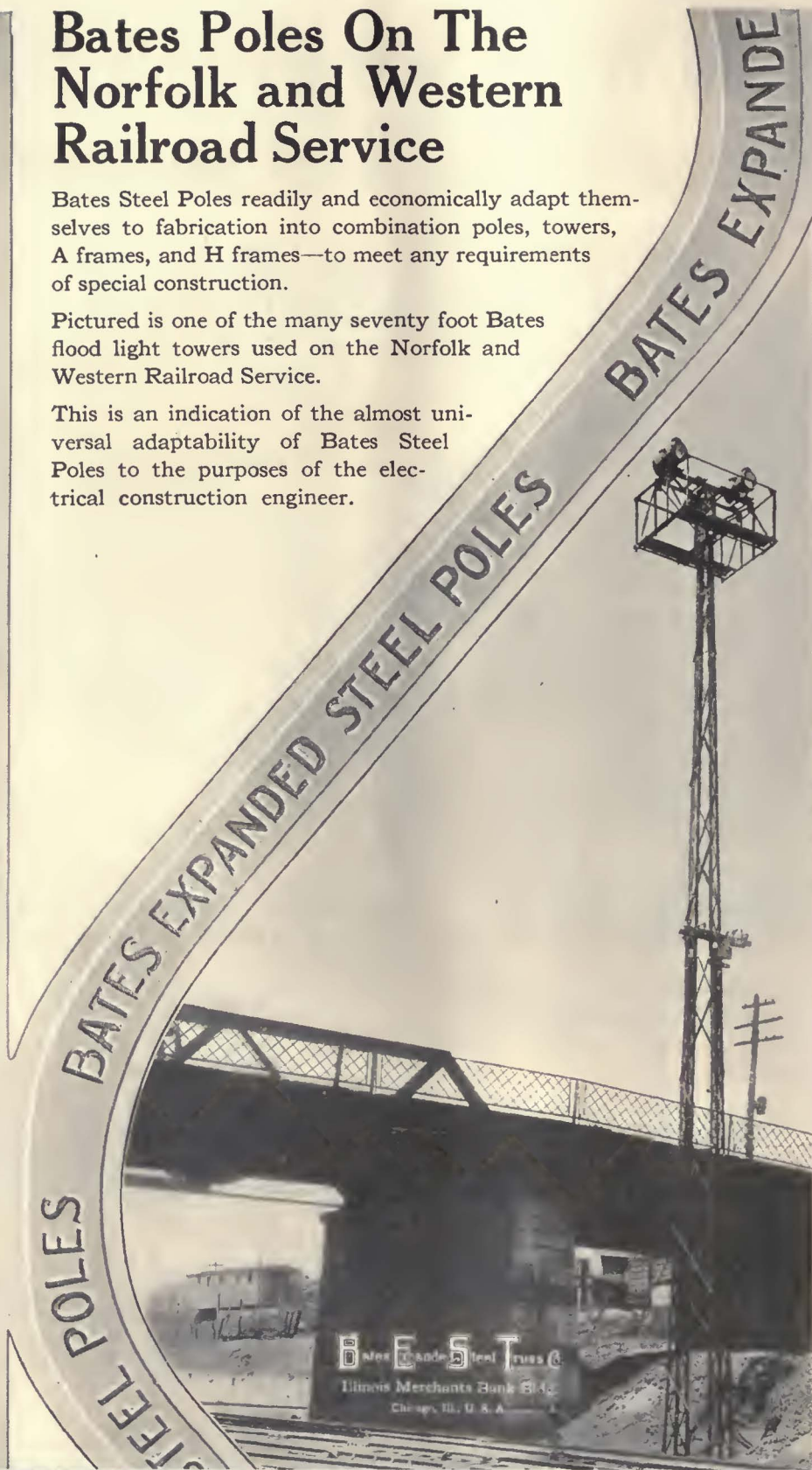
Ludwig Hommel & Co., Pittsburgh
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 Alfred Collyer & Co., Montreal, Quebec

Bates Poles On The Norfolk and Western Railroad Service

Bates Steel Poles readily and economically adapt themselves to fabrication into combination poles, towers, A frames, and H frames—to meet any requirements of special construction.

Pictured is one of the many seventy foot Bates flood light towers used on the Norfolk and Western Railroad Service.

This is an indication of the almost universal adaptability of Bates Steel Poles to the purposes of the electrical construction engineer.



BATES ONE PIECE EXPANDED STEEL POLES

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He had found fire-extinguishers hung here and there in anticipation of electric fires. But he had also found, practically unguarded, quantities of oil, paint, varnish, and other dangerous fire hazards.

"You are pretty well prepared against what you expect," he said, "but it is the *unexpected* fire that causes the most damage."

And then, through his knowledge of fire risks, he was able to outline a system that would protect that plant from fire of any kind.

This scientific service is now available to you

You can benefit by this expert counsel. It is available through the Foamite-Childs Corporation, a company whose business is the placing of the right kind of fire protection in the right place. A company that manufactures every type of chemical fire-extinguishing device and system, and can advise you without prejudice.

The men who represent Foamite-Childs Corporation include graduate engineers—fire protection specialists who have studied, experimented with, and subdued fire in all its manifestations. Their advice is always practical. They can design, install, and maintain protection that covers every fire emergency.

Saving to industry millions of dollars that formerly were lost

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Some of the actual extinguishing devices and means that Foamite-Childs men can supply, once your particular needs have been determined, are listed elsewhere on this page.



You can benefit by his counsel

FOR ELECTRICAL FIRES, the *Fire-Gun* is always efficient. Its non-conducting stream stifles combustion in live electrical equipment. Adopted as standard equipment by many leading railroads and public utilities. Widely used for protecting automobiles and trucks.

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WHILE FOR ORDINARY RISKS, *Foamite* equipment is the best protection. Where Soda-and-acid apparatus is selected, *Childs* extinguishers and engines have been standard for 27 years.

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Send for the free booklet, "The Essentials of Self-Protection Against Fire."

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UNA Rail Bonds



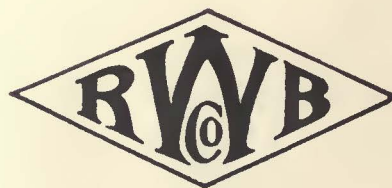
Exceptionally Simple Method of Welding

UNA Bonding is undoubtedly the easiest method of bonding which is extensively used. New operators without previous welding experience have readily learned to produce good welds by this simple welding process.

No preliminary grinding of the rails is necessary. To weld, the bond is placed in a mold against the rails, then with an electric arc UNA Metal (copper alloy) is melted into the mold and combined with the bond strands to form each finished head. Just as soon as the mold is full—which requires only about 30 seconds—the bond head is welded to the rail.

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Rail Welding & Bonding Company, Cleveland, Ohio

UNA Joints



Electric Railway Lubrication

From the very first day!

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And from the very first day these improvements become apparent. They continue with increasing force as the cumulative efforts of Galena Service have eradicated all faulty conditions and installed the oils and methods that have made the name GALENA synonymous with efficiency.

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*"When Galena Service goes in—
Lubrication troubles go out!"*



Galena-Signal Oil Company

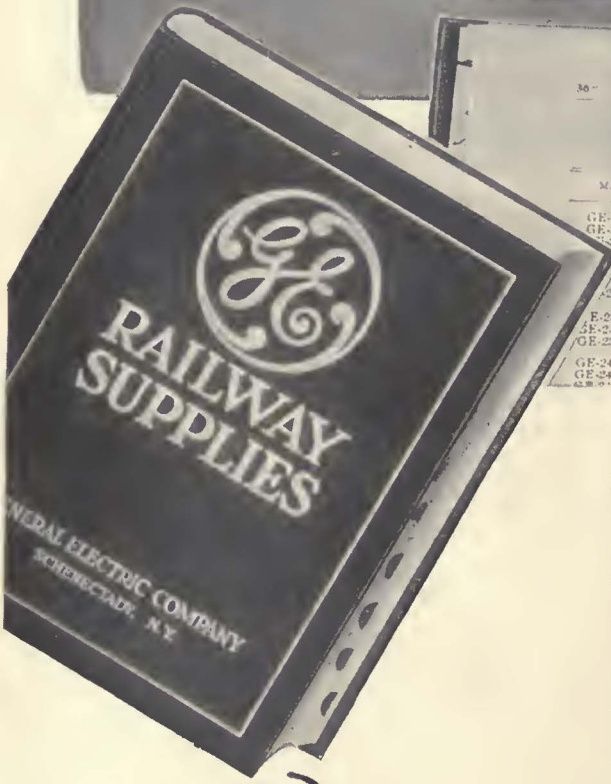
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30 - GENERAL ELECTRIC COMPANY

RAILWAY AND MINE HAULAGE MOTORS
ARMATURE COILS FOR TYPE GE MOTORS

Motor	Volts	Turns	Conductor	Cells in Set	Cat. No.	Net Wt. in Lb. per Set
GE-231	600	4	No. 11 B.W.G.	35	136001	75
GE-232	600 1200	3	No. 10 B.&S.	31	157090	57
GE-233	600	2	2 No. 10 B.&S.	29	157091	91
GE-234	600 1200	2	2 No. 13 B.W.G.	29	157092	86
GE-235	600	3	No. 11 B.W.G.	29	144377	64
GE-236	775	1	0.08 x 0.700 in.	37	* 157093	180
GE-237	750 1500	2	0.100 x 0.320 in.	39	157096	220
GE-238	600	3	No. 10 B.&S.	31	157097	60
GE-239	1200, 2400	2	2 No. 10 B.&S.	37	157098	209
GE-240	600	2	2 No. 9 B.&S.	29	177183	140
GE-241	600 1200	2	2 No. 9 B.&S.	29	164504	140

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One operator says: "G-E Coils couldn't be improved. So now they're packaged to guarantee original quality on the job."

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To get the same efficiency as from your original coils, to secure maximum armature life, and to insure satisfactory service from your G-E Motors you must rewind with G-E Armature Coils. Each is an exact duplicate of the other.

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your
Catalog

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Schenectady, N. Y.
Sales Offices in all Large Cities



GENERAL ELECTRIC

New York, Saturday, November 17, 1923

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*



Volume 62
Number 20

An Opportunity to Expedite Standardization of Car Parts

THE electric railway industry has had before it for a number of years the general subject of standardization. While the industry is generally agreed that this work is extremely important, it has not been so clear that there are several separate and distinct phases of it that must be treated from different angles.

A letter from the Division of Simplified Practice of the Department of Commerce, dealing with one important phase which has not been given much attention, was published on page 744 of the Oct. 27 issue of this paper. It refers particularly to the work of obtaining more uniformity in the many commonly used car parts which usually differ in some small ways as supplied by the different manufacturers or car builders. As expressed by this division of the Department of Commerce its co-operation with the railway industry would be more in the nature of clearing the field so real standardization could be more effectively and expeditiously accomplished. A review of present varieties of any one article or commodity and a determination of the relative demand for each variety usually suggests the elimination of a large number as being superfluous; and then agreement among manufacturers and users of that item to concentrate on the remaining varieties leads directly into the consideration of improved quality, performance and design of standards. Simplification is a necessary preliminary step in the campaign that is essential in order to carry out successfully any standardization program on a property, no matter of what size.

To obtain some concrete illustrations of the magnitude and importance of this subject a survey was recently made in one of the shop storerooms on a large railway property. The conditions on this particular property are far better than the average, due to the fact that the cars have been purchased in comparatively large groups, thus reducing the number of different groups and consequently the number of different sets of parts. In addition an active equipment engineering organization has been engaged for a number of years in a campaign of simplification which has in many instances materially reduced the number of different lots of parts required for purposes of maintaining the cars and equipment.

Even under these very favorable conditions many examples of the needs for simplification were apparent. There were eight different combinations of hand strap hangers and grips; five different types of bell cord pulley supports; a wide range of cupboard catches, latches, register mechanism fittings and hinges of various sizes for cabinets and folding doors; five different lots of rubber insulating bushings for lead outlets in motors, and various designs and sizes of motor lead terminals which required that sixty differ-

ent lots of made-up motor leads be carried in stock. Variations in the size and design of control resistors required eight different lots of mica insulating tubes, twelve lots of mica washers and a large number of different lengths and sizes of rods and frame parts. Many examples of special parts which were required in comparatively small quantities but of many different varieties were found. In most cases these parts must be manufactured to order from samples and the problem of keeping a supply of parts on hand is a serious one. Switches, fuse blocks and boxes for auxiliary circuits were stocked in a large range of varieties. Electric heaters of approximately the same capacity per unit were constructed and rated in so many ways that twenty different types of coils were carried in stock. Even then a still larger variety were being wound to order as required. There were six different sizes and types of truck turnbuckle castings and forty different lots of grab-handle castings. The number of lots of corresponding parts for door and step mechanisms roughly coincided with the number of groups of cars on the property. There were forty different types or sizes of motor and gear case oil box covers, nine types of sand hose supports and an extremely wide variety of seat parts and fittings.

These are merely a few examples illustrating a condition which is rather difficult to visualize. But the above description is only the operating side of the general picture, and is taken in one storeroom supplying only a portion of one property that may be said to represent one of the best situations that could be found. Apply these facts to a property whose cars have been purchased in many small lots and then multiply by the number of different railways and we begin to get a view of the manufacturing side of the picture. The net results of the condition are needlessly high prices for parts, high costs of maintenance, high investment in stores and high expense of stores keeping.

Judging by the success the Division of Simplified Practice has had along these lines in other branches of industry, the JOURNAL believes that the American Electric Railway Engineering Association might well give serious consideration to some plan for securing co-operation of the various interests in the electric railway field.

Maintenance Ideas Should Be Put to Work

TRIPS made about the country by the editors of this paper, visiting many electric railways, disclose great variations in the methods of doing maintenance work of substantially the same character. While all of the practices may produce results that are satisfactory, in so far as they keep the property in fair

operating condition, it is quite noticeable that there is a great difference in the relative efficiency of the various methods. This applies to shop, track and line with about equal emphasis.

The good old term "local conditions" used to be brought forward regularly as an alibi for retaining some backward practice. The term is not heard so frequently now, probably because of the ridicule bestowed upon it. The excuse now used is the lack of money to purchase new and improved shop and construction equipment.

This paper is devoting considerable space, and much thought and effort, to the work of bringing to the attention of maintenance men throughout the industry the best of the methods that have been devised by progressive executives and workmen. Fortunately, many of the methods cost little to install, while they produce excellent results. But of how many of these improvements has your shop taken advantage? And how many maintenance articles have given you ideas for still better methods than those described? And have these ideas been carried out?

It would be well for the maintenance men to check up and see if everything possible has been done to improve the methods in use, keeping in mind that an improvement in the standards of maintenance usually results in an ultimate reduction of costs. In the meantime the transportation department has had the advantage of better tools to work with, and the public, in its turn, undoubtedly has reflected its approval in greater patronage of the cars.

Is Enamel Better than Varnish for the Car Interior?

AN INTERESTING speculation aroused by the exhibits of the paint manufacturers at the recent convention at Atlantic City concerns the value of enamel as a substitute for varnish in repainting of cars. Every electric railway man is familiar with the difficulty of making old and battered woodwork in the car interior fresh and clean looking when the car is renovated. It is a comparatively simple matter to repaint the metal parts, both inside and out, and give them a luster equal to the original appearance when first they came from the car builders. But the problem is not so simple with the woodwork. Inevitably, this becomes dingy with age, battered by the carelessness of trainmen and passengers and otherwise defaced. No matter how carefully the varnish is removed and the new applied, it is impossible to restore the original freshness of the material. Moreover, varnish removal and sandpapering is an expensive process. Many railways simply varnish over whatever dirt is on the wood. In the course of time, by this process, a thick coating of varnish accumulates and acts as a lens to magnify the underlying defacement.

The use of a solid color enamel is being tried to overcome the difficulty. This is in line with the practice on many steam roads, although in the case of their more modern cars, there is likely to be less wood trimming in the interior. That, however, is a minor difference and in no way affects the general principle. By simply smoothing down the surface of the wood and then covering it with a coating of solid color enamel of some dark color, such as maroon, the majority of the blemishes in the woodwork are entirely concealed. In

order to relieve the monotony resulting from the use of a solid color, railways which have adopted this method of repainting the car interior apply a little hand striping and trimming.

It is perhaps too early to reach any definite conclusions of the value of this treatment of defaced woodwork in electric railway cars. So far it has been tried only on a comparatively few properties. But it seems nevertheless that there are a number of advantages in the methods and that it deserves careful consideration when any extensive program of car renovation is contemplated.

Co-ordinating Motor Drives for Efficient Shop Work

ELECTRIC railway shops still furnish many conspicuous illustrations of the obsolete plan of group driving of machine tools. The life and service obtained from many of the motors have been so satisfactory that in many shops the replacement of these with more modern equipment having individual motor drive has lagged far behind the advance of engineering design. Power has often been looked upon by railway shopmen as too cheap a commodity to worry about, and the need of getting along in so many cases with old shops and equipment has also precluded systematic improvement of motor drives.

But repair shops that have modernized their drives have reaped the reward of their progressiveness. Elsewhere in this issue are presented views of individual motor installations in the Chelsea shops of the Eastern Massachusetts Street Railway, and the reader who sees beyond the machine "close-up" in these pictures will be impressed with the general value of independent tool operation. Clearer working spaces, more compact tool areas, increased safety to employees, a lighter shop, more flexible use of tools and power conservation, all follow the banner of the individual motor drive into the zone of more efficient shop service.

One word of caution should be sounded in regard to shop electrification, and this warning is an economic one. New machine tools with motors especially designed for them may prove more economical, production considered, than remodeling the drive for the present tools. Within recent years machine tool and motor manufacturers have been drawing closer together in mutual design work, so that today a wide range of high-grade machine tools admirably equipped electrically is available for great varieties of shop operating. The master mechanic confronted with the problem of modernizing his shop drives will thus do well to study the new designs and costs of available unit tools built for high efficiency service on self-contained motor drive basis.

He may find, in this case or that, lower total costs by adapting existing tools and motors to mutually co-ordinated service; but he is more likely to discover that the economic solution is to buy entirely new equipment. General purpose motors can be applied with much success to constant-speed tool driving, and the skillful use of angle-iron and other metal shapes in making up motor mountings often solves a most difficult appearing problem in tool powering. The whole question of how best to drive shop tools is a very important one and examples like those pictured from Chelsea are full of suggestions that will make their appeal to the discerning mechanical eye.

Machines Facilitate Track Zone Pavement

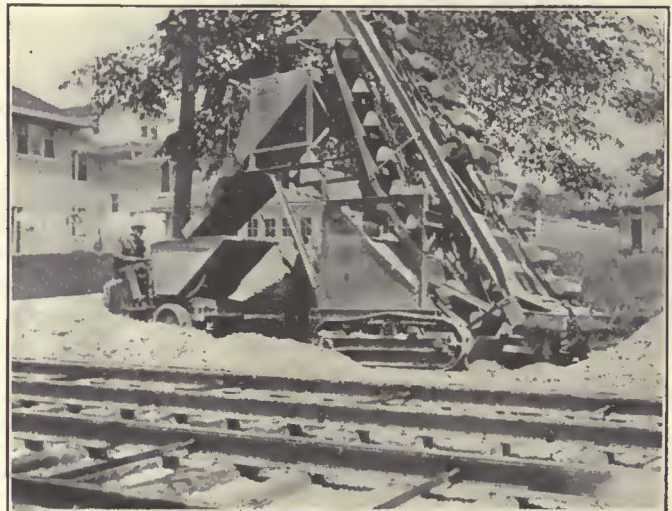
Distribution of Material to Make Convenient Its Delivery to Concrete Mixer and the Use of Loaders and Tractors Have Helped the Milwaukee Electric Railway & Light Company to Get Good Results in Track Paving and Lower the Cost

THE way and structure department of the Milwaukee Electric Railway & Light Company has been paying particular attention to the development of methods and devices for dispensing with hand labor to the fullest possible extent in track and paving work. A recent improvement in this direction is the application of labor-saving equipment to the track zone paving operation.

With the increasing use of concrete pavement the company made a study to find the most economical scheme of placing the material for the construction. The amount of material necessary for pouring a particular stretch of track is figured out beforehand and the materials are apportioned and placed on the adjoining pavement by means of steel Differential dump cars.

and the tractor proceeds to the sand loader, where it receives its proper measure of sand. Having thus received a charge for a complete mix, the tractor proceeds to the mixer and dumps its load into the elevating skip. A layout of this nature results in the cement being sandwiched between the two heavier materials, eliminating to a great extent the cement dust usually experienced when dumping into the mixer. A 21-cu-ft. motor-driven Chain Belt Company concrete mixer of the latest type, mounted on rubber-tired wheels, is used for preparing the aggregate. The mixture is made fairly dry and is placed on the roadbed by means of a bucket traveling on the mixer boom.

Leaving the mixer, the concrete, which is of 1:2:3½ mix of a dry consistency, is hand-tamped and shoveled



Left—Material Distribution and Equipment Arrangement for Concrete Paving Work in Milwaukee. In the Foreground Is the Crushed Stone and Loader; Beyond the Cement Is Piled; then the Sand and Sand Loader, and in the Background the Concrete Mixer. Right—Truck Tractor Receiving Measure of Gravel at Loader

Alternate piles of sand and gravel are supplied, starting 200 ft. from the mixer, in such quantities that each pile provides sufficient material for 100 ft. of pavement. As an example, a particular stretch of track under construction required 22 yd. of sand, 38 yd. of gravel, 290 bags of cement per 100 ft. and a series of unit supplies of these amounts of materials were placed the entire length of the new construction.

The materials are taken up from the street and placed in measuring hoppers, by means of Barber-Greene loaders, and conveyed from the hoppers to the concrete mixer in Clark 1-yd. capacity truck tractors, two loaders and three truck tractors being used on a job. In order to obtain the proper mix and get the most efficient pick-up of materials the mixer is set nearest the sand pile with its conveyor, while the adjoining gravel pile and its conveyor are a little further away from the mixer, with the cement in sacks piled at convenient intervals along the curb midway between the two conveyors.

The procedure is for a truck tractor first to secure its load of gravel. Cement then is placed on the gravel

into the crevices around the rails and ties. The first layer of concrete is placed to within 2½ in. of the finished top for a distance of about 30 ft. Wire mesh reinforcement is then rolled out into place and the mixer backs up and places the 2½-in. finish surface. The steel tie rods, in general, serve as forms to gage the height of the first level of concrete and act in a way as reinforcing bars, the wire mesh being laid on top of the tie rods. American Steel & Wire Company's 0.058 steel mesh is used for the reinforcement.

The flangeways along the gage side of the rail are formed by laying metal-protected beveled wood strips of the proper shape, which are left in place until the finishing work is well under way. A design is being worked out for a finishing machine which will strike off the concrete, tamp, finish and form the grooves all at the same time. This will still further eliminate hand labor. The curing of the concrete is accomplished by placing a layer of sand over the finished surface and keeping this wet for several days. More recently the company has been trying out the use of a silicate of soda solution for curing, apparently with good results.



Left—Concrete Mixer in Working Position Ready to Receive Charge. Right—Special Forms Used Where Granite Header Blocks Are Employed for Flangeways

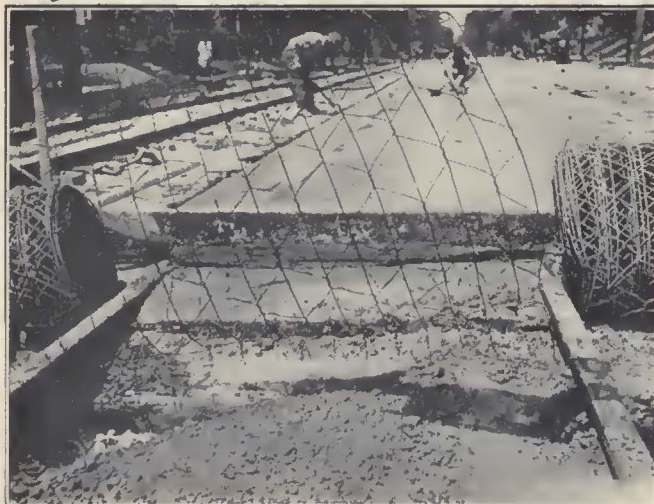
The track being laid in Milwaukee is of the rock ballast type, having 8 in. of mechanically tamped rock ballast under the ties and sufficient ballast between ties to bring it up to within $2\frac{1}{2}$ in. of the top surface. A $7\frac{1}{2}$ -in. 102-lb. plain girder rail, Lorain section No. 516, is carried on 6 x 8-in. x 7-ft. hewn yellow pine ties spaced at 24-in. centers. A shoulder tieplate is used and $\frac{1}{2}$ -in. screw spikes. Steel tie rods are placed every 6 ft. and serve to maintain the gage as well as reinforce the concrete. For ordinary street crossings, the 4-in. sloping flangeway provides a not objectionable crossing for vehicular traffic. However, at boulevard intersections a granite header is used which has a 2-in. flangeway cut in one corner the depth of the rail head. Suitable wooden forms are provided in a special case of this kind to prevent the concrete being carried up against the rail. These are constructed of 1-in. material braced every few feet. The rock ballast is excavated a few inches between the ties at the point where the granite header is to be placed in order that a 6-in. thick concrete base may be provided for the header. In the case of a certain boulevard, 150 ft. of granite headers were required per rail. This portion of the work requires an extra amount of time and labor, but is encountered at only a few points in the city.

Thermit welded joints are used, a portable track grinder being used to smooth the surfaces.

In general, the concrete paving gang consists of twenty-three men, including equipment operators, working nine hours per day. Approximately 500 sq.yd. of concrete pavement is laid and finished per day. It is expected, through the substitution of additional equipment as described above, further to reduce the man-hours on this class of work.

The Milwaukee company was at first reluctant to adopt concrete as a substitute for stone blocks for track zone pavement, due to the difficulty of opening up concrete pavement when track repairs are needed. With the development of the use of air tools and air equipment, however, the difficulties of making repairs in concrete pavement became less, so in 1919 the company laid its first experimental sections of concrete pavement. This was found to be satisfactory in every way and met with the approval of the municipal authorities wherever tried out. So the use of concrete pavement has been greatly extended since that time. During the season of 1923 approximately 50,000 sq.yd. will have been laid, forming about 70 per cent of the track zone paving work done by the company in that period. At the end of 1923 about 18 per cent of all track zone pavement in Milwaukee will be concrete.

The company is also laying this year certain experimental sections of pavement finished with the so-called "Vitrolithic" process to test out this pavement in comparison with the reinforced concrete.



Left—Wire Mesh Reinforcing Placed $2\frac{1}{2}$ In. Below Finished Surface. Right—Track Construction; Note Wood Ties, Tie Rods, Rock Ballast and Track Drain. A Temporary Track Is Laid at One Side to Carry Traffic Past the Construction Work

Wheel, Gear and Axle Practice—III

Grinding of Chilled Wheels Done by Pit and Floor Grinders and Abrasive Brakeshoes—
Gaging of Wheels for Wear and Rotundity Important—Proper Inspection
Insures Removal of Axles Before Failures—Axles Are
Straightened by Hot or Cold Processes

PREVIOUS articles in this series giving information obtained from a survey of the wheel, gear and axle practice in use at sixty representative railway shops were published in the *ELECTRIC RAILWAY JOURNAL* for Aug. 18 and Oct. 27, 1923. Information has been given in regard to mileage obtained, conditions that limit life, methods used to increase mileage, shop arrangement, storage, and method of handling material to and from machines. In this, the third and last article of the survey, the maintenance of chilled iron wheels is discussed, together with maintenance methods and machines used for axle work.

Gaging Wheels in a 300-Ton Hydraulic Wheel Press at the Sullivan Square Shop of the Boston Elevated Railway



OF THE SIXTY electric railways from which information was obtained by personal visits in making this survey, approximately half were using chilled-iron wheels. Ten companies were using both steel and chilled-iron wheels. The most of these used steel wheels in interurban service and iron wheels in city service.

One of the principal differences in shop equipment, where chilled-iron wheels are used exclusively, is that a wheel lathe is not required, as the general practice is to grind the iron wheels. The methods and equipment used for grinding can be divided into three classes: First, where a pit grinder is used; second, where the equipment consists of a floor-type grinder, and third, where wheel-truing brakeshoes are used. In the information collected regarding methods of grinding wheels, the three types were used about equally.

RELATIVE ADVANTAGES OF WHEEL GRINDING METHODS

A canvass was made to obtain information on the relative advantages of the three methods of grinding wheels, and opinions as to when the purchase of a wheel grinder would be warranted. The majority of master mechanics seem to think that on roads having 100 pairs or more of cast-iron wheels the economies obtained would pay interest on the investment in a grinder. Individual opinions varied, however, from a minimum of fifty pairs of wheels to a maximum of 500 pairs. Of course, wheel grinders are obtainable at various prices, depending upon the degree of efficiency, and a selection should be made so as to purchase

a grinder commensurate with the actual requirements of the railway.

Electric railways using wheel-truing brakeshoes are obtaining very beneficial results, particularly where the flat spots are small. The great advantage in their use is that the wheels are ground without removing cars from service. It appears, however, that large flat spots cannot be ground out satisfactorily with this method, and some master mechanics have complained about the attention necessary to compensate for the increased coefficient of friction, lest additional flat spots develop. They also find that wheel-truing brakeshoes do not leave the wheels concentric with the journal and that the method is slow as compared to pit or floor type grinders. Several master mechanics stated that they would not know how to handle the flat wheel situation, particularly in winter months, without the use of these shoes.

The main advantage of the pit grinder as compared with the floor-type grinder lies in the saving of expense in jacking up cars, removing and replacing wheels, and handling wheels in and out of the grinder. There is also a reduction in time that the car is withheld from service. Some of the disadvantages given are that the pit grinder does not produce as satisfactory a job as the floor-type grinder, that the wheel treads are not ground concentric with journals and that the driving machinery is in the way of pit work.

The question of the rigidity of the grinder has quite an important bearing upon the results obtained. Some master mechanics feel that a sufficiently rigid con-

struction could not be obtained from a pit grinder and for that reason the floor-type grinder is best. Many roads grind their wheels before placing them in service, and of course in this case the floor-type grinder is of advantage.

The opinions expressed by some of the men responsible for wheel maintenance are of interest. F. P. Maize, master mechanic of the Portland Railway, Light & Power Company, Portland, Ore., uses pit grinders, as he found it impossible to grind out flat spots successfully with abrasive brakeshoes. This road has a large number of steep grades and as a result considerable trouble is experienced from flat spots. Mr. Maize felt that the advantages of a pit wheel grinder lie in the fact that the wheels do not have to be removed from the car in order to grind them, and there is less expense from changing wheels and less delay in returning the cars to service.

Shop men at Norfolk, Va., find the use of grinders for establishing the rotundity of cast-iron wheels more

then be ground in the shop grinder at most convenient and economical times. Roads having a large number of cast-iron wheels can use this method to particular advantage, as the grinders can be kept in use almost continuously.

The Portland Railway, Light & Power Company uses pit and floor type grinders. Wheels are ordinarily ground with the pit grinders after about 5,000 miles of service, and as the cast-iron wheels average 60,000 miles, each wheel will normally be ground twelve times during its life. The floor type grinder is used for grinding wheels which are out of service and for grinding wheels mated on the same axle.

INSPECTION AND GAGING OF WHEELS

The American Electric Railway Engineering Association has standards for wheel mounting and track gages as well as plain and rotundity gages for steel wheels. Most electric railways use these standards or a modification of them to suit their particular condition. The standard gage is provided with a pointer for the center line of the axle, so that wheels are located from this center line as well as being located the proper distance apart. Several roads use the "back to back" method for gaging the wheels, in which the distance between the inner faces is determined with a pin gage. They report that this proves entirely satisfactory on their particular railways.

In general wheels are inspected at the same time as other parts of the car equipment. Some roads rely upon the judgment of the man making the inspection as to whether wheels require grinding or turning. Most roads, however, provide their shop men with standard wheel gages giving the proper contour for flange treads, and these are used on regular inspection. Where improper wear occurs, attempts are made to correct it. Methods of doing this were discussed in the first article of this series, which was printed in the Aug. 18 issue.

The British Columbia Electric Railway, Vancouver, B. C., which uses steel wheels exclusively, has an inspector who goes from carhouse to carhouse inspecting wheels. The plan of the company is to have wheels watched so closely that it is never necessary to shop a car for wheels alone. The company finds that by proper attention the work can be done at times when the car is in for regular overhauling, which comes about six times in the life of a steel wheel. Occasionally a new wheel is run beyond its time limit and then is scrapped as under diameter, rather than to shop the car just to save the wheel. Standard gages are used and the spacing of wheels is checked at four places on the rim and hub.

The Kansas City Railways reports that its practice in connection with steel wheels is to gage the contour and flange of the wheels with templets. The minimum thickness of flange allowed is 1 1/8 in., and 3/8 in. the maximum tread wear. With a wide tread wheel in city service, the tread becomes concave or what is commonly termed rail worn. Wheels are carefully inspected and finally passed upon as to whether they are to be scrapped or reclaimed by the foreman in charge of the wheel shop.

The operating companies in Brooklyn, N. Y., are using an automatic device to indicate when wheels are worn to their minimum diameter. On account of unusual conditions of the elevated lines, the underneath clearances between bottoms of gear cases and motor

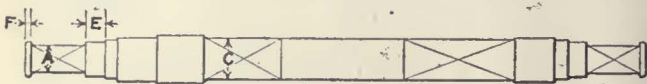


Table of New and Scrapping Dimensions Convenient for Shop Use

Nominal Diameter of Axle	A Journal Diameters		C Motor Journal Diameters		E Width of Dust Collar		F Width of End Collar	
	New	Scrapping	New	Scrapping	New	Scrapping	New	Scrapping
6 1/2 in.	5 in.	4 1/2 in.	6 1/2 in.	6 1/2 in.	2 in.	1 1/2 in.	3 in.	3 in.
6 1/2 in.	5 in.	4 1/2 in.	6 1/2 in.	6 1/2 in.	2 in.	1 1/2 in.	...	...
5 1/2 in.	5 in.	4 1/2 in.	...	...	2 in.	1 1/2 in.	...	...
5 1/2 in.	4 1/2 in.	3 3/4 in.	...	...	2 1/2 in.	2 1/2 in.	...	...
6 in.	4 1/2 in.	3 3/4 in.	6 in.	5 1/2 in.	2 1/2 in.	2 1/2 in.	...	...
6 in.	4 1/2 in.	3 3/4 in.	6 in.	5 1/2 in.	2 in.	1 1/2 in.	...	...
5 3/4 in.	4 1/2 in.	3 3/4 in.	...	...	2 in.	1 1/2 in.	...	...
5 in.	4 in.	3 1/2 in.	5 in.	4 1/2 in.	2 1/2 in.	2 1/2 in.	...	...
5 1/2 in.	4 1/2 in.	3 3/4 in.	5 1/2 in.	5 1/2 in.	2 in.	1 1/2 in.	...	...
5 1/2 in.	4 1/2 in.	3 3/4 in.	5 1/2 in.	5 1/2 in.	2 in.	1 1/2 in.	...	...
4 1/2 in.	3 1/2 in.	3 in.	...	...	1 3/4 in.	1 3/4 in.	...	...
6 1/2 in.	5 1/2 in.	5 1/2 in.	6 1/2 in.	6 1/2 in.	2 in.	1 1/2 in.	...	...

satisfactory than the use of wheel-truing brakeshoes. With the wheel grinder, the character of the work is absolutely predetermined, and it can be turned out in its most efficient manner. Good results are obtained from wheel-truing brakeshoes if they are watched carefully, and their particular advantage is on roads which are not provided with wheel grinders. At Norfolk, where special shoes are installed in place of the regular shoes for the purpose of grinding out flat spots, particular regard is given to the increased coefficient of friction and the brake leverage is proportioned accordingly. The floor type of grinder is favored at Norfolk, due to its convenience for handling the initial grinding of new wheels prior to their installation. With the shop grinder any number of cars may be jacked up at one time and the wheels of these cars ground more rapidly and slightly more accurately than with the pit grinder, while with the latter a car must be shifted and a new car run in place before additional wheels can be ground.

An important adjunct in connection with any wheel grinder is some provision for removing or caring for the dust removed from the wheels. Several railways are using an exhaust ventilating system to good advantage. This improves working conditions considerably, so that the job does not become so annoying or unfavorable for the workmen.

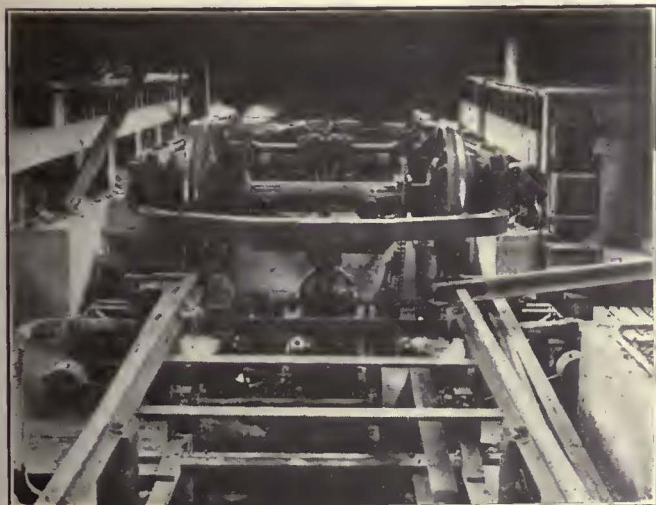
Some shops find economy in keeping a number of spare axles with wheels mounted, and replace any defective wheels immediately. The defective wheels can



Grinding Out Flat Spots at the Sullivan Square Shop of the Boston Elevated Railway

shells and the top of switch housings, as well as other special trackwork, are very scant. Maximum permissible clearances were determined from a careful study made by all departments concerned, and from this the diameters for wheel removal were specified. In order to simplify the work of checking and seeing that wheels are not allowed to wear beyond these limits, electrical telltales are installed at the head of each track in the three elevated inspection shops. Every car, on entering or leaving the inspection shop, must pass over these telltales. If the predetermined clearances for the motors and gear cases are not present, a bell is automatically rung. As the cars are ordinarily run over the pit made up in trains, the location of the exact part of the particular car which caused the action of the telltale is essential. To accomplish this, the tops of the telltales are whitewashed, and if a motor case strikes the top of this a portion of the whitewash remains on it so as to show readily on inspection.

An engineer of a large company manufacturing car wheels, who considers the gaging of wheels very important; considers the only proper way to gage a wheel is from the throat side of one flange to the back of the mate flange. Where the throat side of the flange is against the head of the outside rail of a curve or a frog, the back of the mate wheel should touch the guard rail.



Novel Type of Pit Grinder. Wheels Are Driven from Motor Located in Pit Through Chain and Sprocket

If wheels are so gaged it is stated that a much better flange can be worked out than can be obtained by gaging from the throat of one wheel to the throat of the mate.

HOLLOW TREADS ARE OBJECTIONABLE

In gaging wheels some roads have a practice of measuring the amount that the wheel is worn hollow, but this practice is not very generally used. The reason for measuring the hollow wear is that when a wheel is sufficiently worn to allow the rim to project below the top of the rail, it is likely to receive blows from frogs and crossings. When the flange becomes so high that the apex is likely to strike the bottom of flangeways, it should be removed from service. Wheels that are excessively hollow are likely to damage tracks and crossings on account of the overhanging rim and of the high flange, which causes excessive pounding and rapid deterioration of the track at these points. Hollow wear is usually caused by running wheels which are wider than the top of the rail. Of course, if the rail were wide enough to cover the whole wheel tread, the wear should continue evenly.

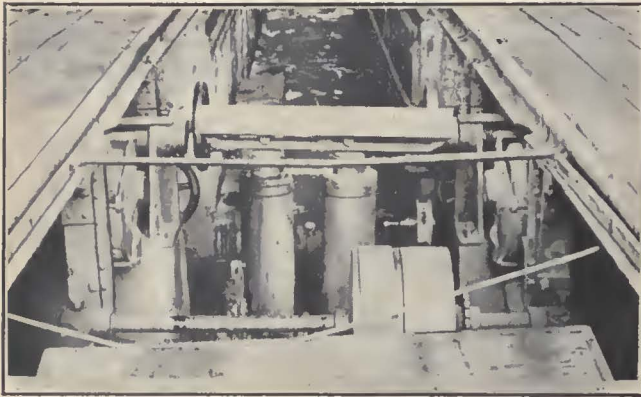
In regard to the amount that a wheel can be worn hollow, the M.C.B. Association proceedings for 1905 recommend that wheels be allowed to wear down $\frac{3}{8}$ in. before they are condemned unless worn through the chill. Wheels originally having the ordinary taper can be worn $\frac{3}{8}$ in. from the original contour at the throat before they can become worn $\frac{1}{8}$ in. hollow. It is also evident that if the rim wears down, a total of more than $\frac{3}{8}$ in. can be secured before the wheel is worn sufficiently to condemn it. It is also possible to modify the taper and especially the drop-off taper in such a manner that more than $\frac{3}{8}$ in. wear can be secured before the wheel is $\frac{1}{8}$ in. hollow.

A peculiar case of trouble from wheels wearing hollow was noted on one electric railway some time ago. This company used T-rails in open track construction, and laminated bonds soldered to the rail head were installed. Only a short time after the bonding was completed it was found that nearly all of the bonds were torn off or loosened. Investigation showed that this was caused by a wheel operating over the line whose tread was worn concave to such an extent that its outside portion struck the tops of the bonds and broke them off so that replacement was necessary.

RAILWAY AXLE PRACTICE

One of the chief problems in connection with electric railway axles is to determine when they have reached the end of their useful life. The principal reasons for removal are excessive wear and the occurrence of cracks or breaks. A few electric railways that are operating high-speed service are removing axles after they have reached a certain mileage limit regardless of appearance on inspection, experience having shown that axle breakage is most frequent after this point has been reached.

The British Columbia Electric Railway, Vancouver, B. C., has a practice of scrapping all axles when they have been in service for 250,000 miles. This company finds that proper inspection and tests for flaws or cracks cannot be made without removing the wheels expressly for that purpose. An epidemic of axle failures last year was traced to some tight gage track. This narrowing of the gage was caused by the swelling of wood

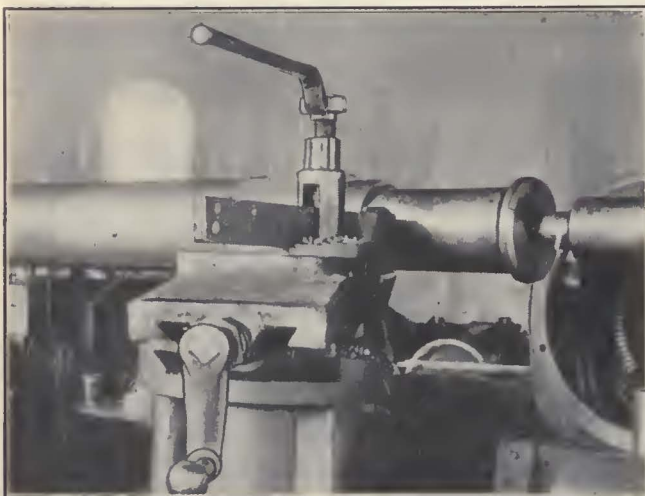


Flat Wheel Grinder Used In the Shop of the Des Moines City Railway

block paving on a bridge over which the cars operated. New axles are now being provided with reinforced wheel seats, and it is expected that a considerable improvement will result. Experiments made by this company with nickel-steel axles did not produce good results, although this steel had a higher tensile strength. It did not resist the effect of fatigue as well as the heat-treated axle ordinarily used. Many axle breaks were found to start at the corner of the keyway at the base of the drilled hole made to start the keyway cut. This has led to a change in the practice of cutting keyways, so that they are now milled at the end instead of being drilled.

The Puget Sound Electric Railway, Tacoma, Wash., stamps on the end of each axle the date that it is placed in service. After four years of service, all interurban axles are removed and annealed, regardless of the mileage which they have made. Careful inspection is made of wear and tests are made for flaws. Most of the broken axles on this system have occurred close to the wheel. The fillet at this point is tested for flaws or cracks by gouging up a groove in the fillet with a small diamond pointed chisel. If it traverses a flaw a square chip will be thrown off.

On the Portland Railway, Light & Power Company, Portland, Ore., when axle cracks are discovered in an incipient stage by a test, an attempt is made to turn the axle down below the depth of the crack. If this proves feasible, the roughly turned axle is annealed



Rolling an Axle Bearing Fit on Shaft in the Shop of the Chicago, Lake Shore & South Bend Railway

and is afterward finished by further turning to a smaller diameter.

Many electric railways specify a wear allowance, and axles are either scrapped or turned down to smaller diameters when this wear has been reached. Twenty railways reported using this system, the wear allowances varying from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. of diameter of bearing fit. An accompanying illustration shows the form of instructions which are sent to shops in Brooklyn for scrapping axles or removal for turning to smaller sizes.

Several electric railways report that they are following the rules of the Master Car Builders' Association. Rule 22 requires that axles broken or having seamy or pitted journals, fillets in the back shoulder worn out, or collars broken off or worn to $\frac{1}{4}$ in. or less, should be removed. Rule 23 prescribes limit of wear for different sized axles, and rule 24 provides for the removal of axles with cut journals, bent axles, or axles rendered unsafe by unfair usage, derailment or accident.

ROUGH MACHINING CAUSES AXLE FAILURES

Axles are usually received in the rough state from the manufacturers and are finish-turned in the railway company's shops. Careful machining is most essential, as many failures have been traced to bad machining. The radii of fillets should be maintained accurately, as a sharp corner or tool marks may defeat all the care used in the design and preparation of the axle. A roughly turned axle may be compared to a threaded bolt, the length and thickness of the thread being dependent upon the cut and speed used in the lathe operation. The lathe tool shears small particles of the material, so that a turned axle is in reality a sheared surface, from which small particles of steel have been torn away. Small gaps in the material are caused by the edges of the tool pushing away the layer of steel. When the distorted steel breaks, additional gaps are formed. These gaps lie along the axle, and in general across the direction in which the axle will be bent in service. The grooves lie in the direct line in which fracture is most likely to occur under working stress. Car axles, to give the best service, should have smoothly ground surfaces and be free from sharp angles and accidental notches or dents. Most electric railways know that the manufacturer is not responsible for all the ills which may occur to an axle, that careful machining after it is received is quite essential, and finally that periodical inspection of axles in service is most important.

TESTING AXLES FOR CRACKS

The general practice used by electric railways in testing axles for cracks is first to place the axle in a lathe and rotate it so that its trueness can be determined. After this a hammer test of some form is quite generally applied.

The test used by the Connecticut Company consists of painting the axle with a coat of black lead and oil over the entire surface. The axle is then wiped clean and again painted with a coat of white lead and oil, after which the axle is struck with an 8-lb. sledge on each end. If there are cracks, flaws, breaks or other defects the oil and black lead will show through the white paint. A large number of railways reported as using practically this same test except that the first coat of black lead and oil is omitted. Others report that if the axle is carefully cleaned and then struck several

sharp blows on the ends with a sledge, the oil which remains in any cracks will be forced out and thus indicate the position of the crack. In this latter case no painting of the axle is done.

One railway reports a method of testing axles without removing the wheels. This consists of immersing the axle with wheels mounted in a tank of hot oil. After removal, the oil is carefully wiped off, and the axle is covered with whiting. The axle is then supported on a block at the center with the wheels hanging free, and is struck several blows with a heavy sledge. Wherever there is a crack, a fine thread of oil works up from the crack under the vibration, and can be seen against the white. Several roads report that they clean axles very carefully and then go over them with a magnifying glass.

A test used by the Empire State Railroad Corporation, Syracuse, N. Y., consists of taking a very fine cut with a sharp lathe tool over the section where the crack is most likely to develop. If the axle has a crack, it is then apparent to the operator.

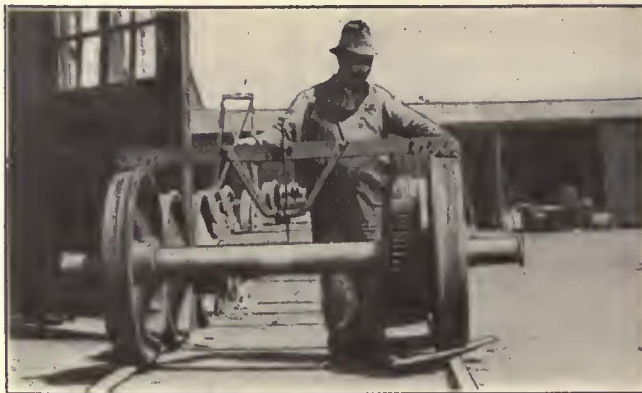
In discussing with master mechanics the question of what might be considered as a safe operating maximum mileage, opinions vary, depending upon service conditions, from 500,000 to 900,000 miles.

HOT OR COLD STRAIGHTENING OF AXLES AN OPEN QUESTION

The controversy as to whether it is best to straighten axles cold or heat them is a very active one, and the information collected in this survey indicates that opinions are about equally divided. There is no doubt that if axles are but slightly sprung, the best method is to straighten them cold, as this can be accomplished quite successfully with a proper axle straightening machine, and there is no danger of destroying the original properties of the steel through heat. Many railways find that mild heating does not injure the original properties to any great extent, and if cooled properly, that satisfactory results will be obtained.

The practice in Brooklyn is to straighten slightly bent axles cold, as it is believed that while the straightening process will cause further distortion of the fiber of the material and so tend to weaken the axle, there is probably less danger from this source than from heating, especially in the case of cold-rolled or heat-treated material, and where proper facilities are not available for re-treating the axle, so as to retain its original properties. The heating of axles of quenched, tempered, and cold-rolled material will affect the physical properties in amounts depending upon the degree of temperature and the rate of cooling. If heated above the critical point of the steel, about 700 deg. C., and then allowed to cool slowly, the result will be materially to reduce the strength with a slight increase in ductility. Annealed axles may be heated to the original annealing temperature, without seriously affecting the physical properties, provided care is taken in the heating and cooling processes.

F. R. Phillips, Pittsburgh, considers it the best practice to straighten axles cold, provided the straightening process does not require more than 10 tons pressure for a 5-in. axle. Heating of axles as usually carried out will change the original physical properties, and if it is necessary to heat cold-rolled or annealed, quenched and tempered axles to straighten them, they should be then restored by re-rolling, re-annealing,



Type of Wheel Gage Used by the Waterloo, Cedar Falls & Northern Railway

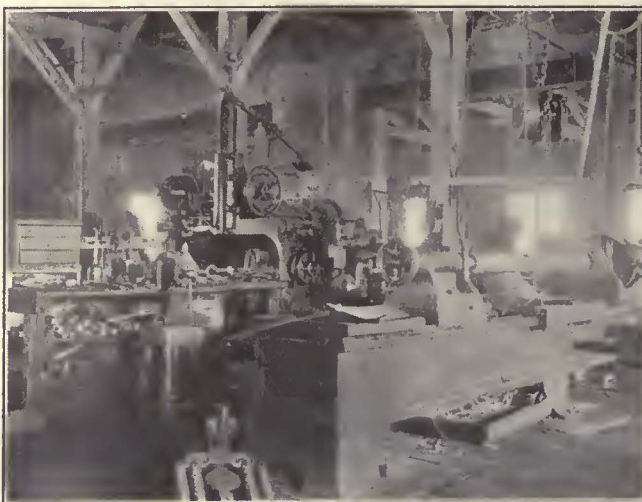
and re-treating, as the case may require, in accordance with the methods originally specified for this treatment.

Many railways follow the practice of straightening cold axles, which are bent only slightly, but when out of true to such an extent that this method cannot be done readily the axles are turned down to smaller sizes, or else scrapped.

The Portland Railway, Light & Power Company has had successful results from heating axles for straightening. It is considered better by this company to heat the axles to such an extent that there would be no danger of damage, taking particular care not to over-heat them.

WELDING OF AXLES REGARDED WITH SUSPICION

The question as to whether it is advantageous to build up wheel, gear and bearing fits on axles by welding is another one on which there is considerable difference of opinion. Several railways have experienced trouble from breaking of the axles after they were built up, so that this practice has now been discontinued. Others apparently are obtaining quite satisfactory results. Where welding is practiced, the most general custom appears to be to lay the metal on longitudinally. In the shops of the Spokane United Railways bearing fits are built up. The metal is laid on longitudinally by covering first one-quarter of the circumference and then turning the axle 180 deg., where another weld is made. The axle is then turned back 90



Turning an Axle in the Shop of the Columbus Railway, Power & Light Company, Columbus, Ohio

deg., so as to fill in between the two layers, and finally the fourth quarter is filled in.

The Connecticut Company has built up axles to a limited degree, but has found that this seemed to make the material more brittle. Probably this condition is in part due to the fact that the metal is already somewhat fatigued. The company finds that there is no great economy in the practice, even if it proved mechanically desirable.

FINISHING BEARING SURFACES

Careful finishing of the bearing surfaces of axles has much to do with keeping bearing troubles to a minimum. The two principal methods used in electric railway shops, after the bearings are turned in a lathe, are to file and then polish with emery cloth and oil, and to roll the surface with a steel roller. Several roads report a considerable reduction in hot bearings after changing from the use of emery paper for polishing to the use of the rolling method. When finishing with a roller after the last finishing cut is taken on the bearing surface, the rolling tool is substituted in the lathe tool post for the cutting tool. The roller most commonly used is of about 2½ in. diameter and has either a flat or rounded face. Where a flat face is used, it is common practice to round off the corners. The roller is forced up against the bearing surface of the axle by means of the cross-feed screw of the lathe carriage and is run back and forth over the surface as it rotates, by using the regular lathe feed. In passing over the surface of the axle, the roller compresses the metal ridges left by the cutting tool and leaves a smooth, polished surface.

Loose gears are almost unheard of, now that railways are using the solid type. There are, however, quite a number of split gears still in use. The general tendency is also to press gears on axles without keys, although about half of the properties from which information was obtained still use keys with their gears. The pressure used for pressing on gears ranges from 15 tons to 80 tons, with the great majority of roads using approximately 50 tons. Many railways specify a pressure for pressing on gears in proportion to the diameter of the bore. This ranges from 4½ tons per inch diameter up to 10 tons per inch. For the convenience of the shop men many railways have prepared charts of pressures for pressing on in proportion to the diameter of the axle. For example, the Puget Sound Electric Railway, Tacoma, Wash., keeps the pressures within the following specified limits: for 3½-in. axles, 30 to 40 tons; 4-in. axles, 35 to 45 tons; 4½-in. axles, 40 to 50 tons; 5-in. axles, 45 to 55 tons; 5½-in. axles, 45 to 60 tons; 6-in. axles, 50 to 65 tons. It is stated that danger of springing axles is avoided when the pressures are kept within these limits.

The question as to whether the finished diameters for the gear fits of axles and the finished bores of axles could be specified was discussed with operating men on several properties. Most of them seemed to feel that it would be safer to continue the practice of specifying the pressures at which gears should be pressed on, although some felt that diameters of bore with tolerances could be worked out which would be satisfactory. The Kentucky Traction & Terminal Company, Lexington, Ky., has been using for its gears 0.001 in. under size bore per inch of diameter, to allow for press fit, and has been obtaining very uniform pressure for pressing gears on.

Enameled Signs Prove to Be Economical

THE use of enameled signs to mark trolley stations, section insulators, private rights-of-way has proved to be so satisfactory in Brooklyn that no other type is now used. It was formerly the practice to designate stops, etc., by painted signs of wood or sheet iron. A number of years ago it was decided to try enameled signs. While such signs cost a little more in the first place than painted signs, they last so much longer that they are more economical in the end. Paint will wear off a painted sign or become dimmed by weather or dirt in a few years, whereas the enameled sign will last indefinitely unless it is subjected to some severe blow, such as that from a wild trolley pole, which chips off the enamel.

When the sign becomes so dirty that the lettering begins to appear faint, it is an easy matter to wipe it off with a rag soaked in kerosene and restore the original freshness. Where a large enameled sign is attached to a tubular steel pole or to a column of the elevated railway structure, it is slipped into an iron frame, and to prevent the wear that might occur between the sign and its frame, thin pieces of rubber are placed between the two surfaces.

Cold Paving Patch Saves Money

ALTHOUGH the Beaver Valley Traction Company, New Brighton, Pa., first tried the use of a cold paving patch with the idea that it was only a temporary expedient, it has proved so satisfactory that the company is now using this method widely in New Brighton, Rochester and Freedom. Throughout this territory brick paving predominates, and small repairs often entailed considerable expense when it was necessary to take up the old brick. With the cold patch method none of the old brick is taken up. Limestone, sand and oil are prepared in a concrete mixer and hauled to the desired location, where the patch is made without any interruption to traffic. The oils used have been Tarvia and Texaco and both have given satisfactory results.

COST OF PREPARATION AND INSTALLATION OF COLD PATCH FOR PAVING REPAIRS

Material			
1 ton limestone.....		\$2.30	
¼ ton sand.....		0.30	
Tarvia, 16 gal. at 20 cents.....		3.20	
Gasoline.....		0.15	\$5.95
Mixing			
Labor, fifteen hours at 45 cents.....		6.75	
Supervision, five hours.....		4.50	11.25
Installation			
Labor, forty hours at 45 cents.....		18.00	
Supervision, twenty hours.....		18.00	36.00
Grand total.....			\$53.20

One cubic yard of material will cover approximately 66½ square yards. This is at the rate of 80 cents per yard.

The estimated cost is about 80 cents per square yard, as shown in the accompanying table. Vehicles are not closed off at any time, but are allowed to run over the cold patch as soon as it has been installed. No detrimental effect has been noticed from this practice.

The various communities through which the railway operates have expressed their approval of this method of repairing the pavement and have been agreeable to the extension of its use rather than urging more permanent repairs. The accompanying figures show the cost of this kind of patching.

Car Mileage Records with a Posting Machine

A NEW method of determining individual car mileage has been developed by the Toronto Transportation Commission, making use of a Burroughs posting machine, the addition and printing being done automatically. The use of this method has simplified greatly the detailed work of obtaining individual or group car mileage records, and the distance covered by the equipment

between any two dates is obtained merely by subtracting the cumulative figures. The results also are applicable to determine the mileage of all parts of the equipment, such as motors, gears and pinions.

The following description outlines in detail the method employed in obtaining the original data and in working it up to give the final record. The system has been developed under the supervision of W. R. McRae, superintendent of rolling stock.

The mileage of the individual car is based on the route schedule, which is of standard form, giving the run for each crew and the corresponding trips and mileage for the day's work. The car assigned to each run is listed on the "Daily Record of Cars in Service," Form D-63 (No. 5 in the illustration on page 856), by a clerk at the carhouse. Spaces are provided on this form so that if more than one car is assigned to a run, as for instance happens when it is broken into several sections that cover parts of the day only, the full information will be recorded. It will be noticed that for the Yonge Street line several car numbers are shown for each run number. This is because the motor cars, which are in service all day, have trailers attached to them during the rush hours.

The information of the daily record of cars in service is confirmed by the "Motorman's Signing-in Sheet," Form D-35. On this the motorman at the end of his work records the run number, car number, time in and condition of the car. In case a car has to be replaced during the run, this information is recorded for the division on Form D-22, "Car Change" (No. 2 in the illustration), on which the route, run number, time and cause of the change are given, in addition to the numbers of the cars involved.

The next form is the first one which is distinctive to this method of calculating car mileage, those already described being similar to forms used elsewhere. This form, X-3, known as the "Daily Record of Cars and Wheel Mileage," both sides of which are reproduced on page 857, is made out in the offices of the divisional superintendents, the run number, car number, time out, time in, miles lost and miles run being entered. The distinctive feature of this form is that the thirty sections on the sheet are separated by perforations so that they may be detached individually. Each

Plan Adopted in Toronto Based on Use of a Bookkeeping Machine Gives Cumulative Mileage for Each Car and Group—Original Records Made on Perforated Sheets Are Torn Apart and Assembled by Car Numbers to Get Individual Records—Wheel, Axle, Motor and Gear Mileage Also Obtained—One Machine Posts Records for 970 Cars Within One Day's Time

section bears a code letter in its lower left-hand corner which indicates the division. When the form is filled out each of the sections will contain a car number with the other information for determining mileage. In case of a change-off a new ticket is filled out for the car making the change, thus giving a ticket for each individual car on every run. In the event of error it is neces-

sary to know not only the division but the route and date, so that each section of the form is marked on the back with a number in Roman numerals, representing the route, and the date in Arabic numerals. This is done easily and quickly by means of roller self-inking rubber stamps.

Passenger cars are divided into groups according to type and equipment. Service cars, motor buses and trolley buses are similarly separated into groups. The sections of the form are separated on the perforations and are sorted according to car number, then being made up into bundles, each of which has car numbers corresponding to a single group of cars.

From the above it is seen that the tickets contain all the information necessary for the record, consisting of the date, division, route, run number, car number, time out, time in, miles lost and miles run.

Accompanying the "Daily Record of Cars and Wheel Mileage" is the "Daily Mileage Report," Form D-10, on which route mileage and divisional mileage are reported. This is made up from the scheduled mileage, by adding the miles for extra cars or trips not scheduled, and subtracting mileage lost.

THE MILEAGE CALCULATION IS MADE BY MACHINE

The mileage shown on the small slips is then posted on the "Daily Mileage Record," Form X-4 (No. 3), by a Burroughs type 2406 split-platen posting machine with an automatic carriage. In order to facilitate the operation, the sheet for the previous day and the sheet to be posted are placed together in the machine, so that the column headed "total miles to date" on the record for the previous day shows to the right of the new sheet. This simplifies the work of transferring the amounts from one sheet to the other and minimizes the chance for error. When an error is made it may be detected easily by comparison and by checking the sheet totals.

The daily mileage record for the entire system is placed on thirty-five of the sheets. The car numbers are printed in the right-hand column, being segregated by groups of equipment. Group L, for instance, consists of forty cars, numbered from 2500 to 2578, which are all of the same type and are all equipped with English Electric DK-83 motors.

Toronto Transportation Commission
MOTORMAN'S SIGNING-IN SHEET 035-204-6-13

NOTE HERE ANY DEFECT FOUND TO EXIST IN CAR. IF NONE, MARK 'O K' OPPOSITE CAR NUMBER.

TRAFFIC DIVISION
DATE: _____

MOTORMAN'S COLUMN
SIGNATURE OF MOTORMAN: _____
ACTION TAKEN: _____

Toronto Transportation Commission
CAR CHANGES, FOR Week Aug. 7th. 1923

ROUTE	SUN	Time	CAUSE	Car No.	Type	Replaced By Car No.	Date	Run Miles	Index
Toronto	Y	1.50 P.M.	Placed	2510		2530		1928	
"	Y	1.50 P.M.	Emergency Valve	2291		2022		877	
"		12-11.17 P.M.	Lisc switch & Lights	2504		2502		602	

Toronto Transportation Commission
DAILY MILEAGE RECORD Group. L. Date: JUL 31 1923

TOTAL MILES To Yesterday	MILES RUN	TOTAL MILES To Date	Car Number
1 357 23.6	2 685 16.90	5240	19 67 501 T
1 900 42	1 315.5		1 67 395 T
2 065 08.7	1 690		2 06 757 T
2 048 17	7 405		2 05 252 T
1 9 353.8	131.0	437.3	1 8 9 22 1 T
2 05 27 1	1 04.4		2 04 13 3 T
1 9 22 4 6 2	7 4.5		2 00 03 1 T

(YEAR) TOTAL MILES TO DATE: 7 617 479.7

TOTAL MILES TO YESTERDAY: 7 59 01.5

GROUP L. TOTAL MILES FOR DAY: 48 63.8

(MONTH) GROUP L. TOTAL MILES TO DATE: 15 087 283.8

Toronto Transportation Commission
DAILY MILEAGE REPORT Dundas Division DATE: Saturday, Aug. 4 1923.

MILEAGE	DUNDAS 796	CARLTON 650	DOVERCOURT	BLOOR 776	DUNDAS TRAILERS 788	BATHURST XXXX
PER SCHEDULE	3,702.92	1,384.41		496.32	1,822.30	
CAR CHANGES						
EXTRA CARS						15.34
SCHEDULE TOTAL	3,702.92	1,384.41		496.32	1,822.30	15.34
LOST MILEAGE	22.04				1.94	
TOTAL	3,680.88	1,384.41		496.32	1,820.36	15.34
LIGHT CARS		107.98				
LOST MILEAGE						
TOTAL		107.98				
TRAILERS	1,320.20					
SUMMARY	5,001.24	1,492.39		496.32	1,820.36	15.34

RAW

Toronto Transportation Commission
DAILY RECORD OF CARS IN SERVICE

Friday DAY 10 August 1923 Eglinton Div.

Run	A.M.	Run	A.M.	Run	A.M.	Run	P.M.
1	2502	1	2902	1	2902	1	2902
2	2526	2	2951	2	2951	2	2951
3	2546	3	2943	3	2943	3	2943
4	2522	4	2969	4	2969	4	2969
5	2548	5	2963	5	2963	5	2963
6	2548	6	2921	6	2921	6	2921
7	2544	7	2921	7	2921	7	2921
8	2512	8	2917	8	2917	8	2917

Checked by _____ Car Owner
Certified Correct _____ Division Foreman

This report showing condition of all cars used in passenger service, must be made daily, proper report showing that cars have been "REPAIRED," "HELD IN," or sent "TO SHOPS" should be noted by Division Foreman, whose signature must then be affixed. Report will then be carefully checked over by Car Starter and copies of same sent to the Traffic Dept. and Master Mechanic.

No. 1—Each motorman must certify to the condition of his car when ending work for the day.
 No. 2—When cars are changed it is indicated on this form.
 No. 3—The daily mileage record is printed automatically by the posting machine.
 No. 4—The route mileage is furnished by the division superintendent, with scheduled mileage and variations therefrom to give the actual car miles run for the day.
 No. 5—The daily record of cars in service is made up from information on the time table.

Form X24-3m-10-22 Toronto Transportation Commission
MILEAGE RECORD WHEEL NO.

CAR NUMBER	INSTALLED REMOVED	CAR MILEAGE	WORN OUT OBJECTIVE	CHIPPED FLANGE DAO FLAT

Form X33-2m-10-1 Toronto Transportation Commission
MILEAGE RECORD GEAR No.

Date In	Car Number	Date out	MILES RUN	Set	Make	Axle Number

Form X24-3m-10-22 Toronto Transportation Commission
MILEAGE RECORD PINION No.

Date	Motor Number	Armature Number	MILES RUN	Set	Make

Form X31-3m-10-22 Toronto Transportation Commission
RECORD OF ARMATURE No.

Motor Number	DATE	MILES RUN	Set

Form X30-3m-10-22 Toronto Transportation Commission
RECORD OF MOTOR No.

Armature Number	Date In	Car No.	Date out	MILES RUN	Set

Form X32-3m-10-22 Toronto Transportation Commission
MILEAGE RECORD AXLE No.

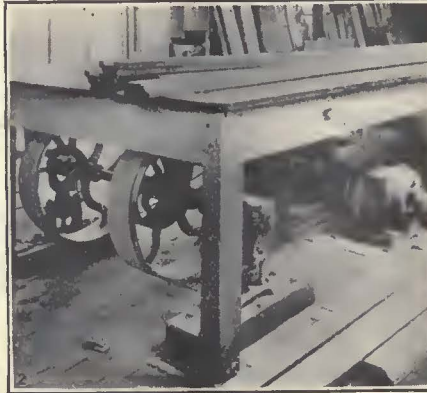
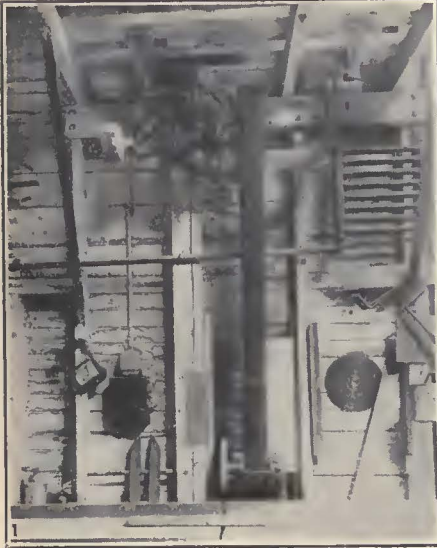
Gear No.	Date	MILES RUN	Set

Form X11-1m-10-22 Toronto Transportation Commission
COMPRESSOR RECORD - TYPE No.

DATE IN	CAR NUMBER	DATE OUT	MILES IN SERVICE	ARMATURE NUMBER	FIELD NUMBER

Individual Cards Give Records of Mileage of Various Parts of Equipment

Individual Motor Mounting Improves Shop Drives



THE illustrations on this and the following page show what can be done in the way of improving motor drives by adapting the mounting of individual units to existing tools, and also, in one or two cases, the convenience with which motors can sometimes be located directly upon or below the machines driven.

In some quarters the use of "home-made" motor mountings has been criticised as not representing the latest thought of the electric motor and machine tool maker. This however, would be a poor reason for failing to improve old-established drives at low relative cost in shops where it is an advantage to get rid of long lines of shafting, oily drips, excessive belt friction, and poor power factor due to running motors unloaded or lightly loaded for long periods.

The machine tool drives that are described in this article are installed in the Washington Avenue, Chelsea, shops of the Eastern Massachusetts Street Railway.

No. 1. The motor-driven circular saw at cutting-up bench has a 3-hp. induction motor mounted in a swinging yoke above the bench, with compact belt drive to the circular saw pulley. A counterweight drops the motor and saw out of the way when not in action, and a conveniently located starting switch on the wall at the operator's left provides easy control of the service. The arc through which the motor travels is so small as to cause no trouble from wiring distortion when the machine is run.

No. 2. Driving a cutting-up saw by a 5-hp. motor mounted on the shop floor below the working surface of the tool. In this case a speed reduction was required and easily obtained by belting the motor pulley to a short jackshaft under the table, with concealed drive by belt to the pulley on the saw shaft. The motor occupies no otherwise useful space, and because the space on and

above the table is needed for working the material effectively, the starting switch was located on a post at the right of the table, not shown in the photograph, but within a step of the working position.

No. 3. Here is a bandsaw gear-driven by a 5-hp. motor mounted on a floor pedestal of concrete at the side of the saw frame, with intermediate gear box. The motor service is brought through the floor by means of rigid conduit, and the gearing is protected by a thin but

effective metal housing. A starting box on the adjacent post provides quick and easy control. In this case the disadvantage of being obliged to mount the motor on the floor at the side of the tool is considerably lessened by the use of the very compact gear drive and by the location of the motor out of the line of travel of workmen.

No. 4. Pony planer drive by belting from 5-hp. motor mounted on bracket platform about 12 ft. above shop floor. Here the motor is entirely out of the way even in handling long pieces of board; the wiring is direct in rigid conduit with convenient starting and stopping switch with push-button stop attachment on the post at the rear of the machine. The location of the single belt drive at the side of the tool frees the space around the working table for handling stock, and a close-up view of the motor mounting, which is unusually thorough for an overhead job on the side of a post, is shown in the next illustration, No. 5.

No. 5. Close-up of motor mounting for driving pony planer from post. The motor, a 5-hp. machine running on 220-volt service, is bolted to two 2-in. x 9-in. timbers carried on 4-in. x 5-in. sills resting on a 2½-in. x 12-in. extension piece attached to the post by bolts as shown. The bolts are ⅝-in. diameter. Strap-iron pieces as shown reinforce the ends of the improvised platform, and right-angled bracing in the form of a tie-rod from above

and a horizontal stiffener piece from the left are used.

No. 6. Lathe driven by 2-hp. motor mounted on wall-bracket directly over tool and with starting switch and fuses between motor and tool. Space was readily available here for belting the motor to an overhead shaft and pulleys from which a flexible down-drive to the lathe could be had. While many self-contained lathe-motor combinations are now available for shop service, the arrangement shown was put into use at moderate expense, takes up little room useful otherwise and provides an effective and economical drive.

No. 7. Simple and convenient drive of buzz planer by overhead 5-hp. motor. Directly behind is a self-contained motor-driven mortising machine, the 3-hp. unit required being mounted on top of the frame, and at the rear, left, is shown a vertical drill with overhead mounted motor. The absence of overhead line shafting and belting complications is a convenience in material handling. The planer motor is mounted simply on a 2½-in. x 16-in. plank bolted to the post.

No. 8. An irregular molder individually driven by a 5-hp. motor located beneath the working table. Here the drive is extremely simple, with the motor bolted to the under side of the table and served by a short vertical run of rigid conduit brought up from the floor to the terminal cap on the motor frame. The drive is out of the way and yet the motor is readily accessible for inspection or repairs.

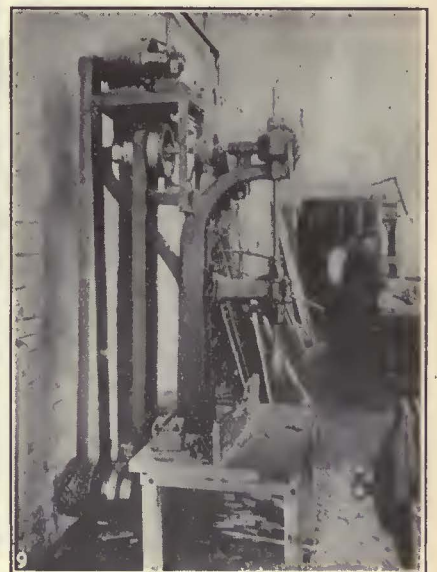
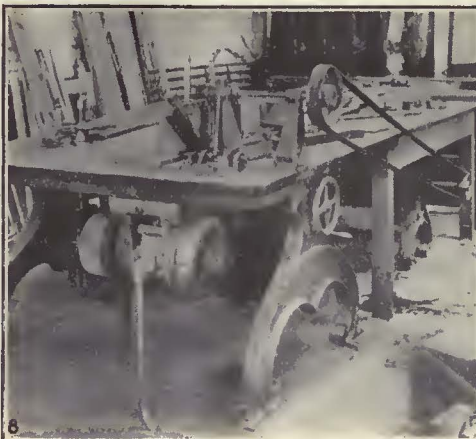
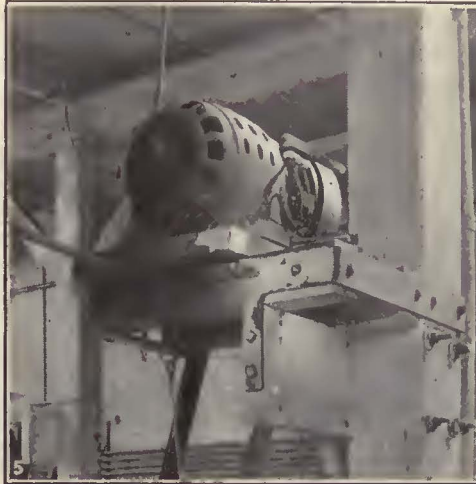
No. 9. Close-up of drill press and overhead mounted motor shown in No. 7. The motor, a 3-hp. direct-current unit, is carried on a platform supported on a ¾-in. x 1½-in. strap bracket carrying 1¼-in. x 5-in. planks to which the motor base is attached. The belt driving is at the rear and thus out of the way of the workmen.

The drives shown herewith were worked out under the direction of W. C. Bolt, superintendent, and H. S. Wray, assistant superintendent of rolling stock and shops, Eastern Massachusetts Street Railway, Boston.

Since the Eastern Massachusetts Street Railway had available both alternating current and direct current at the Washington Avenue shop, it was possible to select the type of drive best suited for each machine tool. While in general the most convenient system of power supply is direct current, motor manufacturers recommend the use of alternating-current induction motors for constant-speed machines where possible, with direct current for machines that must run at variable speeds or have heavy starting conditions.

The wide variety of machines illustrated in this article shows the adaptability of the motor drive to a number of different conditions such as exist in most electric railway shops. Where the electric installation is designed as a part of a new machine tool, speed changes may be provided by means of gears built as an integral part of the machine. This allows a constant-speed motor to be employed, but to obtain the speed increments necessary with a direct-current adjustable-speed motor requires abnormal gear combinations. Very often a single gear change is used with an adjustable-speed direct-current motor to obtain a wide speed range.

The comparative freedom of the Washington Avenue shops, as rearranged, from overhead shafting and belting is not shown in the illustrations. Where new machinery with individual motor drive is installed, it is, of course, possible to eliminate the shafting and belting. In this case, however, the shafting had been removed from the machines on which individual motor drive was installed, but long belts were necessary where the motors were placed overhead.



Reconstructed Cars for Open Air Line

A DEMONSTRATION run with a train of four reconstructed Manhattan elevated cars was given on the Second Avenue line in New York on Nov. 7, as mentioned in the news columns of this paper in the issue of Nov. 10. The reconstructed cars have vestibuled platforms, with sliding doors in place of the old platform gates and railings. The sliding doors are of sheet steel construction with two panels, one with glass and the other closed. The doors slide on the outside of the car. This construction is of particular advantage as a pocket does not have to be provided inside, which would otherwise disturb the interior equipment. The motorman's operating cab is still retained in its original position just back of the platform.

The sliding doors are electro-pneumatically operated by door engines installed under the longitudinal seats at the ends of the car. The control of these door engines is by control switches installed on the ends of the car. The operator's station is on two elevated footrests between the two cars. By having a train line control cable, multiple operation of the doors is provided, so that one operator can control the doors on as many cars as found advisable. Cut-out switches for the door control lines are installed inside the cars, so that the control connections can be dead-ended at the operator's station or connected through to the next car as desired. Indicating signal lamps are installed at the center of each car on the outside. The circuit for these signal lights passes through both the door contacts and the door-locking contacts, so that it is necessary to have the doors both closed and locked before the lights are extinguished to indicate that the train is ready to start. The motorman's cab is also equipped with a starting signal, which lights when all doors are properly closed and locked. The locking of the doors is accomplished by a small projecting stirrup, which is pulled in when the doors are unlocked and is extended for the locking position.

Provision is made for the emergency opening of doors by a glass-inclosed mechanism at each end of the car. The glass is lettered "To Open Door in Emergency, Break Glass and Pull Weight." The pulling of the weight raises the operating arm of the door engine beyond its center so that the door can be readily pushed back. Similar emergency operating equipment is provided on the outside of the cars as well. These are

intended for use of platform attendants and hooks for the emergency operation are kept at each station. The first test train had ventilators installed on the roof over the vestibule portions of the car. It has not been definitely decided whether all future cars will be so equipped or not. The cars remodeled have been thoroughly overhauled and painted and varnished on the outside with the new standard color goldenrod orange. The inside has also been renovated and painted. The lower woodwork is finished in mahogany and the ceilings in white enamel to improve the lighting conditions.

Sign Tells How Many Windows to Open

IN ORDER to insure uniformity in regard to the number of windows open in the cars, the New York Railways has installed a changeable sign in the inspector's shanty at the West Twenty-third Street and



Sign in Window of Inspector's Shanty Gives Instructions as to Windows

Eleventh Avenue carhouse. The sign is lettered in black on a white board in the shanty window on the Twenty-third Street side, where it can readily be seen by all passing cars. It reads, "Windows Each Side All Down," as shown in the accompanying illustration. The fourth word is not permanently lettered on the sign, but is on a second board behind the main sign and is read through an opening therein. The rear board

rotates and the word appearing through the opening may be changed at will to read "one," "two," "three," etc., or "all."

The windows of the cars of the New York Railways are of the drop sash type, so that having the windows down means having them open. The device is somewhat similar to those whose object is to control the use of electric heat on the cars. Such arrangements have already been described in the ELECTRIC RAILWAY JOURNAL, but they are useful only during parts of the year, while the instruction board telling the conductor how many windows to open is useful throughout the entire twelve months.



Train of Remodeled Cars with Doors Closed Ready to Start

N. & W. Line Trouble Record Analyzed

Total Period of Interruptions to Traffic Chargeable to Electric Equipment and Transmission in 1922 Was About Sixty Hours—During Entire Month of March No Line Trouble Was Reported—Pantograph Proved to Be Most Liable to Injury of All Parts of Electric System

THE log of line troubles for 1922 compiled by the electric traction department of the Norfolk & Western Railway, reproduced herewith, shows that most of these are of a trifling nature, a relatively small number causing any interruption to traffic. The electric traction department requires that all defects be reported, hence the table contains many that may seem trifling, but these are included for completeness.

In compiling the records the total delay caused is included. If, for instance, an insulator flashover causes a power interruption of thirty minutes, the delay shown is equal to the number of locomotives delayed multiplied by thirty minutes. The delay, therefore, does not mean the length of time the line was out of service. For example, on June 4 a wooden pole gave way on one of the mine outlet tracks, causing the trolley wires to get out of line and wrecking a pantograph on locomotive No. 2,505. Power was off this section from 5:02 p.m. to 5:44 p.m., or forty-two minutes. As a result locomotives No. 2,507, No. 2,505 and No. 2,502 were each delayed forty minutes, and No. 2,500 was delayed twenty-five minutes. The delay shown is thus two hours and twenty-five minutes, due to this particular case of trouble.

The tabular summary of the causes of interruption

to traffic shows that there were fifty-one of these, or slightly less than one per week. Of these fifty-one, eleven are chargeable to wrecks and bad track, for which the electric traction department is in no way responsible, so that the actual number is forty, or an average of three and one-third per month.

The total period of delays to movement, including those due to wrecks and bad track, is 161 hours and twenty-five minutes, and excluding these, 101 hours and twenty-five minutes. This is two and one-half hours for each of the forty delays, or an average of eight and one-half hours a month.

LINE TROUBLE ABSENT IN MARCH

It will be noted in the log that in one month, March, 1922, there were no line troubles reported, and further, as would be expected, that the interruptions are very light in the summer and relatively heavy in the winter.

For purpose of study, it is interesting to segregate the troubles into classes, in each of which there is a common element. Taking up first the transmission and contact line system, there were six short circuits on the line from unknown causes, none of which resulted in delays to traffic. Lightning was responsible for six trouble reports, accompanied by negligible delay. The

TABLE I—LOG OF LINE TROUBLE

Date	Place	Nature of Trouble	Delay Hrs.	Min.	Date	Place	Nature of Trouble	Delay Hrs.	Min.
Jan. 5	Eckman	Insulator flashed in Eckman Yard.....	3	17	May 2	Ruth	Piece of fishpole on top of cab caused ground.....	..	40
Jan. 7	Bottom Creek	Loco. No. 2,503 wrecked pantograph. Ran onto non-electrified track.....	..	30	May 7	Switchback	Appalachian Power Company's 25-cycle circuit breaker blew up.....	1	..
Jan. 16	Maybuery	Loco. No. 2,506 wrecked pantograph. Broken spring on truck and track bad.....	..	50	May 9	Maybuery to Bluestone	Short circuit, cause unknown.....	..	..
Jan. 16	Powhatan	Loco. No. 2,506 wrecked pantograph, due to broken driver spring.....	..	45	May 12	Eckman	Set of insulators flashed due to lightning. Loco. No. 2,507 had ground, due to piece of fishpole on top of engine.....	2	44
Jan. 17	Empire outlet	Loco. No. 2,502 wrecked pantograph, account of bad track.....	1	20	May 13	Vivian	Loco. No. 2,504 wrecked pantograph, due to pantograph unlatching while running.....	3	54
Jan. 17	Bluestone	Cab 24 turned over and broke off wood pole.....	..	..	May 21	Kimball	Engine No. 9, popping off under set of insulators, caused insulators to flash....	..	..
Jan. 18	Vivian	Trolley burned in two on crossover to old main line.....	1	25	May 24	Coaldale	Loco. No. 1,507 had ventilator up and struck wire in tunnel.....	..	..
Jan. 21	Morgan	Insulator flashed over on pantograph of Loco. No. 2,503.....	1	..	May 29	Bluestone	Loco. No. 2,509, wrecked pantograph on crossover; board from bridge struck wire.....	..	40
Jan. 22	Pocahontas	Bus line on Loco. No. 2,502 burned off at three-way connector and dropped on roof.....	2	..	May 31	Delta	Loco. No. 2,503 wrecked pantograph, ran onto non-electrified track.....	..	..
Jan. 23	Clift Yard	Loco. No. 2,508 wrecked pantograph, due to pin falling out of live insulator and allowing it to catch pantograph....	..	..	June 1	Upland	Short caused by bird, burned steady-span in two.....	..	..
Feb. 6	Ruth Hill	Loco. No. 85, steam engine, flashed set of insulators and burned messenger in two.....	6	45	June 1	Bluefield	Short circuit, cause unknown.....	..	..
Feb. 9	Keystone	Disconnect switch flashed to ground when opened.....	..	15	June 1	Bluefield	Short circuit, cause unknown.....	..	..
Feb. 9	Bluefield Yard	Wood stick flashed on No. 7 track.....	..	25	June 2	Switchback	Loco. No. 2,500 wrecked pantograph in Switchback Hollow; operator did not give crew copy of embargo order.....	3	..
Feb. 9	Bluefield Yard	Loco. No. 2,509 wrecked pantograph on Cab 22, coming in on west end of pit track.....	..	10	June 2	Switchback	Loco. No. 2,500 pulled out on line but had pantograph grounded, causing another short.....	..	..
Feb. 12	Bluestone	Loco. No. 2,502 wrecked pantograph in Bluestone Yard.....	..	..	June 3	Ruth	Piece of fishpole on roof of Loco. No. 2,508 grounded.....	..	20
Feb. 25	Bluestone	Loco. No. 2,508 wrecked pantograph on crossover east of power house.....	..	..	June 4	Bluefield	Short circuit, cause unknown.....	..	..
Mar.	.....	No line trouble reported for month of March.....	..	..	June 5	Bluefield	Short circuit caused by bird at Grant Street bridge.....	..	..
Apr. 1	Bluestone	Pantograph raised with ground on another pantograph.....	..	..	June 8	Keystone	Loco. No. 2,510, oil circuit breaker blew up due to resistance grounding in breaker.....	..	..
Apr. 4	Coaldale	Main lead to transformer grounded in conduit on Loco. No. 2,505.....	..	30	June 13	Bluefield Pit	Short circuit, caused by opening yard switch with power on locomotive transformer.....	..	..
Apr. 7	Cooper	Loco. No. 2,506 wrecked pantograph at Cooper crossover.....	1	25	June 14	Bluestone	Short circuit caused by raising of pantograph with one ground hook in.....	..	..
Apr. 20	Lick Branch	Loco. No. 85 wrecked and knocked down one signal bridge and one tubular bridge.....	60	..	June 15	North Fork	Loco. No. 2,507 wrecked pantograph coming out of Byrd Yard. Bad track.....	2	45
Apr. 20	Bluefield Yard	Body span burned in two.....	1	15	June 17	Eckman Yard	Loco. No. 2,507, breaker blew up.....	..	..
Apr. 28	Bluefield Yard	Radford lead burned in two at Mercer Street.....	..	30	June 19	Switchback	Short circuit, caused by wreck in Switchback Hollow.....	..	..

(Table continued on next page)

TABLE I—LOG OF LINE TROUBLE—(Continued)

Date	Place	Nature of Trouble	Delay		Date	Place	Nature of Trouble	Delay	
			Hrs.	Min.				Hrs.	Min.
June 27	Eckman	Loco. No. 2,501 wrecked pantograph on east end No. 10 track. Bad track.	3	30	Oct. 2	Eckman	Loco. No. 2,509 wrecked pantograph on No. 6 track. . . . .	..	..
June 27	Bluefield Yard	Insulator on No. 5 track, east of Grant Street flashed, due to activities of sparrow. . . . .	..	..	Oct. 6	Bluefield Pit	Switch opened while motor was running. . . . .	..	..
June 27	Houston	Dead end insulators flashed on Houston outlet, due to lightning. . . . .	..	..	Oct. 7	Powhatan	Set of insulators flashed over at Powhatan Coke track. . . . .	..	..
June 30	Coaldale	High-tension cable on Loco. No. 2,508 grounded in conduit.	1	..	Oct. 12	Bluestone	Loco. No. 2,505 burned wire in two on Pocahontas Branch while standing at tower. . . . .	..	..
July 2	Vivian	Loco. No. 2,507 wrecked No. 2 pantograph on crossover to old mainline.	5	..	Oct. 12	Bluefield	Solder melted out of terminal on disconnect switch lead and allowed lead to drop.	2	50
July 3	Maybuery	Feeder burned in two, probably due to lightning. . . . .	..	..	Oct. 16	Peerless	Set of dead-end insulators flashed. . . . .	..	..
July 9	Bluestone	Switch closed on ground on pit. . . . .	..	..	Oct. 22	Eckman	Loco. No. 2,500 wrecked pantograph No. 2 on east cab coming out of Eckman Yard, due to bad track. . . . .	..	50
July 11	Bluefield	Short circuit, due to lightning. . . . .	..	..	Oct. 23	Bluefield	Loco. No. 2,507 wrecked pantograph at Mercer Street Bridge. . . . .	..	..
July 11	Vivian	Fire on top of high-tension oil breaker. . . . .	..	..	Oct. 23	Bluefield	Loco. No. 2,500 wrecked pantograph on crossover at west end of No. 11 track in Bluefield Yard. Had knocked horn off at Eckman. . . . .	..	..
July 12	Bluefield Yard	Short circuit, cause unknown. . . . .	..	..	Oct. 28	Bluestone	Helper shocked in Bluestone Yard. . . . .	..	..
July 24	Graham	Wood stick broke in two. . . . .	..	..	Oct. 29	Elkhorn	Loco. No. 2,502 wrecked pantograph on Elkhorn Siding.	1	30
July 26	Nemours	Loco. No. 2,508 reported lightning struck cab, flashing insulators.	1	55	Nov. 1	Pin Hook	Loco. No. 2,502 flashed insulator on pantograph. . . . .	..	55
July 28	Bluefield Yard	Yard crew ran Loco. No. 2,506 onto grounded line at freight house. . . . .	..	50	Nov. 9	Coaldale	Loco. No. 2,506 wrecked pantograph at Coaldale crossover. Blew up Maybuery substation when breaker was closed on short circuit.	20	..
Aug. 8	Empire	Trolley burned in two at Empire outlet. . . . .	..	..	Nov. 24	Eckman	44,000-volt line burned in two at Eckman, smoke from steam engine.	3	30
Aug. 13	Pulaski	Loco. No. 2,503 wrecked No. 1 pantograph, due to bad track.	1	..	Nov. 25	Eckman	Wood stick flashed on crossover, west end of Eckman Yard. . . . .	..	..
Aug. 18	Keystone	Fireman burned, putting up pantograph on Loco. No. 2,510; climbed on roof of cab. . . . .	..	30	Nov. 26	Eckman	Loco. No. 2,504 wrecked No. 1 pantograph east end of No. 10 track. Bad track.	1	30
Aug. 21	Dans' Branch	Loco. No. 2,508 wrecked pantograph, due to wood pole splitting and allowing dead end to slack off. . . . .	..	45	Nov. 28	Bluefield Pit	Trolley burned in two on storage track. Improper handling of pantograph. . . . .	..	40
Aug. 22	North Fork	Loco. No. 2,508 wrecked pantograph, cause unknown. . . . .	..	20	Dec. 1	Eckman	Loco. No. 2,504 wrecked pantograph on No. 10 track, east end of Eckman Yard.	2	35
Aug. 24	Flat Top	Set of insulators flashed.	1	10	Dec. 2	Eckman	Loco. No. 2,504 wrecked pantograph on No. 10 track. Bad track and pantograph out of line.	1	10
Aug. 24	Simmons	Tree fell across line; also three insulators flashed, due to lightning. . . . .	..	..	Dec. 12	Eckman	Loco. No. 2,508 wrecked pantograph on No. 10 track. Bad track.	2	..
Aug. 28	Ruth	Loco. No. 2,510 knocked horn off pantograph. . . . .	..	..	Dec. 19	Bluefield Yard	Set of insulators flashed on lead. Engine No. 2,036 standing under insulators popped off. . . . .	..	20
Aug. 30	Flat Top	Loco. No. 2,501 bus line burned in two. . . . .	..	..	Dec. 20	Eckman	Steady span burned in two.	3	45
Sept. 1	Ennis	Loco. No. 2,509 wrecked No. 1 pantograph at Ennis crossover. . . . .	..	..	Dec. 26	Cliff Yard	Cat climbed wood pole and bridged set of insulators. . . . .	..	..
Sept. 7	Bluefield Pit	Motor run onto grounded line. . . . .	..	..	Dec. 26	Bluestone	Insulator flashed on pantograph on Loco. No. 2,502. About 4 ft. of messenger wire found on cab. . . . .	..	..
Sept. 12	Bluefield Yard	Loco. No. 2,502 wrecked pantograph, No. 10 track, west yard, ran engine onto non-electrified track. . . . .	..	45					
Sept. 12	Eckman Yard	Loco. No. 2,509 wrecked No. 1 pantograph on No. 6 track; pantograph out of line.	2	15					
Sept. 13	Vivian	Loco. No. 2,503 wrecked No. 1 pantograph on No. 5 track in Vivian Yard. Bolt came out of clip.	1	25					
Sept. 15	Bluestone	Loco. No. 2,501 ran onto non-electrified track. . . . .	..	..			
Sept. 16	Bluefield Pit	Switch opened on pit track with locomotive spanning breaker. . . . .	..	..			
Sept. 27	Bluefield Yard	Loco. No. 2,510 wrecked pantograph on crossover at passenger station. . . . .	..	..			

storm of Aug. 24 was a severe one, causing a tree to fall across the line, as well as three insulators to flash, but with no delay to traffic. The worst that the lightning did was usually to flash insulators, although in one case the burn-off of a feeder may be attributed to this cause.

In the electric zone it was not possible to use the ordinary rope "ticklers" which are customary on steam railroads to indicate to trainmen on the roofs of the cars that a tunnel or a low bridge is being approached. Instead, a reed fishpole hinged to the catenary side column is substituted. This extends over the track in such a position that the pantograph of an approaching train strikes it and causes it to swing parallel to the track. Occasionally in striking the pole the pantograph breaks off a piece of it, which drops down on the roof and grounds the pantograph. This is particularly true during heavy rainstorms. A total delay of three and three-quarter hours was attributed to this cause.

The smoke and steam from steam engines caused difficulty on four occasions, a negligible number in view of the fact that all passenger and freight trains go through the electric zone behind steam engines. Two engines popped off under insulators, one short circuited the 44,000-volt line by means of smoke, and another flashed over an insulator and burned out a messenger. These four accidents account for more than a sixth of the total year's delay.

Aside from the insulator troubles mentioned, the line insulators gave a good account of themselves. Occasionally there was a flashover, usually with a trifling delay or none, although an insulator flash early in

January did cause a three-and-one-quarter-hour delay. The regular inspection and renewal of insulators described in the article in the issue of this paper for Aug. 11, 1923, page 203, insures a minimum of insulator troubles in service.

Something over one-sixth of the total time of delay tabulated may be charged to the burning off of contact and span wires and difficulties with switches and circuit breakers. The total for the year, however, is only ten, mostly minor troubles.

Locomotive troubles, aside from the pantograph wrecks already referred to, were of minor importance, having caused less than five hours' delay during the year. These include pantograph insulator flashovers, circuit breaker failures and wiring burnouts. The number coming within this class is ten, or less than one a month.

THE PANTOGRAPH IS THE MOST SENSITIVE PART OF THE EQUIPMENT

The pantograph is naturally the part of the locomotive which comes in for the most severe punishment. In construction it must be light and flexible to function properly. It is liable to injury from causes which have nothing to do with the electric equipment. For example, during 1922 nine pantograph wrecks were due to the track being out of alignment, another was caused by the splitting of a wood pole, another by the breaking of a driver spring, and still another by a pin falling out of an insulator. In another case a board from a bridge struck the contact wire and wrecked the pantograph. A large proportion of the pantograph wrecks

TABLE II—SUMMARY OF LINE TROUBLES CAUSING TRAFFIC DELAY

Number of Cases	Nature of Trouble	Delay to Movement	
		Hrs.	Min.
2	Inulators flashed on pantograph	1	55
2	Steam engine popped off under insulators	7	5
6	Wrecked pantograph, cause not determined	9	10
1	Wood stick flashed	15	15
2	Wrecks	63	0
1	Body span burned in two	1	15
3	Defective insulators	3	7
4	Ran onto non-electrified track	3	35
6	Defect on electric locomotives	6	30
9	Bad track	16	20
2	Trolley burned in two	1	55
1	Steady span burned in two	3	45
4	Foreign material on locomotive roof	4	20
7	Miscellaneous	13	9
1	Lightning	1	55

occur at crossovers, where the overhead line has to be more complicated than on tangent track.

In a few cases pantographs are wrecked due to their own defects, not more than three, however, during 1922. Occasionally one is injured through an unknown cause. On the whole, the pantograph is the cause of more delays than all other pieces of apparatus together.

In spite of watchfulness on the part of employees of the electrified section, men will occasionally forget or misunderstand instructions, causing unnecessary delay or inconvenience. There were from fifteen to twenty cases last year which can be thus classified, but among them all they caused but a little more than three hours delay. Such accidents as raising a pantograph with the ground on another pantograph, raising a pantograph with a ground hook on it, opening switches with power on, running onto non-electrified track or grounded line, etc., illustrate this class of trouble.

The log includes the result of a train wreck which caused a total delay of sixty hours. One signal bridge and one tubular bridge were knocked down and a short circuit was caused by the wreck.

The Davis wheels that were scrapped during the year 1920 because of being unfit for further service were mostly put in service during 1918. Because of the stress of war conditions at that time, the factory did not turn out the high quality product that it is now doing. This directly affected the mileage obtained from the wheels of the Davis type that were installed during that year.

The mileage shown as obtained from 31-in. rolled steel wheels during 1920, while correct, is also misleading because we did not commence the extensive use of rolled steel wheels until the spring of that year. We did have a few rolled steel wheels that were put into service in 1918 for experimental purposes, and during 1920 four of these first wheels were scrapped because of being worn out. The average mileage for the four wheels was 90,000, but the mileage obtained from such wheels does not conclusively prove that similar results will be obtained from such wheels when used extensively. In the table below are shown the mileages of wheels on our property for the years 1920, 1921, 1922 and six months of 1923.

You will note from this that the Davis wheels have steadily increased in mileage and decreased in cost per 1,000 miles each year. In order to get the mileage shown for the rolled steel wheels it was necessary to remove them from service twice for turning, while in the case of the Davis wheels they were not removed after first installed until ready to scrap. This is decidedly in their favor.

We obtain the mileage of wheels scrapped by keeping an individual card record for every wheel on our system from the time it is put into service new until it is removed and scrapped. The number of wheels by types and sizes that were removed and scrapped during each month is also compiled, which shows the total mileage actually made by the scrapped wheels. This divided by the number scrapped gives the figures used for average mileage.

The reason we obtained better mileage from 30-in. Davis wheels than from 33-in. Davis wheels is because the latter are used entirely under 54,000-lb. cars operating at fairly high speeds and with frequent stops and severe braking conditions. The 30-in. wheels are used under cars weighing around 35,000 to 40,000 lb. in strictly city service. A large amount of our track is grooved rail with a very narrow groove which has only 3/8-in. clearance over wheel flange. Consequently the rolled steel wheel flanges wear very fast on the back side of the flange, which necessitates frequent turning, resulting in low total mileage when worn out. The Davis wheel having a very hard flange does not wear anywhere near as fast as the steel wheel.

R. D. VOSHALL,
Superintendent of Equipment and Buildings.

The Readers' Forum

Additional Information on Steel Wheel Mileage

WASHINGTON RAILWAY & ELECTRIC COMPANY
WASHINGTON, D. C., Nov. 5, 1923.

To the Editors:

In the article appearing in the Aug. 18 issue of ELECTRIC RAILWAY JOURNAL under the heading "Wheel, Gear and Axle Practice" (on page 250) is shown certain data in the nature of mileages obtained on our property from different types of wheels for the year 1920. Since you obtained the figures as shown we have prepared similar statistics for the years 1921, 1922 and the first six months of 1923 which I think are more representative.

WHEEL MILEAGES FOR THE YEARS 1920, 1921, 1922 AND FIRST SIX MONTHS OF 1923
WASHINGTON RAILWAY & ELECTRIC COMPANY

Type of Wheel	Year 1920		Year 1921		Year 1922		First Six Months, 1923	
	Average Miles	Cost per 1,000 Miles	Average Miles	Cost per 1,000 Miles	Average Miles	Cost per 1,000 Miles	Average Miles	Cost per 1,000 Miles
20-in. cast iron	44,665	0.15	47,051	0.11	41,974	0.14	43,222	0.13
22-in. cast iron	41,841	0.206	39,552	0.18	38,221	0.22	37,705	0.19
30-in. cast iron	41,009	0.276	36,700	0.27	35,300	0.32	37,069	0.24
33-in. cast iron	41,577	0.304	51,993	0.17	39,005	0.25	20,982	0.58
30-in. Davis	48,725	0.688	66,559	0.41	91,278	0.30	102,244	0.27
33-in. Davis	65,254	0.559	71,651	0.46	79,076	0.41	90,997	0.38
31-in. rolled steel	90,000	0.383	52,180	0.66	84,702	0.41	81,271	0.44

Maintenance of Equipment

Selection of Waste for Motor Bearings

BY HENRY S. DAY*

Railway Department, Westinghouse Electric & Manufacturing Company

WITHOUT good wool waste bearings of motors and truck journals cannot be properly lubricated, and the ratio between good and bad lubrication and good and bad waste is about the same. Probably there is no one article in the storeroom of the electric railway that varies so in quality and grade as the waste used for packing bearings.

The amount expended for lubrication which covers oil, grease and waste packing is only a very small percentage of the total cost of equipment maintenance, but poor lubrication causes a very large percentage of the troubles. Frequently a railway that has low lubrication costs has high costs for repairs. Many factors enter into poor lubrication besides poor waste, and there are many opinions as to what constitutes good packing. Years of operation have demonstrated that to feed oil properly and to prevent sagging the packing should be composed of pure wool yarn with few short strands. Strands should not be less than 12 in. or 15 in. long, should also be of a good diameter and well mixed. Such wool yarn will feed oil and at the same time retain a resiliency sufficient to hold it in place against the journal without sagging or matting.

Many specially prepared types of packing waste are composed of various grades of wool yarn mixed with cotton strands and different kinds of fibrous substances. Some of these prepared packings give fairly good results. If the packing is of an inferior grade and has a high percentage of cotton and fiber, it cannot lift sufficient oil to carry away dirt, dust and foreign substances that all tend to shorten the life of the bearing and wear the journal.

An additional cause of lean feed-



Montreal's Crane Car Ready for Service

ing in a mixed packing is the tendency for cotton and fibrous substances to bunch up and mat from vibration and thus introduce barriers which break the path of oil in its upward flow and reduce the amount that reaches the journal. Mats or pads formed this way also catch and hold sand and dirt which cannot fall to the bottom of the housing or journal box. Cotton and fibers when they come in contact with a moving journal will also form a glazed surface which will frequently cut off the oil flow. Another advantage of high-grade wool packing is that it can be washed and reclaimed and so be used over again.

Bearing and journal wear is costly and the source of much trouble. Good packing, oil and grease are a comparatively small item in the operating cost, and a liberal use of the best that can be procured will prevent much expense and many failures.

Well Constructed Crane Car for Montreal

THE Montreal Tramways has recently added a new crane car to the present work car equipment. The underframe was designed and built in the shops at Youville. It has an over-all length of 42 ft., width 8 ft. 5 in. and 41 in. body height, with an over-all height over top of rotating crane cabin of 11 ft. 5 in. The low body height was necessary to give the required subway clearances.

The body is of very rigid construction, consisting of two fish belly girders of $\frac{3}{8}$ -in. plate and 2 $\frac{1}{2}$ -in. x 2 $\frac{1}{2}$ -in. x $\frac{3}{8}$ -in. angles, connected by intermediate girders of $\frac{3}{8}$ -in. plate and 2 $\frac{1}{2}$ -in. x 2 $\frac{1}{2}$ -in. x $\frac{3}{8}$ -in. angles and heavy channel box bolsters. The rear end is covered by the half-inch plate to which the base ring is fastened, this forming the bolster top plate, also tying the whole structure together and preventing any twisting of the body due to swaying loads



Underframing of New Crane Car

*Formerly superintendent of equipment Kansas City Railways.

when the crane is revolved. The body and trucks are equipped with interlocking side bearings which transmit the load directly to the truck side frame, thus relieving the bolster of the lifted load.

The trucks, which were built in the company's shops, are placed at 27-ft. centers. They are of 6-ft. 3-in. wheelbase with 30-in. wheels and special axles. The front end is fitted with a 5 x 6-ft. cab for the motor-man.

A K-35 controller handles the driving equipment of four Westinghouse 533 motors connected in series, series multiple, to allow for slow movement with a lifted load. The weight of the car equipped is 77,600 lb.

The crane proper, which was purchased from the Ohio Locomotive Crane Company, weighs 37,100 lb. and is driven by a Westinghouse 37-hp. type K motor. It has a lifting power of 17,000 lb. at 12-ft. radius, 12,000 lb. at 15-ft. radius and 8,500 lb. at 20-ft. radius, these limits being fixed by the stability of the whole structure on the limited base of the 4-ft. 8½-in. rail gage. Much greater loads can be handled over the rear end of

the car and, when suitable, struts are inserted between underside of car frame and the ground to give a wider effective base.

Maintenance of Bearings and Welding Practice

BY O. A. NORENE

Assistant Master Mechanic Omaha & Council Bluffs Street Railway

BOTH cast and malleable iron Baxle collars are being replaced with cast steel collars in Omaha. We are also discarding the cotter keys in all the collars and replacing them with plain locknuts which lock the screws rigid to the collar and prevent the threads from wearing on both screw and collar.

We are using cast steel axle shells, babbitt lined, on all our motors where a thickness of shell is ½ in. or over. The shells are machined in a specially designed jig in which they are held rigid without distorting them in any way. Two sets of jigs are used for each type of bearing, to permit the operator to change one pair of shells while the other set is

being machined. The babbitting is done in a special mold where the bearings are cast finished complete with oil grooves. All halves are interchangeable. It has not been found necessary to tin these shells, as anchors cast in the flanges and body of the shell are ample to hold the babbitt.

REPAIRS BY WELDING

For repair of broken truck frames, cast steel bolsters, motor cases or for any heavy welding we are using the thermit process. Armature shafts are welded in this manner if broken at the pinion end and if the winding is found to be in good condition. The weld is always made from 2 in. to 3 in. from the end of the pinion taper. This is done principally to get as large an area for weld as possible.

Worn pinion fits and broken and worn keyways in armature shafts are built up with oxyacetylene torches and the shafts machined to standard sizes. We have discontinued entirely the use of so-called liners of sheet iron, canvas or paper, and by so doing we have also elimi-

The Roadmaster Catches H—

MR. REDFIELD, did you see the editorial in this morning's Jinxville *Clarion*, complaining about our track on Main Street?" asked Charlie Riter, Mr. Redfield's clerk, on the boss' arrival at the office.

"Yes, Charlie, I did, thanks, but I'm pleased to note that you take enough interest in the property to call my attention to it. That track ought to have been fixed up long ago. I'll see Tom Fairweather about it today. He's roadmaster and it's his job to forestall such complaints. Here's the superintendent; we'll see what he has to say.

"Good morning, Bill, I see the *Clarion's* after us about our Main Street track."

"No wonder, Mr. Redfield, that track's a disgrace. The joints are the main trouble and they are awful. John O'Neill and I learned something about track at the Atlantic City convention that we ought to apply here. I wish you'd have Tom put in some of the welded joints that we've heard so much about."

"I'll see him today, Bill. Something's got to be done. We must make a start anyway before next Sunday. Charlie, get hold of Mr. Fairweather as soon as you can and tell him to come to my office."

On Fairweather's arrival the G. M. lost no time in coming to the point.

And he takes it because he knows he's been asleep. General manager of Jinxville Railway says roadmaster's slackness was responsible for justified complaint of riders as voiced in newspaper editorial. Insists that fault be acknowledged and conditions rectified and makes deep impression

◆◆◆◆◆

"Good morning, Tom. This morning's paper says our Main Street track might be improved. What about it?"

"Sure, Mr. Redfield, it's the worst piece of track in town, but I don't think they ought to roast us about it that way. I intended to patch it up next spring."

"Look here, Tom, don't you realize that if the public has good reason for a complaint like this it makes it mighty hard to maintain good terms with our car riders?"

"Oh, it's just one of them young reporters who wanted something to complain"

"Stop right there, Tom. You're all wrong. Gainway says there's good reason for the complaint and, as superintendent, he ought to know. Trouble with you is you're not keep-

ing up to the times. What kind of track joints have we on Main Street?"

"Fish-plates; same as we've always used. I never took much stock in these newfangled joints."

"Well, you've got to take stock in them from now on, Tom. You had better get yourself posted right away on these welded joints and jointboosters and one thing and another that Bill and John say stirred up so much interest at the convention. I want to put an ad in the *Clarion* telling the people of Jinxville that improvements are going to be made. If we've been slack, let's say so, but saying at the same time that we're going to fix up the track right away. We'll tell them, too, that we have done a lot of other things to improve service on this property in the last year.

"Now don't fall down on this job, Tom, even if you have been working here for thirty years. You can keep up to date if you'll read the *JOURNAL* and think and keep up with what other people are doing. You know I don't want to get a new roadmaster unless I have to. Let me know tomorrow what we ought to do on Main Street and how soon we can get it done, so I can write my advertisement."

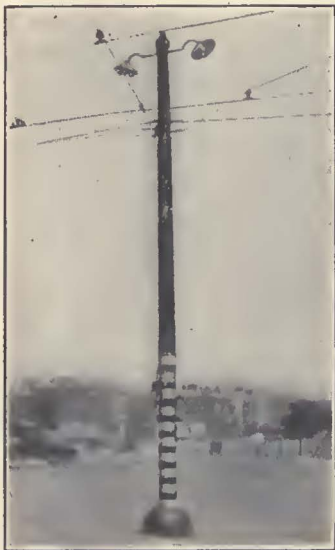
"I guess maybe you're right, Chief, I have been a little slack. I'll get right after this."

nated almost all the loose pinion trouble we used to have. No attempt is made to build up the worn bearing surface on an armature shaft by welding. When worn down too small, a seamless steel tubing is shrunk on to bring the shaft to standard size.

Reducing Exposed Pole Hazard

THE trolley pole shown in the accompanying illustration is located in the plaza at the entrance to Prospect Park, Brooklyn. It had to be set well out toward the center of the plaza in order to support the overhead work at the intersection of two streets, on both of which there were electric railway lines. In this location it was in constant danger of being struck by passing vehicles. In order to make the pole conspicuous at night as well as during the day, a cluster of ten lights was installed at the top of the pole. Then to make it stand out even in the daylight it was painted, in accordance with a city ordinance, with alternate white and black stripes for a distance of approximately 12 ft. above the ground line.

It was further protected by a cast-



A Thrice-Protected Pole

iron wheelguard at the base of the pole. This wheelguard will deflect wheels of passing vehicles to one side and greatly lessen the blow as well as cause the wheel to be struck rather than the body of the vehicle, so that if the automobile or wagon were damaged it would be in a part that would not also cause injury to any persons who might be riding in the vehicle.

Automatic Control for Shop Compressor

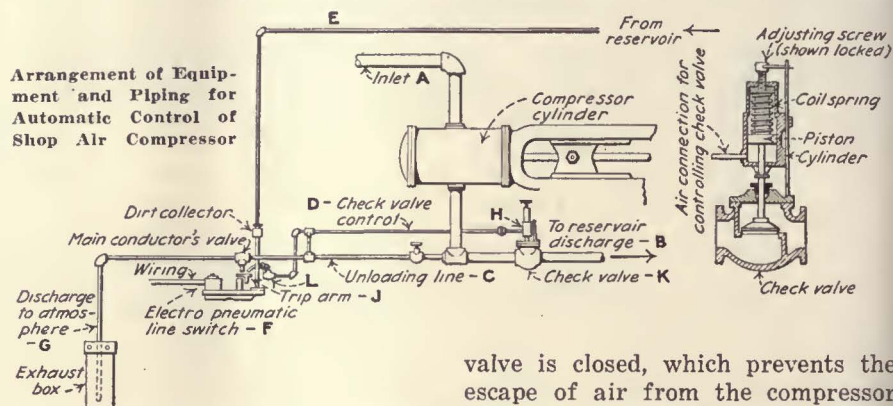
BY H. COWEN

General Foreman New York Railways,
New York, N. Y.

AT THE Fiftieth Street shops of the New York Railways compressed air for hoists and pneumatic tools was supplied by a "Platt" straight-line, single-stage, double-acting compressor, driven by duplex belts from an overhead countershaft belted to a 75-hp. motor. This compressor had been in operation over twenty years and increased demands

General Electric type MC Westinghouse 275 line switch, conductor's valves, fender trip cylinder and a standard 5-in. check valve were piped, as shown in the accompanying diagram.

Referring to the diagram, A is the inlet to the compressor, B the discharge to the reservoir, C an unloading connection, D a check valve control line, E the connection from the reservoir to an electropneumatic line switch, F the line switch and G the discharge to atmosphere. During compressor operation, the line switch F is de-energized and the conductor's



for air imposed excessive duties on it and necessitated the use of larger supply reservoirs. The only ones available were ample in size for maximum requirements, but excessively large for the normal shop needs. This resulted in the compressor running idle for a major portion of the days and caused overheating.

Frequent shutdowns were necessary for repairs, such as renewing main and crankpin bearings, cross-head gibs, inlet and discharge valves and seats. The two latter resulted from deposits of carbonized oil, caused by excessive temperatures. These troubles were not anticipated, as an unloading device formerly part of the compressor and connected in the inlet pipe was expected to control the compressor operation during rush and normal periods. Its function, however, was merely to restrict the inlet flow of air and it did not eliminate idling, with its attendant waste of power and rapid wear of parts. Automatic control was therefore added by the use of several spare air-brake parts. A shop-made automatic controller was used for stopping and starting the compressor motor, at a minimum reservoir pressure of 40 lb. and maximum pressure of 65 lb. These, together with the

valve is closed, which prevents the escape of air from the compressor cylinder to atmosphere. When the air pressure in the supply reservoir reaches the required maximum of 65 lb. the G.E. governor, previously adjusted, opens the main motor circuit and the compressor comes to rest.

As air is consumed the reservoir pressure diminishes to 40 lb., when the governor cuts in and closes the motor circuit, simultaneously energizing the magnet valve in F so that communication is established between the reservoir and the conductor's valve trip cylinder. This moves the trip arm J upward and opens the conductor's valve so that a rapid release of the air confined in the compressor cylinders occurs, which removes the resistance against starting. Without this arrangement, proper acceleration of the compressor was impossible because both the motor and countershaft belts slipped and in many instances these were damaged.

After the motor circuit is closed, the automatic contactors on the switchboard gradually cut in resistance as the acceleration progresses. When the magnet valve in F is de-energized, the trip arm J drops and closes the conductor's valve and the atmospheric discharge line from the compressor cylinder. Air now passes through the main discharge and check valve into the main supply reservoir.

The check valve *K* functions only during the acceleration period, when air passes from the unloading pipe to the cylinder *H*, which contains a piston and rod integral with the check valve stem. By adjusting the screw pressure on a coil spring as shown in the enlarged section of the check valve the air pressure, for completed acceleration, is regulated. When the piston moves up the check valve is held open, allowing air to flow from the compressor to the supply reservoir. This eliminates pounding of the check valve on its seat.

To prevent a general discharge of air from the supply reservoir through the unloading and atmospheric lines, at the instant of starting, a conductor's valve *L* with a

multiplying lever is connected to the check valve control line, so that the air in the check valve cylinder discharges to atmosphere and allows the valve to seat before the main conductor's valve opens.

A series of tests made after installing this apparatus showed that during 50 per cent of the working day the compressor was not required to operate. The reduction in power consumption and the elimination of shutdowns have produced a substantial saving. Furthermore, renewals of main valves, seats, bearings, etc., have not been necessary during the past two years, and an improved shop output has resulted from the successful operation of the compressor.

New Equipment Available

Truck-Mounted, Electrically Driven Compressor

TO MEET the demands of electric railway track departments for an electrically driven air compressor, which can be readily and conveniently moved about, the Ingersoll-Rand Company, New York, N. Y., is placing on the market a new type 20 equipment shown in the accompanying illustration. A standard Ingersoll-Rand duplex air compressor, with 5-in. x 5-in. cylinders and having a capacity of 91 cu.ft. piston displacement per minute, is direct-connected to the compound-wound direct-current motor used for driving.

The motor obtains its current from the overhead trolley and is designed to operate at practically constant speed within a range of 400-600 volts on the trolley. This

takes care of the voltage variation commonly experienced in electric railway service and maintains the capacity of the outfit under practically all conditions. This outfit has sufficient capacity so that it will operate four tie tampers or two paving breakers.

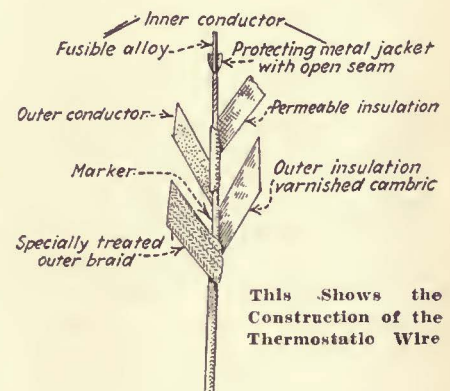
The use of an electric drive which can be operated directly from the overhead trolley supply is a particularly attractive feature to electric railway track men, and the constant speed feature is of advantage. The type 20 equipment is offered either ready for mounting on any standard Ford truck or complete with truck as specified. Some companies have found it convenient to make use of old motor trucks with this unit, as the amount of actual travel in miles which such a unit is required to make is comparatively small.



Air Compressor for Trackwork Mounted on Truck

Continuous Thermostatic Wire for Fire Alarm Systems

AN AUTOMATIC fire alarm system applicable to railway car-houses, substations, etc., is marketed by the Fire Detecting Wire Corporation, New York, and is said to possess several advantages over other systems now widely used. It consists of various circuits of continuous thermostatic wire, each connected with a centrally located control panel and with alarm gongs. In the event of fire, or even of undue heat, an alarm will be given before the fire has become dangerous. This thermostatic wire consists of a core of special fusible alloy covered with a protecting metal jacket having a narrow open seam. Superimposed upon this is a permeable wrapping of cotton yarn which provides insulation between the core and an outer conductor of spirally wound brass tape. On top of this is a layer of



varnished cambric to protect the wire against grounding and a varnished cotton braid outer covering to give mechanical protection.

The soft metal in the interior of the wire has a fusing temperature of 160 deg. F. The wrapping material outside, however, has a retarding effect equivalent to about 20 deg., so that the actual fusing temperature of the wire is about 180 deg. under normal conditions. Under a very slow heat the fusing point is reduced to approximately 160 deg., because the whole mass has time to become thoroughly heated.

When the metal core fuses, it spurts through the seam in the protecting cover and through the permeable insulation, making electrical contact with the outer conductor of brass tape. This shunts out a resistance, and the alarm box, indicator, etc., give their warning.

Although the fusing point of the

metallic alloy is theoretically about the same as that for sprinkler heads, nevertheless experience has demonstrated that the alarm will always be sounded some time before the sprinkler system operates. The reason for this is that the metal pipes of the sprinkler system and the water contained therein tend to carry away the heat from the sprinkler head and thereby postpone its melting.

A supervisory current passes continuously through all parts of the system, including the core and brass wrapping of the wire. Any interference with this supervising current, such as that caused by an open circuit, results in a trouble signal. False alarms have been eliminated.

Wires are spaced about 10 ft. apart or approximately the same distance as sprinkler pipes. A single circuit may contain from 1,000 to 1,500 ft. of thermostatic wire. With the 10-ft. spacing 1,000 ft. of wire will protect 10,000 sq.ft. of floor area. When desirable smaller sections may be used, giving a finer allocation of alarm.

An interesting possibility in the thermostatic wire is its use in automatic substations. Stations may be wired not only for fire but for protection against overheating of transformers and other apparatus. The installation of the thermostatic wire makes it possible to sound an alarm and automatically shut the station down in case of fire or the overheating of any of the equipment, which is particularly desirable for older type manually operated stations.

New Switch Provides Unbroken Main Line Rail

A TYPE of switch which embodies several new features is being marketed by the Railway Safety Equipment Company, Inc., Philadelphia, Pa. It is called the Freeburg Heel-less Safety Switch. The throw is made through the medium of a camshaft set in the switch block. This operates two tongues vertically. The use of two tongues eliminates the usual heel of other type switches and provides an unbroken main-line rail as well as unbroken curved rail. One tongue counterbalances the other, so as to provide for a simple and easy throw, whether by hand or automatic operation. The elimination of the heel prevents pounding which results in breaking down the switch bed. Excessive noise, as well as wear and tear on car equipment,



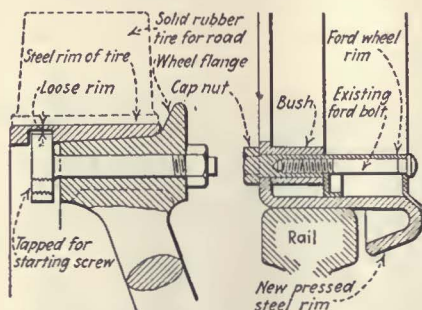
The Moving Part of This Switch Consists of Two Tongues and a Camshaft

is also reduced. When thrown for either the curve or main line, the tongues are locked in position and the vertical action of the tongues between solid steel centers prevents splitting of switches.

Wheels for Either Road or Rail Service

A WHEEL system which can be converted from that used on highways to a form suitable for operating on rails is described in *London Engineering* for Oct. 12. The device is being manufactured under the trade name of "Motorailer" by the Motorailer Transport Company, Ltd., London, England. Two applications of the system are now in service.

One design shown in the accompanying illustration consists in using a motor wheel of the rail-car type



Wheel Rim Design for Use on Either Track or Road

made of high carbon steel. To convert this to a form suitable for road service, a tapered loose rim is used. This slips over the main rim of the wheel and forms an intermediate member between it and the steel ring

at the base of the rubber tire. This loose ring is machined at an angle and is mounted in a manner similar to that used for holding piston rings. It is held in position by six $\frac{3}{4}$ -in. hardened steel bolts with sector-shaped heads. These fit into a milled slot in the loose rim.

Another design of rim construction is for use on a standard Ford truck. With this construction a pressed steel rail rim is attached to the wheel rim, the steel rim replacing the ordinary detachable rim generally used with rubber tires. An accompanying illustration shows the type of construction and method of fastening.

Non-Magnetic Cast Iron for Resistance Grids

NON-MAGNETIC cast iron has been produced by Messrs. Ferranti, Ltd., Lancashire, England, and has been patented by them in Great Britain and the United States. Its registered name is "Nomag." The magnetic permeability is practically the same as brass, while its electrical resistance is 50 per cent greater than ordinary cast iron. This combination in one metal is of advantage in electrical machinery construction. An increase of temperature causes a slight reduction in the permeability of the metal.

The mechanical properties generally are the same as cast iron, but Nomag has advantages in greater toughness and malleability, which are observable both in its high transverse deflection and in its resistance to shock. These qualities render the metal peculiarly suitable for resistance grids, especially when used for electric railway purposes.

In the design of electrical machinery and apparatus non-magnetic metals such as brass, gunmetal and aluminum are used where an alternating or rotating flux is present, in order to avoid hysteresis. The metals are not only relatively expensive but, as they are good conductors of electricity, they are susceptible to eddy currents.

The new metal is similar in appearance to ordinary gray cast iron and can be cast with the same facility and with the ordinary foundry equipment, although its shrinkage is $\frac{1}{8}$ in. per foot as compared with $\frac{1}{4}$ in. per foot for ordinary cast iron. It compares very favorably with ordinary cast iron in machining.

Association News & Discussions

Progress in West Virginia Railway Electrification*

BY STEPHEN Q. HAYES

General Engineer Westinghouse Electric & Manufacturing Company

WEST VIRGINIA is one of the most important states of our country from a power development standpoint, and must be considered as a pivotal point around which will doubtless center a large part of the super-power system that may ultimately tie together all the Eastern and Southern sections of the United States.

The coal deposits of a single county of West Virginia if sold at \$2.50 per ton would clear off the national debt of the United States. The water powers of West Virginia have been practically untouched, as the demand for power in the sections near such power sites has not warranted development. In most cases it has seemed more economical to generate the power by steam used in local power plants or in larger stations transmitting to the point of utilization. Later it may prove highly desirable to develop all possible water power so as to conserve the supply of coal, and to transmit power electrically from such water-power plants to points where it can be utilized advantageously.

The demand for West Virginia's coal for domestic and foreign use is such that anything that may be done to improve the coal-handling facilities of the important railways traversing the state is of vital importance to all users of coal. The Norfolk & Western Railway has already electrified its Elkhorn grade, relieving the congestion formerly existing at that point and greatly increasing the possibility of coal shipment over that railroad. The Virginian Railway is now arranging an extensive electrified section, while the Baltimore & Ohio and Chesapeake & Ohio railways are laying their plans for similar work.

The report of the Hoover super-power conference brings out the advantages to be gained by interconnection, and great economies in distribution through the interchange of loads between neighboring systems, securing a reduction of the amount of reserve equipment needed by having a better load factor. In the super-power survey made in the North-eastern States under the direction of W. S. Murray, it was calculated that the super-power systems proposed would conserve about 50,000,000 tons of coal per annum, with an annual saving of

\$500,000,000 at an additional capital outlay of \$1,250,000,000.

Electrification of the railroads and a direct connection between them and the power resources available will be considered by the Giant Power Survey Board of Pennsylvania. One-third of the present railroad haulage in Pennsylvania is coal. By eliminating much of this low-grade freight the railroads will be free for other purposes.

The electrification of the Elkhorn grade on the Norfolk & Western Railway has now been in service for such a length of time that the benefits are fairly well known. The purpose of this substitution of electricity for steam was to increase the capacity of the railway line by materially reducing the time required to handle trains, and also to provide a more economical and efficient service over the heavy grades. With this end in view, the electric locomotives were designed to handle the heavy freight trains up the grade at a running speed of 14 m.p.h. as compared with about 7½ m.p.h. under steam operation.

TWO ELECTRICS DO THE WORK OF THREE STEAM LOCOMOTIVES

The coal trains formerly handled in this service weighed 3,500 tons and were hauled up the grade by three Mallet steam locomotives. Two of these, a road engine and a helper, were used over the entire division. The third engine located at the rear served as a pusher at the 1.5 per cent and 2 per cent grades, and was cut off at the summit. Now a single electric engine is used over the electric division, and a second electric engine is used as a pusher up the heavy grade. One electric engine, therefore, takes the place of two Mallets over the division; and two electric engines take the place of three Mallets up the grade. A 4,800-ton train has been hauled in this manner. The constant-speed feature of the locomotive is considered a decided advantage in dispatching traffic through the single-track tunnel.

In all cases, the electric locomotives handle the train at approximately double the speed obtained with steam. On the 9-mile grade between Cooper and Graham, where the maximum rise is 0.4 per cent, and some stretches are level, the speed of the electric locomotive is 28 m.p.h.

The electric installation was designed for handling a daily total of twenty eastbound trains of 65,000 tons over the division, and ample provision was made for additional traffic and extension of the electrified track when required.

A notable achievement on this electrified section was the handling of 90,000 tons eastbound over the Elkhorn grade and through the single track tunnel at the summit in a single day.

The increased train speed and reduction in road delays obtained with the electric locomotive have greatly increased the track capacity on the mountain grade section. The officials of the Norfolk & Western Railway have stated that the electrification approximately doubled the track capacity of the electrified section and that the capacity of their entire system has been materially increased due to the speeding up of traffic on the grade section.

Another notable railway electrification of vital interest to West Virginia is that of the Virginian Railway, which has been recognized as a leader in mass transportation. This railroad is today operating the heaviest trains in the world with the most powerful steam locomotives. It is handling approximately 7,000,000 tons of coal per year, but the potential capacity of the mines it serves is far in excess of this amount and extensive new mine developments are under way.

The initial electrification of this railway will extend from Mullens, W. Va., where the coal is collected from nearly all of the mines served, over the heavy grade section to Roanoke, Va. There is an equivalent 2 per cent grade for approximately 10 miles just east of the western terminus of the electrification. This hill section is double track, but the remainder of the line is single track. The electrification will cover a route distance of 132 miles, and the track mileage to be electrified is approximately 213.

Under the present plan of steam operation, trains of maximum weight of 5,500 tons are hauled from the Elmore yard to the top of the hill at Clark's Gap with two Mallet pusher engines of the 2-10+10-2 type and a road Mallet engine of the 2-8+8-2 type. The speed on the heaviest grade section is 6 to 7 m.p.h. From Clark's Gap to Princeton, this train is handled by the road locomotive. At Princeton, which is an engine terminal, trains of a maximum of 8,500 tons are made up and taken east to Roanoke with the same road engine and a helper out of the Princeton yard, and up the Allegheny mountains from Whitehorne to

*Abstract of a paper presented at the Charleston meeting of the West Virginia Public Utilities Association, Nov. 9, 1923.

Merrimac. These Mallet pusher engines have a tractive power rating of 147,000 lb., operating compound, with a weight of 617,000 lb. on their drivers, and a total weight of engine and tender of 898,000 lb. The Mallets used as road engines have tractive power rating of 101,000 lb.

With the contemplated electric operation, trains of 6,000 tons will be handled from the Elmore yard to Clark's Gap with one road locomotive and one pusher, each being composed of three cabs or units. The speed will be 14 m.p.h. At Clark's Gap trains will be filled out to 9,000 tons, and the road locomotive will take this train all the way to Roanoke without a helper at a speed of either 14 or 28 m.p.h., depending on the grade and alignment conditions.

Each locomotive unit will weigh approximately 200 tons, and the weight per driving axle will be 75,000 lb. Each unit will have a continuous rating of 1,700 hp. at 14 m.p.h., and 2,000 hp. at 28 m.p.h. These electric locomotives are of the so-called split-phase type, similar to those used on the N. & W. Power is supplied from a single-phase trolley at a frequency of 25 cycles at either 11,000 or 22,000 volts.

Since the driving motors of these locomotives are of the induction type, the locomotive automatically becomes a generator and returns power to the trolley when the train tends to drive the motor above synchronous speed on descending grades. In this case, the speed rises slightly with load, but the total variation from maximum load motoring to maximum load generating is only about 10 per cent.

TURBO-GENERATING STATION TO SUPPLY POWER

Power for the Virginian electrification will be supplied from a steam turbo-generating station to be installed by the railway on the New River at Narrows. The initial capacity of this plant comprises four units, each with a maximum rating of 15,000 kw.

Two single-phase, 88,000-volt transmission lines carried on steel towers will supply outdoor transformer stations along the right-of-way, where the voltage will be stepped down for the trolley supply.

The initial power supply equipment will be sufficient for handling approximately double the present tonnage and sufficient for a maximum day traffic of 60 per cent in excess of the average corresponding to that figure.

Moreover, while three locomotive units will normally be coupled to form a service locomotive for handling 9,000-ton trains initially, the locomotives are so designed that four units may be coupled to handle 12,000-ton trains when the rolling stock is improved so that trains of that weight are feasible.

Power is to be supplied from a single-phase trolley at a frequency of 25 cycles and 11,000 volts. The locomotives and transformers and the distribution system are so designed that

when trains of 12,000 tons are handled, the trolley voltage can be changed to 22,000 by making a simple change in the transformer connection.

As the Virginian Railway and the Norfolk & Western Railway parallel each other for a considerable distance on either side of the New River and are only a short distance apart at other portions of their lines, the use of the same general scheme of electrification on the two lines will permit the ready interchange of power between these systems in case of necessity and will allow each system to act essentially as spare capacity for the other.

There is a tie connection between the Appalachian Power Company and the Norfolk & Western Railroad through the frequency changer equipment at Switchback, and there may be a similar connection to the Virginian. The probable interconnection between the Appalachian Power Company and Virginian Power Company at Scarborough, and the future tie connection between the Virginian Power Company, the Kentucky-West Virginia Power Com-

pany and other power systems may ultimately lead to a general interconnection of the railway and power systems throughout West Virginia and the neighboring states.

In addition to the Norfolk & Western, and the Virginian Railway, the Baltimore & Ohio Railroad has been seriously considering electrification of certain portions of their lines in West Virginia. At present, the general limiting conditions for the B. & O. are not due to conditions on the railway lines as they now exist in West Virginia, but the terminal facilities at the ports on the Atlantic seacoast. Particular sections in West Virginia can be greatly improved by electrification.

In a somewhat similar manner, terminal facilities for the Chesapeake & Ohio Railway are possibly limiting features rather than their lines in West Virginia.

However, when the terminal facilities of the B. & O. and the C. & O. railroads at the seaboard have been increased, it will then be advisable to increase their railway facilities.

West Virginians Hold Annual Convention

THE Public Utilities Association of West Virginia held its eighth annual convention in the Kanawha Hotel at Charleston, W. Va., on Nov. 9 and 10. A number of papers of particular interest to electric railway men were presented.

W. R. Power, general manager Ohio Valley Electric Railway, Huntington, W. Va., explained various methods of curtailing accidents caused by either mechanical or human errors. He urged every member to install every real safety device on machinery, as the cost would be but small compared to safety, and he urged that all see that the employees use the safety equipment provided for them.

Martin J. Insull, vice-president Middle West Utilities Company, Chicago, declared that the two most essential needs of the public utilities are favorable public opinion and finances to permit them to provide the public with the service it demands. Most Americans, he said, were in what might be classed as a commodity business, which turns its money over several times in the course of a year, while the public utilities turned their money over but once in five years. Thus talk of profits in utility business to a commodity man was something he couldn't really understand. Profits made him think of lower rates.

The speaker said this was because utilities are a natural monopoly. The monopoly, which sometimes puzzled the public, was an economic-born thing, he said. Builders couldn't afford to install two systems of gas, electric light and telephone. One was enough, and this creates the monopoly. To make this popular, companies must do more than provide the right kilowatt hours and legal service. The public naturally falls into ways of shopping around and

is antagonistic to a monopoly, unless it was impressed with its benefits. This imposed a duty on the utility companies, Mr. Insull said.

Alexander Forward of the Virginia Corporation Commission, Richmond, Va., talked on "The Future of Public Regulation." He said he had yet to find a public utility problem of rates that could not be satisfactorily arbitrated on behalf of the public.

Stephen Q. Hayes, Westinghouse Electric & Manufacturing Company, read a paper on super-power development and railroad electrification which is abstracted elsewhere in this issue.

Other speakers included J. A. Morris, district manager American Railroad Association, Cincinnati, Ohio, on "Relation of Railroads to Utility Commissions"; W. B. Clarkson, general commercial superintendent of the C. & P. Telephone Company, Washington, D. C., "Gaining Support of the Public"; Harry Reid, president Interstate Public Service Company, Indianapolis, Ind., "Electric Interurban Possibilities," and John S. Bleeker, who explained publicity methods of the Indiana, Columbus & Eastern Railway.

The association elected the following officers: C. H. Brues, Wheeling, president; Mentor Hetzor, Moundsville, W. R. Power, Huntington, and J. E. Harsh, Charleston, vice-presidents; A. M. Hill, Charleston, treasurer, and Bliss McCrum, Charleston, secretary

Pennsylvania Street Railways Association

THE Pennsylvania Street Railways Association will hold a convention at the Penn-Harris Hotel in Harrisburg on Dec. 4.

American Association News

Executive Committee

AN ENTHUSIASTIC meeting of the executive committee was held at association headquarters, New York, on Nov. 16. The members present were President Britton I. Budd and Executive Secretary Welsh, C. D. Emmons, W. H. Sawyer, R. P. Stevens, J. H. Pardee, J. N. Shannahan, C. E. Morgan, F. R. Coates, J. H. Hanna, C. L. Henry, L. S. Storrs, Paul Shoup, Gen. George H. Harries, A. W. Brady, C. R. Ellicott, M. B. Lambert for H. D. Shute, A. A. Hale, Barron Collier, C. S. Hawley, H. A. Johnson, J. K. Punderford, E. M. White and W. H. Hyland.

Mr. Pardee reported for the finance committee that the association's finances are in very satisfactory condition. A budget was recommended for 1924 and approved by the executive committee. This carried with it provisions for an increase in salaries of approximately 11 per cent for virtually the entire association headquarters staff, an increase in salary for the executive secretary, the renting of additional floor space. The committee also made recommendations as to the investment of certain surplus moneys. President Budd said that he had had the Bureau of Commercial Economics examine the conditions at headquarters, without expense to the association, and had received a report which spoke very highly of the efficiency of the personnel and the manner in which work was being conducted, but criticised severely the cramped office arrangement and lack of space for efficient operation. Mr. Budd said he thought it would be necessary for the association to move to some other building at the expiration of its present lease, with the idea in mind of setting up an office that would possibly serve as a model for railway men to come to.

Mr. Stevens reported for the committee appointed to nominate a new member of the executive committee to fill his unexpired term arising out of his election as vice-president. The committee recommended the appointment of Harry Reid, president Interstate Public Service Company, Indianapolis, and the executive committee approved. A motion was made and adopted that it was the sense of the executive committee that the election of a member of the executive committee to fill the unexpired term of another member should not be construed to prevent his re-election to fill one full term.

Mr. Storrs reported for the special sub-committee appointed to consider the association's relationship to the motor vehicle industry. The committee recommended that the executive committee accept the offer of the manager of the National Automobile Chamber of Commerce to organize a committee of that body to co-operate with the railway association for mutual benefit,

and made the suggestion that a committee of the railway association confer with a similar committee of executives of the National Automobile Chamber of Commerce for the purpose of considering further the working out of the suggestions.

In regard to the invitation of the Society of Automotive Engineers to co-operate in the development of standards, it was recommended that this be referred to the railway engineering association with instructions to appoint a committee for that purpose. Other matters of co-operation were left for the consideration of the above joint committees to work out in conference. The executive committee adopted these recommendations.

President Budd added to the report of this sub-committee that it was his feeling that the bus manufacturers want the co-operation of the American Electric Railway Association. He said that there is a very strong feeling that the future great market for buses is going to be through the electric railways. In time the railways are going to dominate the situation. If the manufacturers generally realize that the great market for their product is the electric railway field and find that their output is going to be taken there, they will be inclined to co-operate with the association in fostering the use of buses in non-competitive services.

Mr. Shoup expressed the view that if the manufacturers are willing to co-operate, that is very good, but there is no evidence of it yet in California. He said that much of the difficulty there has been caused by the granting of extensive credit by bus manufacturers. If they are willing to cease that sort of thing the railways will be glad to co-operate with them, but whether this is a fact is to be determined.

President Budd expressed the view that the association ought to have a continuing committee to study the whole bus situation and the best way of working out the railway problems jointly with the motor vehicle industry. The executive committee approved the appointment of such a committee and President Budd named the following members: L. S. Storrs, chairman; C. D. Emmons, F. R. Coates, Paul Shoup, A. W. Brady, J. G. Barry and M. B. Lambert.

MID-YEAR MEETING AT ST. LOUIS MARCH 4

Mr. Lambert, reporting for the special committee on date and location of the Mid-Year Meeting, recommended that St. Louis be selected as the place and Tuesday, March 4, as the date. He said that St. Louis has adequate hotel facilities, is near the geographic center of the railway field, and the conditions in St. Louis are deserving of this honor more than any other city that has not

recently been the center of an association meeting. The executive committee approved these recommendations.

President Budd requested authorization to appoint two new committees, one on city operation and one on interurban operation to cover in a comprehensive way, so that it may be disseminated to other member companies, information as to progressive operating methods and equipment, with the idea of speeding up the modernization program in the industry. A more elaborate description of the organization of these committees will be published next week.

Mr. Welsh reported that the American Committee on Electrolysis had recently met in Chicago to consider the advisability of renewing its work. The consensus of opinion was that the work should go on and a resolution was adopted authorizing Chairman Bion J. Arnold to communicate with each association having representation on the electrolysis committee and ask that it reaffirm the appointment of its representative and its intention to support the work financially. The executive committee approved the continued support of the A.E.R.A.

The executive committee discussed at some length the question of whether it should indorse the National Transportation Institute and encourage membership of electric railway companies in that organization. Bert M. Robinson of the Transportation Institute was invited to speak before the committee and he outlined its purposes and answered various questions. As there was insufficient time to give the matter full consideration and as it was realized that the proposed work is an extremely important one, action was deferred to a subsequent meeting and President Budd appointed a special committee consisting of P. H. Gadsden, C. D. Emmons, Paul Shoup, J. H. Hanna, F. R. Coates and W. H. Sawyer to give the matter further study and report back with a definite recommendation.

Mr. Emmons reported for the committee on the Charles A. Coffin prize, recommending that an award of merit be sent to each contestant whose brief contained one or more contributions of special value to the industry; that the committee give further consideration as to which companies should receive these awards of merit; that a letter of appreciation be sent to each of the seventeen companies which took part in the 1923 contest; and that the briefs be edited and prepared for possible publication in book form at the expense of the association. The executive committee approved all of these recommendations.

President Budd was authorized to appoint a special committee on arrangements for the Mid-Year Meeting.

President Hyland of the Claims Association requested approval, which was granted, to appoint a new committee of the claims association which would undertake to bring about uniform grade crossing laws.

The next meeting of the executive committee will be on Jan. 18 at association headquarters, New York, at 10 a.m.

The News of the Industry

Los Angeles After Subways Railroad Commission Holds Hearing on Projected Subway System of Pacific Electric Lines

The California Railroad Commission held a hearing in Los Angeles on Oct. 29 on the application of the Pacific Electric Railway for authority to construct a rapid transit subway in Los Angeles from its present Hill Street passenger terminal to Glendale Boulevard. The railway sought permission to proceed with its original plan to construct the subway as proposed to come to street grade at its Hill Street terminal.

The railway stated to the commission that it had expended \$800,000 for rights-of-way and had the funds in hand to proceed at once with its original plan with the view of giving relief to the congestion on Hill and Sixth Streets in Los Angeles, and for the purpose of furnishing rapid transit service between Los Angeles and Hollywood, as well as San Fernando Valley points; that the subway would take 116 interurban trains a day off of Sixth Street alone; that the work could be started immediately of digging the bore and completed within eighteen months, should the commission see fit to act favorably on the company's application.

DIFFICULTIES BEFORE CITY

As an alternative proposal the suggestion was made that the eastern terminus of the proposed subway might be diverted southward to Pershing Square. The company explained that the alternative proposal was submitted primarily to meet prevalent views that such a tunnel ultimately should become part of a general system of subways.

The city of Los Angeles in presenting its views to the commission indicated that many obstacles had to be removed before it could entertain further authorization of the terminus underneath Pershing Square. First, there were charter provisions to be met. In addition there were engineering problems to be overcome. It was outlined by the city's representative that Pershing Square would have to be excavated with steam shovels and then be remade, and if the requirements of the Park Department were met the station in the park would be 35 ft. below the street level.

It developed at the hearing that the board of engineers, representing the city of Los Angeles, the Los Angeles Traffic Commission, the Los Angeles Railway and the Pacific Electric Railway, had been unable to agree. This board was appointed thirty days ago to

endeavor to bring about an agreement regarding a comprehensive subway system for the city of Los Angeles. In the absence of such an agreement it is evident most any plan will be favored that can be carried out at once.

It is stated that any comprehensive subway system would cost the city from \$5,000,000 a mile upward with a total expense of \$100,000,000 for from 20 to 40 miles of line.

Super-Power Plant for Davenport

A super-power plant generating at least 200,000 hp., for consumption in the Tri-Cities and for long-distance transmission, will be located on the banks of the Mississippi River 2 miles above Davenport. Formal announcement to this effect has been made by B. J. Denman, vice-president and general manager of the United Light & Railways Company.

Located along the right-of-way of the Clinton, Davenport & Muscatine Interurban Railway and also along the line of the Milwaukee road, the power site will be easy of access for coal deliveries. It will also have river wharfage in case coal barge transportation on the Mississippi from lower Illinois and Ohio River mines proves practical in the future.

The first section of the new plant will be 160 x 220 ft. in ground dimensions and 110 ft. in height, of concrete and steel construction with brick exterior. The initial capacity will be 35,000 hp.

The engineering and construction work will be done by the United Light & Railways Company construction forces, the completion of the power plant and dam at Iowa City and the new power house at Fort Dodge making it possible to concentrate construction equipment and forces on the new Tri-City plant.

New Public Service Plan Not Yet Ready

Statements are unofficial which were made in the daily newspapers of Nov. 12 and 13 indicating that the Public Service Railway contemplates putting sixty buses in operation at this time in northern New Jersey. As has been indicated before, the company has in preparation a new plan looking toward unified railway and bus operation in New Jersey, but it appeared unlikely on Nov. 14 that this plan would be ready to be announced for a week or ten days. Out of terms they thought might be included in the forthcoming statement by the company, the newspapers of Nov. 12 and 13 built up and published a story that had the appearance of having been obtained from official sources.

Subway Amendment Carries

Detroit Electors Approve Proposal to Permit Construction of Subway or Elevated Lines

Two charter amendments carried at the Nov. 6 election in the city of Detroit have an important bearing on the city's street railway system.

One amendment, called on the ballot the "Subway Amendment," allows the city to bond up to 4 per cent additional to all other purposes for the construction of a rapid transit system, either subway or elevated. The other amendment permits the Street Railway Commission to sell property and equipment no longer needed by the system, and requires that the proceeds from the sale of such property be reinvested in other equipment and capital assets, or that it be so applied as to reduce the street railway's bonded indebtedness. Property now held by the commission and regarded now as salable has an estimated value of \$500,000.

The Subway Amendment, which required a 60 per cent favorable vote, was carried with a margin of 7 per cent. The other street railway measure was carried by a margin of 11 per cent.

Although called the "Subway Amendment," the measure which paves the way for rapid transit in accordance with the Culver-Wilcox bill passed by the Michigan State Legislature a year ago provides also that the city may own, operate and maintain an elevated railway. Under the terms of the amendment the city is authorized to proceed with plans for the construction of a rapid transit system and to finance construction by an issue of bonds for more than \$80,000,000 at 4 per cent of the present valuation of approximately \$2,100,000,000.

Power is conferred upon the city to make an initial appropriation to plan and fix routes; to make the city's annual assessment roll show in a separate column the assessment on any property because of the subway and the assessment on any property built and acquiring its assessable value because of the subway; to exercise the power of eminent domain if necessary for the purpose of the subway; to transport therein persons and property and to construct, own and maintain, with like powers, privileges and limitations, an elevated railway.

The Subway Amendment also provides for a board of three members called the subway board, appointed by the Mayor by and with the advice and consent of the City Council. The salary provided for the members of the board is not less than \$10,000 a year each,

until the work of constructing the subway is completed, after which the board's members shall serve without pay.

Mayor Frank E. Doremus was re-elected. He received about 90 per cent of the votes cast for Mayor.

Service Changes and Jitney Regulation Recommended

John A. Beeler, reporting to the city of Houston, says that faster service, rerouting of several lines and a redistribution of cars will effect economies that will result in increasing the earnings of the Houston Electric Company. He says, however, that a complete solution of the transportation problems of Houston will be impossible so long as the jitneys are allowed to operate as at present.

The report is in two parts. One covers the details of the railway situation and the other deals with the jitney problem.

Some of the things which Beeler suggests are a few changes in present lines of the company, the adoption of all double truck one-man cars on all lines except the Liberty, the abolition of the present plan of making sixteen stops to a mile, the elimination of all unnecessary delays, more stringent regulations regarding transfers and the placing of men in the downtown districts to assist in loading and unloading passengers during the rush hours. He estimates these changes will increase the earnings to \$602,000.

Mr. Beeler states in his report that he has made a careful survey of the railway situation from every angle and that the suggestions which the report contains will tend to reduce the operating cost and increase the desire of people to ride.

On jitneys, Mr. Beeler says:

A plan successfully adopted by many regulatory bodies is to limit jitney service to territory where the railway service is inadequate and unsatisfactory.

Among other things that are desirable in order to bring about better conditions are the following: A bond of at least \$10,000 should be required of each jitney to cover personal injuries and other liabilities; loading should be limited to the seating capacity, and the matter of taxation should be equalized between the two systems.

The jitneys in nearly every case operate along the railway routes in the old settled and comparatively close-in districts. They receive 6 cents for a single short haul ride, while the railway, which serves the outlying territory, receives an average of 6.45 cents for a much longer ride, and furnishes a free transfer if desired.

The jitneys run 55 per cent faster than the street cars. Because of this saving in time the people will put up with intolerable crowding and take chances on personal injuries. The public demands rapid transportation and the railway will suffer as long as it cannot supply that demand.

Mr. Beeler says that the solution lies largely within the power of the railway. It must revamp its slow, halting service, eliminate the unnecessary stops and delays and reduce the waste in all the factors involving the time element.

The report by Mr. Beeler was made in connection with the action by the company against the city to secure greater revenues.

Old and New Side by Side in Brooklyn

A half century's advance in street railway transportation in Brooklyn was pictured on Nov. 1, when the Brooklyn City Railroad placed on public view at Borough Hall a horse car of 1868 and one of its new front-entrance, center-exit, pay-as-you-pass cars, described in detail in the issue of the ELECTRIC RAILWAY JOURNAL for Oct. 27, page 739.

Following an inspection at the Fifty-eighth Street carhouse by Transit Commissioner LeRoy T. Harkness and other representatives of the Transit Commission, as well as by officers of the United Railways of Baltimore, the "Brooklyn," as the new car is known to the railway industry, was run to a siding at Borough Hall.

There it was joined by the old horse car, long since discarded, and manned by John Orleman of 170 Snyder Avenue, one of the few surviving drivers of horse cars in Greater New York.



Contrast in Cars Collects Crowds

Snyder, who recently retired with "a perfect record" after forty-seven and a half years of service, wore a part of the garb and used the same whip that was a part of his equipment when, after apprenticeship as a towboy, he worked as a driver on the Flatbush Avenue line.

The oil lamps of the car of the days following the Civil War contrasted strongly with the lurid front of the 1923 car. Between the vestibule windows and bumper of the latter the dash is painted a peacock blue, and, from the headlight as the center, there radiated a series of irregular streaks, producing a weird but striking effect. The new car, built for heavy city traffic, and designed from experience in Brooklyn surface transportation, is 44 ft. long over bumpers and seats fifty-three passengers. This is said to be the largest seating capacity yet attained in a car of this size. Two of the cars have already arrived and 200 of them will be in operation before 1924.

The old car was towed from its refuge in Fifty-eighth Street to be exhibited with its modern companion, from 11 a.m. to 7 p.m. Many thousands of the Brooklynites viewed the spectacle before the veteran driver conducted his charge back to the carhouse that night.

The 200 new cars, part of a progres-

sive betterment program being carried out by the Brooklyn City Railroad, represent an outlay of more than \$3,000,000. They are painted red and are trimmed with yellow. Each car costs approximately \$15,000. The cost of the old horse car which was shown in contrast to the new vehicle was about \$650.

Railway Tangle in Monterey

Transportation facilities in the vicinity of Monterey and Pacific Grove, Cal., are at present in an unsatisfactory condition. The difficult situation in which the Monterey & Pacific Grove Railway finds itself dates back to July, 1922, when the City Council of Pacific Grove brought suit against the railway praying for the annulment of the franchise. Its complaint was based upon non-payment of franchise taxes amounting to \$605 and the abandonment of a portion of line along Nineteenth Street to the Southern Pacific

Depot, about half a mile, which could not be operated at a profit. Judgment was rendered in November, 1922, in favor of the city of Pacific Grove and the company's franchise was declared forfeited.

The railway continued to operate until Sept. 11, 1923, on which date the company was served with an injunction prohibiting the operation of cars within that city. Since Sept. 11 cars have been operating from the city line of Pacific Grove through the city of Monterey to Del Monte.

The city of Pacific Grove signified a willingness to grant a new franchise provided the railway would lay new ties and rails and pave the streets for a width of 9 ft. along its right-of-way. This the company declared it could not do owing to its unfavorable financial condition and the unfair requirement of paving.

Bus operation has also played a part in the controversy. At the time the city brought suit for annulment of the company's franchise there was a bus line operating between the two cities at a 10-cent fare. The bus line failed financially twice in fifteen months. The bus line is now operating at a 5-cent fare between the business district of Monterey and Pacific Grove, but it does not furnish local service to Del Monte.

Renewal of Marietta Franchise Grants Approved

Residents of Marietta, at the election on Nov. 6, defeated the referendum petition prepared in opposition to the Monongahela-West Penn Public Service Corporation. As a result the company will continue its operations there and carry out the proposed improvements as soon as possible.

The City Council of Marietta recently passed three orders: One authorized the renewal of the interurban franchise held by the company, another renewed the franchise for railway operation in the city and another renewed the lighting franchise.

Action of the Council on these matters was questioned by some of the residents of the city and a petition was prepared for a referendum. It was this referendum which was defeated in the election. The civic clubs of Marietta were active in the campaign for the service of the company. The Rotary Club, Chamber of Commerce, Woman's Club, Kiwanis and Ad Clubs prepared advertising setting forth the probable condition of Marietta without the services offered by the company and stating the proposition which was made.

The company proposes not only to operate the railway system in the city, but to supplement this with bus service.

New York Central Seeks Electrification Details

Applications by the New York Central Railroad to the Public Service Commission for an order specifying detailed methods of electrification of its steam lines in New York City and to the Transit Commission for elimination of all its grade crossings under the general grade crossing law were made public on Nov. 11. The two applications, which were made necessary by the Kaufmann law requiring the electrification of all railroads in New York City, reopen the question of the relocation of the New York Central's tracks on the west side of Manhattan and the removal of the danger of tracks at grade on so-called "Death Avenue."

In its application to the Transit Commission the New York Central has asked that the expense of eliminating the grade crossings on its west side tracks, estimated at from \$15,000,000 to \$25,000,000, be borne one-half by the company, one-fourth by the city and one-fourth by the State, under the provisions of the general grade crossing law. By special laws, enacted in 1911 and 1917, the company is required to meet the expense of track relocation alone.

George McAneny, chairman of the Transit Commission, expressed doubt that the grades could be changed under the general statute in view of special legislation on the same subject, and said he did not believe that there would be any satisfactory solution of the west side problem or any of its phases until the railroad accepted the principle of the special acts and paid for an im-

provement from which it would derive great gain. Mr. McAneny said, however, that the Transit Commission would fix an early date for a hearing on the company's application and might unite with the Public Service Commission in a joint hearing.

The application of the New York Central to the Public Service Commission for an order specifying detailed methods of electrifying its steam lines in the city mentions as such lines its west side freight line from Spuyten Duyvil to St. John's Park and its Putnam Division. Freight trains on the Harlem Division also are operated by steam.

\$500,000 a Year More for Chicago Trackmen

Union shop and track employees of the Chicago Surface Lines have been granted an increase in wages by the arbitration board, which settled the wage controversy that resulted in a strike during the summer.

The wage increases average 8 cents an hour for the 2,200 men involved. They mean an increase in the annual payroll of the railways of approximately \$500,000.

The old and the new wages of craftsmen who will benefit by the increase follow:

	Old	New
Wreck wagon drivers (horse).....	\$5 a day	\$5.80 a day
Wreck wagon drivers (motor).....	\$5.20 a day	\$6 a day
Carpenters, per hour..	54 to 81 cents	64 to 91 cents
Painters.....	75 to 83 cents	85 to 93 cents
Electricians.....	90 cents	\$1 an hour
Linemen.....	\$1.10	\$1.20
Blacksmiths.....	87 to 92 cents	97 to \$1.02
Armature winders.....	90 cents	\$1
Machinists.....	83 to 95 cents	93 to \$1.05
Sheet metal workers...	85 to 90 cents	95 to \$1
Track dep't foremen...	67 cents	73 cents
Pavers.....	62 cents	68 cents
Track dep't laborers...	54 cents	60 cents
Watchmen.....	39½ cents	45½ cents
Moulders.....	81½ cents	91½ cents

The new wage agreement is for one year and is retroactive to Aug. 1, 1923. This is the second wage increase given employees of the Chicago Surface Lines this year, 13,000 trainmen and other employees receiving a 3 cents an hour increase after an arbitration hearing early in the summer.

Sum Appropriated for Engineering Education

The Carnegie Corporation of New York made an appropriation of \$108,000 recently for the study of engineering education to be conducted by a director responsible to a committee of the Society for the Promotion of Engineering Education. The resolution adopted by the corporation sets aside for the purpose \$24,000 during the present fiscal year and \$12,000 during the fiscal year 1924. W. E. Wickenden has been chosen to conduct this work. Mr. Wickenden is assistant vice-president of the American Telephone & Telegraph Company. From 1909 to 1914 he was assistant professor of electrical engineering at the Massachusetts Institute of Technology and associate professor until 1918.

Public Utility Study Courses Expanded

The Institute for Research at Madison, Wis., in co-operation with Wisconsin University, proposes to expand the study of public utilities so as to put more emphasis on research and individual instructive work.

The proposed program, Prof. Martin G. Glaeser of the Institute staff explains, has a threefold emphasis: A general liberal education; selection of courses which will provide training in method; acquaintance of student with the historical, legal, economic and factual background of the field. Professor Glaeser contends that instruction representing greater detail tends in the direction of the vocationalism and should, therefore, be discouraged. He said:

Special courses in transportation have long been an integral part of the graduate and undergraduate instruction in economics at the University of Wisconsin. Coincident with the beginning of state regulation by commissions in 1905, the work was expanded to include instruction in the field of the local public utilities.

Within the field of public utilities, opportunity can be given for a comprehensive survey course in the history and regulation of public utilities. This should include the local utilities along with railroads and national utilities generally in order to economize time and be available for those who have no interest in the work beyond its "public interest" features. This can then be followed with special courses in the administration of local utilities and railroads.

Burden of Rhode Island Wage Demand \$3,000,000

An increase of \$3,045,689 a year in operating costs of the United Electric Railways, Providence, will result, according to an estimate by the company, if the wage advance asked by the men is granted.

The additional operating expense, according to the company's statement, would necessitate a 12-cent fare, or eleven tokens for \$1, for transportation in the present zones.

Among the increases asked were the following:

- Motormen and conductors from 58 cents an hour to 80 cents an hour.
- Brakemen from 49.6 cents an hour to 65 cents an hour.
- Trolley tenders from 28.7 cents an hour to 40 cents an hour.
- Warehouse men from 49.6 cents an hour to 60 cents an hour.
- Receiving clerks from 49.6 cents an hour to 65 cents an hour.
- Cashiers from \$28.75 a week to \$40 a week.
- Bill clerks from \$26.75 a week to \$35 a week.

An offer to arbitrate the new working agreement submitted by its employees has been made by the company to the union officials. The proposal was that the present agreement which expired at midnight Oct. 31, be continued until the arbitration board had considered the matter as presented by both sides and had then submitted its findings on the terms of the new proposal.

As was reported in the ELECTRIC RAILWAY JOURNAL, issue of Nov 10, the men are opposed to arbitration, but have renewed their request for a conference on their recently submitted draft agreement including a wage increase and the closed shop.

News Notes

Thirty-three Years Without Accident.—John Donahue, motorman, and John Murphy, conductor, of Peoria, Ill., are charter members in the "Safe Drivers Club." They have a record of thirty-three years as a railway crew without an accident of any kind. Since 1890 they have covered more than 1,250,000 miles together. They are known as the original "Safe Drivers."

Wins Paving Suit.—The city of New York has won its paving suit against the Union Railway by a decision of the Appellate Division of the Supreme Court, which rules that the company was not exempt from provisions of the law requiring street railways to keep in repair not only the space between the rails of each track, but the space between the tracks and for 2 ft. on the outside of each track. The result will be that the company will have to pay the city the cost of paving its entire roadbed area, which will amount to more than \$100,000 a year above the amount conceded by the company. The suit heard by the court involved a claim of only \$395 for work done on Melrose Avenue.

Examination Date Announced.—The United States Civil Service Commission will hold an examination on Dec. 5 to fill vacancies in the Bureau of Standards. The optional subjects for junior engineers include civil, electrical, mechanical and radio engineering.

Only Electric Trains in Tunnel.—R. H. Keays, chief engineer of the Moffat tunnel, which is to be a little more than 6 miles long, at a recent address before the Denver, Col., Civic and Commercial Association, explained that only electrically operated trains would use the Moffat tunnel and in consequence there would be no need for artificial ventilation. The work on the tunnel is going right along, both portals having been bored so far in that the winter snows will not interfere with further progress.

"At Your Service" Gives Facts.—The Virginia Railway & Power Company, Richmond, Va., has been running advertisements in the form of a bulletin in the *Times-Dispatch*, entitled "At Your Service." Bulletin No. 2 gives some facts with regard to the operation of the trolley in Richmond during September.

A "Make-Up" for the Ladies.—Every now and then the "Public Service News" published by the Winnipeg Electric Railway, will set aside an issue specially for ladies. The company says in the first number devoted to women patrons that it has endeavored to get a "make-up" as neat and as dainty as the sex to which it is addressed. A patron suggested the plan because from his observation the women were the worst offenders against speeding up service, etc. The Winnipeg Electric

Railway declares that it does not share this view, but rather thinks the women observant of principles upon which good service is built.

Honor Men Listed.—Appreciation of long and faithful service given by ten veteran employees of the Indiana Service Corporation on the city lines of Fort Wayne is expressed by officials of the company through the formation of a "Personal Service Honor Roll." The ten men have service records ranging from twenty-five to more than fifty years and all are still in the service of the company. Cards bearing the names of these employees have been placed in all the city cars, under the caption "Personal Service Honor Roll." Four of the men were in the service of the company in the days of the old horse cars.

One Day off Without Pay.—Employees of the Seattle Municipal Railway lines will have one day off in eight, under a bill introduced in the City Council by Chairman E. L. Blaine of the finance committee. The bill calls on Superintendent D. W. Henderson to rearrange schedules to permit the day off without pay. This policy was agreed on by the budget committee two months ago.

Mountain Division Electrification Report Renewed.—From official sources it is learned that there is nothing new in the report from Pittsburgh to the effect that while no final plans have been adopted for the running of Pennsylvania trains by electricity in the mountains from the Conemaugh section to Altoona, it has reached the point of a definite intention to electrify parts of the Allegheny Mountain lines on both sides of the watershed, which begins at either Galitzin or Cresson.

Tells Its Own Story.—The Vicksburg Light & Traction Company, together with other utilities, is getting out some joint publicity on the things it is doing and for what it stands in the development of the city of Vicksburg, Miss. The railway is a member of the Louisiana-Mississippi Committee on Public Utility Information and suggests that patrons keep in touch with the committee if they want information about their railway property.

Reprints Into Book Form.—The North American Company, New York, N. Y., has put into book form various articles reprinted from the *Wall Street Journal* relating to that company's activities. The pamphlet is called "An Unusual Record of Achievement." It tells all about the company's earning power, expansion, etc.

Will Call Election.—Mayor McNich of St. Joseph, Mo., will call a special election to submit the proposed railway contract for furnishing electric current to the city for lighting purposes as soon as he receives a report from the State Public Service Commission that the form of the contract, which was contained in an ordinance passed by the Council, is approved. No bond issue is involved in the proposed election.

The question will be merely whether or not the city will enter into a contract for electric current with the railway at a cost of 1.8 cent per kilowatt-hour for the first 500,000 kw., and 1 cent for all over that amount.

What Houston Is Doing.—How it served its patrons in 1891, 1901 and 1923 was shown by the Houston Electric Company in a recent advertisement in the *Houston Post* entitled "That Houston May Fulfill Her Destiny." Accompanying the pictures the company tells something of its accomplishments and aspirations. It states that from July 31, 1920, through July 31, 1923, the company spent about \$7,000,000 in the extension, improvement and operation of the railway system.

One-Man Car Service Discontinued.—The Tacoma Railway & Power Company has discontinued its one-man car operated to Clover Park from Lake City, connecting with the American Lake line. The district is now served by a motor bus, operated by the City Transportation Company. Fare on the new bus line will be 35 cents one way, with a 25-cent rate to the Lakeside Club. Cars on the south side to Murray will continue as usual.

Ford Gives Another Loan.—The Ford Motor Company has again come to the aid of the city of Detroit by recently agreeing to advance another \$2,000,000 to take care of electric railway extensions and to enable the city to meet payments on sewer work already contracted for. The recent loan brings the city's debt to the Ford company up to \$5,000,000.

Names New Director of Bureau.—The Illinois Committee on Public Utility Information has announced the appointment of Keith Spade as director of its department of public speaking, known as the Public Service Speakers' Bureau.

Better Health Among Employees.—At a meeting of the board of directors of the United Railways, St. Louis, it was brought out that there was a great improvement in the general physical condition of members of the Employees' Mutual Benefit Association. Colonel Perkins remarked that the increased care of the fellow men was beginning to bear good fruit. For a period of sixty days recently there were no deaths reported.

Chair in Transportation Endowed.—Senator William B. McKinley, chairman of the board of the Illinois Power & Light Corporation, Chicago, Ill., has presented to the University of Illinois securities yielding \$7,000 a year for the endowment of a chair in the economics of transportation.

Transit Plan Coming.—The Rapid Transit Commission at Detroit is making plans for the development of a financial and legislative program intended to further the rapid transit project. It has been announced that the commission hopes to develop a plan to finance a rapid transit system that will not be dependent for its success on the ability of the city to borrow within its present debt limits.

Financial and Corporate

Independent Receiver Sought

Holders of St. Louis & Suburban Bonds Want Road Separated from United Railways

Appointment of an independent receiver for the St. Louis & Suburban lines and segregation of those lines from the United Railways system of St. Louis are demanded by the foreclosure suit filed in the Federal court during the week ended Nov. 10 by holders of Suburban bonds on which default has occurred.

A separate valuation of the Suburban properties is demanded to determine among other things, whether the present rate of fare is too high or too low. In demanding an independent receiver the petition states that Rolla Wells, the receiver of the United Railways, is not qualified to act in that capacity for the Suburban, as he represents interests that conflict with those of the Suburban claimants.

The bondholders' committee, members of which appear as plaintiffs in the foreclosure suit, professes to represent about 80 per cent of the holdings of the \$4,500,000 issue of general 5 per cent bonds of the Suburban, which matured on April 1 last, and have not been paid. Marion C. Early and Sam B. Jeffries appear as counsel for the petitioners.

The Mississippi Valley Trust Company, trustees under the Suburban general mortgage, heads the list of plaintiffs, and the individual plaintiffs, members of the bondholders' committee, are Herman C. Stifel, A. C. F. Meyer, J. L. Johnston, John G. Longmire, Craig McQuade and A. H. Reller.

The defendants named are the St. Louis & Suburban Railway, United Railways, St. Louis & Meramec River Railroad, St. Louis Trust Company, St. Louis Transit Company, Mercantile Trust Company, trustee, American Loan & Trust Company, Boston, and Rolla Wells, receiver of the United Railways.

The Suburban lines and those of the St. Louis & Meramec River Company, which are involved with them in the present proceedings, are the present Hodiament, Sarah and Union lines of the United Railways, that part of the Manchester lines west of Sarah Street, and the Maplewood-Meramec, Kirkwood-Ferguson and Florissant lines in St. Louis County.

These lines, the petition states, form 15 per cent of the United Railways system, and furnish more than 15 per cent of its revenue, while their bonded indebtedness is less than 12 per cent of that of the entire system. The Suburban and Meramec lines were absorbed Dec. 31, 1906, by the United Rail-

ways, which thus obtained a complete monopoly of railway transportation in the city and St. Louis County.

The petitioners allege that in 1917 the United Railways charged \$638,279 against depreciation reserve on account of two power plants of the Suburban which were closed without rendering any account of the proceeds of their disposition. This amount, it is alleged, was less than the Suburban lines' share of the United Railways depreciation reserve for that period. The petitioners say this reserve should have been at least \$850,000, and the court is asked to order Receiver Wells to pay that sum, or a sum fixed by investigation, to the new receiver.

It is charged that the United Railways has operated the Suburban property to the profit of the entire system, rather than to that of the Suburban lines, and that this has been detrimental to the interest of the Suburban bondholders. A separate valuation was asked three times, the petition states, but was opposed by the company and the receiver.

The petition says the Suburban lines are capable of being administered independently of the United Railways, and for that purpose, it asks that Receiver Wells be ordered by the court to turn over to the Suburban the rolling stock and other equipment which it will need, and to furnish the needed power at cost. This can be done, it is stated, without detriment to the United Railways system.

Sam B. Jeffries, attorney for the Suburban group, gave out this statement:

We have a mortgage on the best producing portion of the United Railways. Our interest on the mortgage is unpaid, and we are asking for our property, so that we can make it produce for us.

The old Suburban lines were the biggest of the lines that went into the United Railways, and had the greatest potentialities. For instance, the Broadway, the Olive and the Cass lines served a community whose needs were already known. But the Suburban lines served growing communities—Florissant, Ferguson, Maplewood, Webster Groves, Kirkwood and the like—all needing development of the car service.

The report of James E. Allison & Company, consulting engineers, shows that while the underlying bonds and mortgage total only \$6,500,000, the minimum value of the physical properties is \$7,500,000. We have a mortgage on a real paying property, and we want our money, or a chance to get it.

Receiver Will Show Railway's Worth.—The Norwalk-Shelby traction line, placed in the hands of a receiver on Nov. 3, will have a chance to prove its worth, according to Receiver E. G. Martin. Freight-carrying equipment will be added to the line and arrangements have been made with the Ohio State Power Company, Tiffin, to continue to deliver electricity to the power customers of the company by way of Plymouth.

Net Up \$93,802

Third Avenue Railway, New York, Reports Gain for Year Ended June 30

For the fiscal year ended June 30, 1923, the operating revenue of the Third Avenue Railway System, New York, was \$14,406,784, an increase of \$265,371, or 1.88 per cent, as compared with the fiscal year ended June 30, 1922. The operating expense for the year ended June 30, 1923, was \$10,726,984, an increase of \$171,957, or 1.63 per cent, as compared with the previous year. The net income for the year recently ended was \$301,276, an increase of \$93,802 over the previous year.

The property earned during the fiscal year a fraction more than 6 per cent on the 5 per cent adjustment bonds and the directors authorized two interest payments of 3 per cent each, making 6 per cent for the year. Five per cent was for the current interest and 1 per cent a payment upon the accumulated interest on these bonds. There remains as interest still unpaid upon these adjustment bonds 20½ per cent.

Slaughter W. Huff, president of the company, explains that there has been some misunderstanding as to the amount that is available for payment of accumulated interest on these bonds, due to the fact that all the company's cash or its equivalent in securities has been carried heretofore in the current assets account without reference to the amounts that were due to depreciation and contingencies and other reserve accounts. With the report for the year recently ended there was submitted a balance sheet which shows cash or securities to the amount of the depreciation and contingencies account so set apart that current assets the company has available for general purposes may be readily distinguished. Mr. Huff says it will be seen that these assets are not more than are necessary for the safe operation of the companies and the protection of the stockholders' interest in the property. He says

Your directors believe that sufficient cash or its equivalent should be kept available at all time for the purposes of the company, and that the surplus that has been already created should be maintained for the protection of the property. They have, however, paid out in interest on the adjustment bonds, approximately all that has been earned during the last two years, 5 per cent being paid last year and 6 per cent this year.

After the reorganization of the Third Avenue Railway in 1912, 20 per cent of the gross receipts of the companies of the system was set aside for maintenance of the property, depreciation and contingencies. Under the low costs of labor and material prevailing prior to the war, this provided for the maintenance of the property and created a depreciation and contingency fund, which was invested in the securities of the company as follows: \$2,022,498 Third Avenue Railway first refunding 4 per cent bonds, \$254,388.97 Third Avenue Railway 5 per cent adjustment bonds.

With the high cost of labor and material prevailing during the war and since, it was necessary to increase this percentage of gross receipts for maintenance, depreciation and contingencies from 20 per cent to 25 per cent, and during a portion of the time it required the entire 25 per cent to maintain the property or to take care of deferred maintenance, but there have been

**CONSOLIDATED STATEMENT OF INCOME
OF THIRD AVENUE RAILWAY SYSTEM
FOR YEARS ENDED JUNE 30, 1923 AND 1922**

	1923	1922
Operating Revenue:		
Transportation.....	\$14,008,416	\$13,783,349
Advertising.....	150,000	121,755
Rent of tracks and terminals.....	26,005	26,868
Rent of buildings and other property.....	174,695	196,746
Rent of equipment.....	34,551	.....
Sale of power.....	13,117	12,694
Total operating revenue.....	\$14,406,784	\$14,141,412
Operating Expenses:		
Maintenance of way and structures.....	\$1,425,233	\$1,667,318
Maintenance of equipment.....	1,334,189	1,211,766
Depreciation accruals..	733,347	597,177
Power supply.....	1,223,968	1,119,464
Operation of cars.....	4,574,373	4,492,966
Injuries to persons and property—expended..	1,074,590	867,078
Injuries to persons and property—reserved..	*203,613	63,890
General and miscellaneous expense.....	564,794	535,367
Total operating expenses.....	\$10,726,984	\$10,555,026
Net operating revenue....	\$3,679,800	\$3,586,386
Taxes.....	968,044	964,969
Operating income.....	\$2,711,756	\$2,621,417
Interest revenue.....	287,348	261,537
Gross income.....	\$2,999,104	\$2,882,954
Deductions from Gross Income:		
Interest on first mortgage bonds....	\$548,080	\$548,080
Interest on first refunding mortgage bonds.....	879,620	879,620
Interest on adjustment mortgage bonds.....	1,126,800	1,126,800
Track and terminal privileges.....	14,524	14,766
Miscellaneous rent deductions.....	7,782	9,793
Amortization of debt discount and expense.....	21,315	20,782
Amortization of limited franchises.....	10,904	8,670
Sinking fund accruals	33,480	33,480
Miscellaneous.....	55,324	33,485
Total deductions..	\$2,697,829	\$2,675,479
Net income.....	\$301,275	\$207,475
* Deficit.		

periods in which a substantial part of the 25 per cent went into the depreciation and contingency account. During the past year, about \$750,000 passed into that account, partly due to the fact that it was difficult to secure sufficient labor to carry on the maintenance work, and partly to the fact that it was not believed to be economical to perform under present costs maintenance work that might be deferred to a more favorable time for the purchase of material and employment of labor, and when the money could be expended more economically for maintenance work.

It is important that a depreciation and contingency fund be created and that actual cash or its equivalent be set aside to cover this account, not only because of the necessity for actually purchasing from time to time additional equipment to replace that which has worn out or become obsolete, but because it would seem particularly desirable to have a cash fund available from which to borrow, in order to cover the actual cash expenditures that have to be made under capital account.

So long as accumulated interest on the adjustment bonds remains unpaid, the company is not permitted to acquire or construct additional lines, for which additional capital might have to be issued. It is necessary, however, in order to operate lines already owned or controlled, that from time to time expenditures should be made on account of additions to capital. Under the present conditions, these expenditures must of necessity be taken care of out of the surplus of the companies, or borrowed from its depreciation and contingencies fund.

The increased actual physical property of the companies, upon which they are entitled to increase their capitalization, is an offset against the depreciation of the property that has already taken place, or is to

take place, and it is perfectly legitimate to borrow from the depreciation and contingency account, in order to meet the requirements of the capitalization account. It would seem under present conditions that this would be a wise procedure and for the best interests of the security holders of the companies.

At any time that conditions might be favorable, additional securities can be issued for the capital account, and the depreciation and contingency account reimbursed for the funds borrowed from it, while for the present the properties are saved the great sacrifice that would result from an effort to market securities under present conditions.

If the issuance of additional securities can be avoided, with the increase of gross receipts that must result from the growth of the territory of the companies, the financial position of the company should be greatly strengthened, regardless of any temporary setbacks that may come due either to increases in the cost of labor and material, or to the temporary loss of receipts.

Northern Massachusetts May Suspend in December

By a decree of Judge Charles DeCourcy of the Massachusetts Supreme Court, set forth at a hearing in Boston on Nov. 9, service on the Northern Massachusetts Street Railway may cease on Dec. 31 next, either on the whole of the property or upon such portion or portions as the receiver, Daniel P. Abercrombie, shall deem wise, with the written consent of trustees under the mortgages.

The course authorized on the Connecticut Valley system, controlled by the same interests and having the same receiver, was left to be determined at a continued hearing on Nov. 16. The probability is that some of these lines will cease operation on Dec. 31 and that all of them will stop by March 31, unless sales are made enabling some of the lines to be run by other interests.

In the case of the Connecticut Valley lines, which serve Greenfield, Northampton, Deerfield, Turners Falls, Amherst and other points, sale by foreclosure has been generally agreed upon as most desirable. Provisions for immediate needs of the Northern Massachusetts are covered in the court decree, which authorizes the borrowing of \$15,000 on receiver's certificates and the renewal of \$25,000 in outstanding certificates.

Revaluation of Rochester Lines Sought

The city of Rochester has opened proceedings for the review of the valuation of the Rochester lines of the New York State Railways under the service-at-cost contract with the service of summons and complaint upon the railway. The city sets forth that the valuation of \$19,216,000, fixed by the appraisal under the contract, is excessive and predicated upon war-time values.

This action, it is expected, will be tried before the December equity term of the Supreme Court.

President Hamilton of the New York State Railways maintains that the revaluation will show the lines to be worth in excess of the figures set by the appraisal, under which the revenues are now determined.

Purchase of Seattle & Rainier Valley Property Discussed

Possibility of ultimate purchase of the Seattle & Rainier Valley Railway system by the city of Seattle to put Rainier Valley residents on a parity with the rest of the city in fares was discussed informally recently when John C. Higgins, counsel for the company, appeared before the City Council street committee to ask that body to recommend repeal of an ordinance passed recently requiring the company to pave its right of way in Rainier Avenue between Graham and Morgan Streets. The company has pending before the franchise committee of the Council a request for relief from its franchise obligations to pay the city a percentage of its gross revenue as a franchise tax and to carry policemen, firemen and city officials free on its lines. Mr. Higgins said if the company was relieved of these burdens, it would not be able to continue the recent fare adjustment, which put the Rainier Valley patrons on a parity with the Seattle Municipal Railway patrons. While Mr. Higgins suggested that the city might eventually buy the lines as the only means of assuring the same treatment for residents of the section as for other parts of the city, he made it clear that his informal suggestion was not an attempt to open negotiations with the city for merging the line with the Municipal Railway.

Large Payment Made at Montreal on Account of Accumulations

J. F. Saint-Cyr, chairman of the Montreal Tramways Commission, has sent a check for \$303,745 to the city, covering city rentals for the quarter ended Oct. 1, amounting to \$125,000, the balance to serve against the arrears. This is the first check forwarded covering the present fiscal year payments, the fiscal year of the company being from July 1 to the succeeding June 30. It is with only one exception the highest amount paid on this account since the present contract came into force on Feb. 9, 1918.

Paragraph 4, of Article 92, of this contract, dealing with city rentals, reads as follows:

The city shall receive out of the gross revenues over and above all other amounts to which it may be entitled under this contract or otherwise the sum of \$500,000 per annum during the continuation of this contract, payable quarterly.

During the period from Feb. 9, 1918, to Feb. 12, 1921, the company was unable to pay anything to the city on account of city rentals from its gross revenues, and the quarterly amount of \$125,000 consequently grew into a considerable amount of arrears.

On Feb. 12, 1921, the gross revenues were such as to permit the sending of a check to the city for rentals amounting to \$61,090. During the succeeding month another check was mailed on the same account, amounting to \$170,985.

Four payments were made during 1922, as follows, Jan. 27, to the amount

of \$182,468; April 27, \$195,915; Oct. 3, \$260,748; Nov. 27, \$318,720.

Four payments have now been made during 1923, as follows: Feb. 12, to the amount of \$382,741; May 5, \$106,656; August, \$81,033; October, \$303,745.

Total payments to date under the present contract on account of city rentals amount to \$2,064,106. The total amount owing to the city on this account from the beginning of the contract to Oct. 1, 1923, was \$2,817,694. The balance still owing to the city is therefore \$753,587.

These payments on account of city rentals do not include sums paid to the city by the company for taxes and snow removal. During the fiscal year ended June 30, 1923, the company paid in taxes to the city the sum of \$229,629, and in snow removal the sum of \$190,800. The latter is half of the total cost of snow removal in the city on the tracks. The amount of \$889,151 was paid to the city during the 1922-1923 fiscal year for city rentals, this being 10.86 per cent of the gross revenues.

A Good Year for Aberdeen's Cars and Buses

Despite greater unemployment in Aberdeen, the report of William Forbes, general manager Tramways Department, shows that for the year ended May 31, 1923, the management gave more service and earned more net than in either of the two years preceding. The changes in the railway end compared with the year before were: Gross earnings up from £184,618 to £184,868; operating expenses down from £137,979 to £133,614; net, before interest, sinking fund, depreciation, renewals and special expenditure, up from £46,639 to £51,254; surplus down because of exceptional payments from £15,089 to £8,663. The motor bus division grew from £11,650 gross to £12,557. But operating expenses fell from £8,443 to £8,224, increasing the net before fixed charges from £3,207 to £4,033. After payment of interest, sinking fund and special expenditures, there was left a balance of £1,257 (compared with £771 the year before) for renewal and reserve accounts.

One-third of the railway division's surplus of £8,663 was, by ordinance, turned over to the fund called "Common Good and City Improvements."

The double-deck street cars standard in Aberdeen ran 2,399,742 car-miles for 41,142,504 passengers, giving a density of 17.14 passengers per car-mile. In the preceding year service was less liberal, as only 2,252,889 car-miles were run for 41,087,388 passengers, a density of 18.23 passengers per car-mile. Of course, these high density figures are caused by the zone-fare system. More than 30,238,000 persons rode at 1d. although the fare scale ranges from 3d. to 3d. As the motor buses are single-deckers and in use on poorer routes, they do not show the same densities, although far higher than Ameri-

can bus routes of like characteristics. The buses carried 1,805,279 riders with 169,353 bus-miles, a density of 10.66, which compares as follows with the preceding year 1,646,672 riders, 157,807 bus-miles and 10.43 density.

Street car earnings averaged 18.37d. per car-mile from an average fare of 1.07d. and buses averaged 17.33d. per bus-mile from an average fare of 1.51d. Car operating expenses were 13.36d., leaving 5.12d. to overhead; bus operating expenses were 11.65d. and assigned interest and sinking fund charges 3.93d. per mile.

Ottawa Company Earning 7.74 per Cent Return

Figures on the earnings of Ottawa Electric Railway for the present year have been made public in connection with the negotiations between the company and the city of Ottawa for a straight 5-cent fare and extensions to the company's system. According to the *Canadian Financial Post* the figures indicate that for the first eight months of the present year the gross passenger revenue declined \$40,069, as compared with the first eight months of 1922.

The compilation of the return on the company's plant investment indicates a yield of 7.74 per cent during 1922 obtained as follows:

Capital additions.....	\$88,730.43
Allowance for engineering, etc.....	9,760.34
Total annual additions.....	\$98,490.77
Total investment at end of period.....	4,076,499.47
Less one-half capital additions.....	49,245.38
Average investment.....	\$4,027,204.09
Working capital.....	80,000.00
Average investment and working capital.....	\$4,107,204.09
Net return available 1922.....	317,826.01
Per cent return 1922.....	7.74

Income Lower—Passengers Increase in Louisville

During the nine months ended Sept. 30, 1923, the number of passengers carried on the Louisville Railway totaled 73,102,434. This represented an increase of nearly 5,000,000 over the corresponding period in 1922. The revenue derived from these patrons, however, was not so great as last year, due to a fare rate reduction through the sale of 6-cent tokens used by about 80 per cent of the passengers carried. The total revenue from transportation was \$3,182,417, a decrease of \$135,834 compared with the same period of last year. The decrease in operating revenue was offset by operating economies effected, which resulted in reduction of expenses for the nine months of 1923 by \$46,416. Operation of all these factors has resulted for the first nine months of this year in a reduction of the barometer fund from \$350,000 to \$238,571, after the payment of all expenses, fixed charges and full accrual of dividends, as provided by the ordinance. It is expected that October operations will further reduce the amount of the fund by \$10,000, according to a statement by President Barnes. He fur-

ther stated that if the barometer fund could, by operating economy and by increased riding, be brought to the sum of \$500,000, the fare would under the terms of the ordinance be reduced to 6 cents straight.

Long-Term Bonds Offered.—A syndicate headed by E. H. Rollins & Sons is offering at 98½ and interest to yield more than 6.10 per cent, \$5,000,000 of the Illinois Power & Light Corporation first and refunding mortgage gold bonds, known as series "A," 6 per cent, thirty years. The bonds are dated April 2, 1923, and are due April 1, 1953. The bonds are secured by direct mortgage or collateral lien on properties appraised at a value substantially in excess of the total debt and are a direct first mortgage or lien free of prior encumbrance on properties, including some of the most important power and light properties of the system.

New Director Elected.—Irving T. Bush has been elected a director of the Brooklyn City Railroad to fill a vacancy.

Property Sold.—The property of the Northwestern Electric Service Company, which operates a trolley and lighting service between Erie and Meadville, was recently sold to the Penn Public Service Corporation of Johnstown, Pa. Last May the Penn Public Service Corporation, acquired the stock of the Erie Lighting Company and the acquisition of the Northwestern stock is part of a far-reaching plan on the part of the Penn company to extend its power and lighting properties throughout the state of Pennsylvania from the Maryland line in the south to Erie in the north. Purchase of the Northwestern Electric stock was made through the Venango Public Service Corporation.

Five-Year Gold Notes Offered.—The Salt Lake & Utah Railroad has announced the offering of a new issue of \$150,000 of five-year 7 per cent secured gold notes. The issue has been purchased by the Palmer Bond & Mortgage Company and E. H. Rollins & Sons. The notes, offered at 99 and interest to yield 7½ per cent, are secured by deposit with a trustee of \$200,000 of Salt Lake & Utah Railroad's 6 per cent first mortgage bonds. A feature of the notes is that they are convertible into first mortgage bonds prior to Oct. 1, 1925, at 89; thereafter the conversion price advances 1 per cent each year until maturity of the notes, Oct. 1, 1928. The proceeds of the notes are to be used by the railroad to cover the cost of additions and improvements along its line, chief among which are tracks and sidings at the new Columbia Steel Corporation's plant near Provo, Utah.

Payment Made.—The May 1, 1923, coupons pertaining to the Dayton, Springfield & Urbana Electric Railway's first mortgage 5 per cent thirty-year gold bonds due Nov. 1, 1928, were paid Nov. 1 last at their face amount, together with six per cent interest.

Traffic and Transportation

Ten-Cent Fare Justified

Report of Engineers Confirms President's Statement that Davenport Company Must Have Relief

That the relief plan recently proposed to the City Council of Davenport by President B. J. Denman of the Tri-City Railway of Iowa is justified, including a 10-cent fare and a drastic rerouting plan, is the finding of an audit filed with the city on Nov. 8 by Burns & McDonnell, engineers.

The report bears out the arguments submitted by Mr. Denman when he told the City Council that unless some financial relief was granted his company it would be forced to discontinue transportation service. The engineers find the company is entitled to a 10-cent fare; that track abandonment and rerouting as demanded by the company are justified; that the company cannot take care of the depreciation of its property and pay a proper return under the present rates and operating expenses, and that charges made to operating cost are more than fair, the United Light & Railways Company, the holding concern, having been of decided service to the local company.

The investigator for Burns & McDonnell was R. L. Baldwin. Present valuation of the company's property in Davenport is \$3,257,519, this figure being as of Aug. 31 last. The auditor's report substantiated figures used by Mr. Denman in his relief demands, he having used approximately the same valuation figure; in fact, basing his figure not on the company's own valuation estimate but on an extension of a previous valuation figure arrived at by Burns & McDonnell when employed by the city of Davenport in 1920.

The total revenue for the twelve months ended Aug. 31 was \$754,106 and for 1922 \$752,415. Operating expenses for the twelve months ended Aug. 31, 1923, are \$600,603 and for 1922 \$602,581.

The report allows the company 3½ per cent for depreciation and 7 per cent for return on investment. This year the company has made only 4.72 per cent, according to the report. Last year it made 4.70 per cent. In 1917 a 7.70 per cent return is indicated. Since then the company has been unable to make both ends meet.

One-Man Cars Under Fire

Agitation has been renewed against the use of the one-man car in Massachusetts. Employees are circulating petitions which have for their purpose the doing away with these cars. If present indications are any criterion the prospect is that the question of the continued use of these vehicles will be a matter for legislation at the coming

session. The legislation asked in the petitions now being circulated provides that one-man cars shall be forbidden, and that communities where they are operated may vote whether to apply the law to themselves. Platform men everywhere are making a talking point of the fact that the Public Utilities Commission overruled the efforts of the City Councils of Worcester, Cambridge and some other towns and cities to eliminate one-man cars.

Asked for an expression of opinion on the matter Clark V. Wood, president of the Springfield Street Railway, is reported to have said:

The public may have to choose between one-man cars and no service, and the trolley men may find they have killed the goose that lays their golden egg. If the companies cannot carry the costs of two-man cars, and are forbidden by law to operate one-man cars, there may not be any trolley jobs at all for the men.

You cannot legislate against economic laws. On many lines the introduction of one-man cars enabled service to be maintained, when the costs of operation had endangered the continuance of service.

Posts Abolished in District of Columbia

Fixed posts to guard street car safety zones in the District of Columbia have been abolished by order of the Public Utilities Commission on the ground that they constitute a menace to vehicular traffic.

Four sets of these posts were installed in the business district of Washington as an experiment, two being on lines of the Washington Railway & Electric Company and two on lines of the Capital Traction Company. The system consisted of iron posts imbedded 2 ft. in concrete and standing 4 ft. above the street level, set 25 ft. apart to mark a street car loading station and protect passengers. The posts were painted white, with black stripes, for visibility and were marked by oil lanterns with red globes at night. They were removable so that the streets might be cleared for parades and similar uses.

A series of accidents resulting from motorists driving into the posts, mostly at night, caused public attention to be centered upon the experiment, which was tried for an experimental period at the direction of the Public Utilities Commission.

The order of the Utilities Commission directing removal of the posts, for which painted lines have been substituted, brought a protest from the Capital Traction Company on the ground that no hearing on the subject had been granted. The letter called attention to the fact that while removal of the posts might benefit motorists it left passengers exposed to the hazards of street traffic while attempting to board or leave cars.

2,700,000,000 Passengers a Year

456 Rides per Person per Year Is the Record in New York—Surface Lines Carry 40 per Cent

Nearly 2,700,000,000 revenue passengers were carried last year upon the surface, subway and elevated lines of New York City. This traffic was divided almost exactly, 60 per cent to the rapid transit groups—elevated and subway lines—and 40 per cent to the surface lines. The total traffic, 2,681,206,755, represents an increase of 90,893,027 passengers over 1922, each fare that was paid being computed as a passenger carried.

The rate of growth in the fiscal year 1923, however, was slightly less than last year, when nearly 8,000,000 more passengers were carried. The percentage of growth in 1923 was 3.51 per cent, as against 3.95 per cent in 1922. Whereas last year more than three-quarters of the increase was upon the surface lines, in the fiscal year 1923 the condition was almost exactly reversed, the rapid transit line increase being 72,122,104, as against 23,919,193 upon the surface lines.

The figures just quoted were compiled by the New York Transit Commission. They cover the fiscal year ended June 30 last. While the returns have not yet been fully checked, awaiting the final compilation of the figures from the annual reports of the companies, the ultimate figures will not show a variation of more than a few thousand passengers, at most, from the present calculations. The traffic upon steam railroad and omnibus lines is not included.

While the general traffic increase for the year was 3.51 per cent, the traffic has increased more than 30 per cent since the fiscal year 1919, in which year the 2,000,000,000 mark was passed for the first time. A part of the increase in traffic was due to the increase in the habit of riding by New Yorkers. To-day the average New Yorker takes ten times as many rides in a year as he did in 1860. In the latter year, the first of which there is any competent record, the average number of rides was 43. In 1923, based upon an estimated population of 5,875,996, each New Yorker rode 456 times. He rode 448 times in 1922 and 437 times in 1921.

Both the increase in the riding habit and the gross increase in the traffic are indicative of the need for new facilities as fast as they can be provided. Twenty years ago, a year before the first subway was opened, the billion mark in street railroad traffic was passed for the first time. Three years later traffic had grown 25 per cent, to a billion and a quarter. In the seventeen years since, the traffic has more than doubled. While rapid transit facilities have increased in capacity in that period by the building of new subways and the extending and third-tracking of the elevated railroads, the surface car track mileage

STREET RAILWAY TRAFFIC IN NEW YORK CITY, 1921-1923

Number of Revenue Passengers (Cash Fares)

	Fiscal Year Ending June 30			Increase* of 1923 over 1922
	1921	1922	1923	
Subway and Elevated Lines:				
Interborough—				
Subway.....	639,385,780	644,975,474	676,650,431	31,674,957
Elevated.....	374,293,051	348,517,216	348,524,700	7,484
B.R.T. elevated and subway.....	404,970,640	444,747,228	480,900,869	36,153,641
Hudson and Manhattan tubes.....	95,607,645	99,104,889	103,390,911	4,286,022
Total rapid transit.....	1,514,257,116	1,537,344,807	1,609,466,911	72,122,104
Street Surface Lines:				
By Boroughs—				
Manhattan.....	384,128,024	388,357,767	383,209,497	D5,148,270
Brooklyn.....	418,106,693	472,538,068	490,128,692	17,590,624
The Bronx.....	107,675,507	114,679,520	119,140,781	4,461,261
Queens (a).....	51,944,034	58,826,451	59,852,694	1,826,243
Richmond.....	15,797,894	18,567,115	19,408,180	841,065
Total surface lines.....	977,652,062	1,052,968,921	1,071,739,844	23,919,193
Grand total.....	2,491,909,178	2,590,313,720	2,601,206,755	90,693,027
Population (b).....	5,705,364	5,780,870	5,875,996	.....
Fares per capita.....	437	448	456	.....

(a) Exclusive of B.M.T. (b) Estimated on basis of one-tenth of decennial increase.
* Prefix D indicates decrease.

has tended to decrease steadily. As the commission has repeatedly pointed out, more rapid transit lines are urgently needed if adequate provision is to be made for the growth in traffic. With the growth in traffic has grown the length of ride, the latter being to a certain extent responsible for the former. Where people used to walk they now ride, because in most instances it is no longer possible to walk the distance between work and home. As the commission sees it surface cars and bus lines, while playing a highly important part in short-haul transportation and in feeder traffic, are becoming less and less a factor in the solution of the long-haul transportation problem.

The traffic upon the Hudson & Manhattan tubes, while largely a traffic into and out of New York rather than a traffic within the city, is nevertheless included in the gross figures. The following table shows the traffic of all the lines,—subway, elevated and surface,—operated in certain years, with the increases in each year, including figures of the Hudson tubes for the years in which those lines have been operated:

Year Ended June 30	Number of Revenue Passengers	Annual Increase
1903	1,000,767,483	61,777,519
1906	1,251,841,173	120,838,479
1910	1,531,262,914	128,845,272
1913	1,709,876,508	88,962,573
1916	1,898,735,615	91,102,889
1918	1,975,482,316	56,670,087
1919	2,079,944,297	104,461,981
1920	2,365,587,369	285,643,072
1921	2,491,909,178	126,321,809
1922	2,590,313,728	98,404,550
1923	2,681,206,755	90,893,027

One of the outstanding features in the traffic statistics of the year was the fact that the tremendous traffic loss was halted which began on the Manhattan elevated lines of the Interborough Company in 1921, and these lines showed a very slight gain, amounting to 7,484 passengers over last year. The total Interborough elevated figure, however, is still far below the 1921 figure, 1922 having shown a falling off of more than 25,750,000 elevated passengers from the previous year. In 1921 the Manhattan elevated carried about 374,500,000 passengers, while last year and this year the figure was about 348,500,000, the

exact figure for this year being 348,524,700. The change in regard to the Interborough elevated traffic is generally presumed to be due to the campaign which that company made to build up this traffic, resulting in increased service and in the repainting of cars and stations a taxicab orange. The statistics show that just about the time this campaign started the loss in traffic which had been continuing into the current fiscal year, was halted, and there was a prompt gain.

Still another feature of the traffic year was the increase in riding upon the Interborough subway. During the fiscal year 1922 the gain upon the Interborough's underground system was only a little more than 5,500,000 passengers, losses being noted upon practically all parts of the system except upon the two main trunk lines through Manhattan. This year, however, the Interborough subway traffic was 676,650,431, a gain of 31,674,957. The Interborough traffic, therefore, was more than the whole traffic upon all lines in the city of New York thirty years ago.

Another outstanding feature of the report for the year was a falling off in trolley traffic in Manhattan of 5,148,270, as against a gain last year of 4,229,743. The exact cause of this change is not determinable, but it is probable that the elevated railroad traffic campaign drew a large number of riders from the surface cars, as with the growth of vehicular traffic in the street, the difficulty of maintaining trolley schedules is constantly increasing. The loss, however, in trolley traffic in Manhattan is a small figure when compared with the aggregate of this traffic, and does not mean any material falling off, being in fact larger than in any other recent years outside of 1921 and 1922, and higher than in any other period in the history of such railroad operation in Manhattan, with the exception of the four years 1913 to 1916, inclusive, which were the banner years of trolley operation in Manhattan, the figure of total traffic being for each of the four years well over 400,000,000.

The Brooklyn trolley gain for the year was 17,590,624 in a total traffic of 490,128,692. The figure of gain for the year previous, however, nearly 54,500,-

000, was abnormal, due to the splitting up of lines and the collection of added fares thereby, together with an abnormally low traffic, due to street car strikes in a part of the previous fiscal year. The Bronx, with a gain of 4,461,261 in a total trolley traffic of 119,140,781, shows a somewhat reduced rate of gain from the previous year. For the Borough of Queens, in a total trolley traffic of 59,852,694, there was shown a gain of 1,026,243, which was also less than last year, but appreciable. Trolley traffic in Richmond Borough, which showed a rather abnormal growth last year, in 1923 went back to its practically normal rate, with an increase of 841,065 in a total traffic of 19,408,180. The total traffic upon the rapid transit lines was 1,609,466,911, and on the surface railroad lines 1,071,759,844.

Estimated upon the basis of 340 average traffic days in the year,—account being taken of lighter traffic on holidays and Sundays,—the total increase in 1923 would mean that 267,000 more persons each day rode upon the subways, elevated and surface car lines of the city than rode upon a similar date in the year previous. As a matter of fact, however, the rate of increase is known to be far higher at the end of the year than at the beginning, and it has been estimated that about 2,500 more persons ride upon these lines on a particular day than rode upon the day previous. Using the same divisor of 340, the daily total traffic averaged last year 7,885,900 passengers; but again taking into consideration the fact that traffic is higher at the end of the year than at the beginning, the figure was probably well over 8,000,000 at the end of the fiscal year.

Despite the slight net gain for the whole Interborough elevated system, there was a net loss of traffic upon two of its principal lines, the Third Avenue and Sixth Avenue. However, where last year the loss upon the Third Avenue line was nearly 8,000,000, the drop this year was less than 150,000. On the Sixth Avenue line last year, which suffered a loss of 10,750,000 in traffic, the loss this year was about 1,100,000. The Second Avenue and Ninth Avenue lines which, together, last year lost 7,000,000 passengers, this year both showed a gain amounting to more than 1,250,000 passengers. On the Interborough's underground system, passengers carried on the Lexington Avenue trunk line were 202,600,000 in number, or 8,400,000 more than last year, while on the West Side trunk line, with 199,600,000 passengers, there was a gain of 12,200,000. With the exception of the West Farms branch, which lost about 400,000 passengers, and the stations in downtown Brooklyn, which dropped back about 275,000, practically all branches of the Interborough subway system showed gains. There was a gain of 5,000,000 passengers on the Jerome Avenue branch; of 2,500,000 on the Eastern Parkway branch, and of 1,600,000 on the Queensboro subway.

The Broadway subway of the B.-M. T.

system continued to be one of the great traffic gainers. Last year it had a traffic of a little less than 109,000,000, and this year of 119,000,000, a gain of nearly 10,200,000. Other lines in the Brooklyn system which showed big gains were the Brighton and Fourth Avenue subway lines and the Lexington Avenue elevated, which each gained about 3,000,000 passengers; the Fulton Avenue elevated, which gained some 2,500,000 passengers; the West End line, with 2,000,000 passengers; the Culver, Sea Beach and Myrtle Avenue lines, with 1,000,000 passengers each, and the Canarsie and Fifth Avenue elevated lines, with 500,000 each.

The accompanying table shows the street railway traffic in New York for the three years 1921 to 1923, inclusive.

Ordinances Introduced to Prohibit Jitneys in Gadsden

An ordinance has been introduced before the City Council of Gadsden, Ala., designed to put the jitneys out of business. The ordinance prohibits the operation of the jitneys on streets over which electric railway cars are operated. If the jitneys cannot be operated over streets where car lines run the jitneys will be forced out of business. This ordinance will come up before the City Council for final passage on Dec. 1. Officials of the Alabama Power Company, which operates in Gadsden say the buses and the jitneys are getting so much of their business that the operation of the cars is unprofitable.

Alabama City and Attalla, two good-sized towns, are located within a few miles of Gadsden. These two towns are connected with Gadsden by street cars, buses and jitneys. Officials of both Attalla and Alabama City are discussing the probability of passing ordinances similar to the one now before the City Council of Gadsden. Should these ordinances be adopted it would prevent the operation of buses and jitneys on the paved highways entering these three cities.

Different Rates Sought in Pensacola

Jack G. Holtzclaw, receiver for the Pensacola Electric Company, has filed a petition with the Florida Railroad Commission asking for a readjustment of passenger and freight rates. The petition leaves the rate entirely to the commission to decide. In the petition Mr. Holtzclaw says that the railway loses on an average of \$55 a year in fares on every privately owned automobile in its territory.

Vote Against One-Man Cars.—At a recent election in Dayton the people voted in favor of an ordinance requiring two men on every car. The Oakwood Street Railway, the Peoples Railway and the Dayton Street Railway have been running one-man cars.

Why the Trackless Trolley?

The trackless trolley is said to have made a hit. But why not the bus without the trolley poles and overhead wires?—Philadelphia "Evening Bulletin."

The trackless trolley is primarily the forerunner of extended trolley service and, by utilizing the electrical distribution system, can be operated by means of street car motors at a cost sufficiently lower than that of the gasoline motorbus of similar size closely to approximate the difference between the trackless trolley fare of 7 cents—four tickets for 25 cents—and the 10-cent fare which is necessary to support operation of the gasoline motorbus when supplying similar service.

—Philadelphia Rapid Transit Co.

Will Supplement Service with Buses.

—Service given by the Jacksonville Traction Company will be supplemented by buses, according to a recent announcement of J. P. Ingle, general manager of the company. It is planned to replace the line on Oakland Street with buses as a start, and if this service proves successful similar service will be established in other sections not now served by the railway. For sometime the city has been seeking the extension of the railway line to the electric light plant and municipal docks, but the necessary cost would be prohibitive, according to Mr. Ingle. The regular 7-cent fare now in effect on the railway line will prevail on the buses and transfer privileges will remain as at present.

Winter Rates in Effect.—Winter rates on the Oregon Electric Railway, operating between Portland, Ore., and Willamette Valley points, became effective Nov. 12. Under the new tariff, which affects week-end and fifteen-day round trip tickets, the fare from Salem to Portland will be increased from \$2 to \$2.30, the fifteen-day ticket from \$2 to \$2.50, the week-end fare, Eugene to Portland, \$5.30 instead of \$4.90, and the fifteen-day rate \$6 instead of \$5.80.

No Jitneys in El Paso.—Following the opinion of Judge Stewart Berkshire of the Corporation Court declaring the jitney ordinance invalid because it did not specify both a maximum and minimum penalty for violation, the City Council under the emergency clause passed a new ordinance at the same time repealing the older one. After this ruling jitneys ceased to run. One jitney driver did operate but was arrested and fined. His case is now on appeal in the higher court. With this exception no jitneys have been run in El Paso since April 30 of this year. This brings up to date the status of the jitney situation, which was referred to in the ELECTRIC RAILWAY JOURNAL, issue of Oct. 20, 1923, page 723.

Improved Service Provided.—J. M. Barry, division manager of the Alabama Power Company, recently submitted to Mayor Gunter of Montgomery a proposal for the rerouting of the Montgomery Street Railway system. The proposal includes transfer privileges between depot cars and other cars so that passengers could travel on the cars between the Union Station and all other parts of the city.

Will Consider Results of Referendum.—A post card referendum is to be started in Milwaukee. Post cards on the desirability of continuing motor bus service in the Eighteenth Ward will be sent to all owners of property on the streets where the buses of the Milwaukee Electric Railway & Light Company are operated. The results of the referendum will be placed before the Common Council for consideration.

Anti-Jitney Ordinance Before Court.

—The case of E. C. Waid against the city of Fort Worth, Tex., on appeal before the Court of Civil Appeals, involving the validity of the anti-jitney ordinance enacted by the city of Fort Worth has been set for hearing before the court. This particular ordinance as passed makes it unlawful for jitneys and other vehicles carrying passengers for hire in opposition to the traction company to operate on certain specified streets, the specified streets being the downtown business district. Enforcement of the ordinance would put the jitneys in Fort Worth out of business.

Fare Reduction Sought.—A reduction in fares at Savannah, Ga., to 5 cents is being sought by the city. A resolution asking for the reduction has been adopted by the City Council, and the Mayor of Savannah will present it to officials of the Savannah Electric & Power Company. The present rate is 7 cents. If the company refuses voluntarily to grant the request, the resolution authorizes the Mayor of Savannah to appeal the matter to the Georgia Public Service Commission.

Hears Five-Cent Fare Claim.—The city of London, Ont., has questioned the right of the London Street Railway to charge the 5-cent fare that is now in effect. R. G. Ivey, vice-president of the company, recently appeared before the Provincial Cabinet to present the claim of his company. Adam Back and City Solicitor Meredith appeared before the Cabinet on behalf of the city.

More One-Man Cars in Use in New Jersey.—As a measure of economy the Public Service Railway, Newark, N. J., is extending the use of its one-man cars. In the Central division of the system one-man cars have been placed in operation on the Middlesex and South Amboy lines. Other lines which tried out the one-man type of cars recently were the West Hoboken line operating in Hoboken and West Hoboken; Pavonia line, in Jersey City, and the Clifton line, in Newark. The Bergen line in Newark has been using the one-man cars for several months.

Personal Items

G. E. Departments Combine

Publication and Advertising Departments to Merge on Dec. 1 with
M. P. Rice as Manager

The publication and advertising departments of the General Electric Company will be combined on Dec. 1, with Martin P. Rice, as manager of the publicity department, in charge.

Frank H. Gale, advertising manager, will on Dec. 1 become assistant to D. R. Bullen and manager of conventions and exhibits. Mr. Bullen was recently appointed assistant vice-president, and Mr. Gale will do important association work.

C. H. Lang, who has been assistant to Mr. Rice as manager of the publication department, will continue as assistant manager of the newly created publicity department, and T. J. McManis, who has been manager of the department of publicity for the Edison Lamp Works of the General Electric Company at Harrison, N. J., will also become an assistant manager of the new department.

In addition to the above announcement made by President Gerard Swope, an advertising council has been created, with the following members and with Director B. G. Tremaine, Vice-presidents J. R. Lovejoy, George F. Morrison and F. S. Terry and A. D. Page as ex officio members of this council: Chairman of the council, J. G. Barry; manager of publicity department, M. P. Rice; assistant manager of the publicity department, T. J. McManis; P. B. Zimmerman, George C. Osborne, L. P. Sawyer and G. P. Baldwin; advertising counsel, Bruce Barton, and secretary of the council, C. H. Lang.

Mr. Rice, the new publicity manager, has been in the employ of the General Electric Company for twenty-eight years. He was graduated from the University of Pennsylvania in the class of 1893 with the degree of bachelor of science, and then took a post-graduate course, receiving the degree of mechanical engineer.

Mr. Rice entered the service of the General Electric Company in 1895 in the drafting room. After nine months he was transferred to the engineering department, and when the X-ray was discovered was assigned to that new work. The publication bureau was organized in December, 1897, and he was made manager, a position he has since held. In this position he had supervision of all company printing, photographs, technical data and all general publicity for the company. In June, 1903, he established the *General Electric Review*.

In February, 1921, when the General Electric Company became interested in radio broadcasting, Mr. Rice was made director of radio broadcasting and in

this position outlines the company's policy in this new field. He readily recognized that broadcasting should be more than a mere entertainment to be successful and that its programs should be educational and helpful to the public in the distribution of interesting news events of the day. The company is now building a second large radio station at Oakland, Cal., and has definitely announced plans for a third station to be built at Denver, Col., both of which will come under Mr. Rice's supervision.

Mr. Gale has been in charge of the space advertising of the company for the last seventeen years. As a member of the staff of Dana R. Bullen, assistant vice-president, he will assist Mr. Bullen in the manifold activities of his



M. P. Rice

new work, and in particular will have charge of conventions and exhibits. He will have the title of manager of conventions and exhibits, and his field will be one with which his work has made him very familiar.

Mr. Gale entered the service of the Thomson-Houston Electric Company at Lynn, Mass., in 1890 as a draftsman. Later he served in the catalog department. With the formation of the General Electric Company in 1892, into which the Thomson-Houston Company was merged, his work took him to Schenectady, to the Schuyler plant at Middletown, Conn., to the Edison Lamp Works at Harrison, N. J., and to the Brush Works at Cleveland, Ohio, where he was also associated with the Short Electric Railway and the Sperry Electric Railway.

He returned to Schenectady in the spring of 1895, and in 1899 was transferred to the commercial department. In 1901 he had charge of the company's interests at the Pan-American Exposition at Buffalo, and since then has had supervision of such work at all exhibits and conventions, notably at the St. Louis and San Francisco world's fairs. He was awarded a gold medal at

the San Francisco Exposition for the excellence of the design of the company's exhibit. Following the St. Louis Exposition he was placed in charge of the company's advertising in periodicals and later given the title of advertising manager.

A. V. Kipp, traffic manager of the Salt Lake & Utah Railroad, has been appointed assistant general freight agent of the Oregon Short Line. Mr. Kipp has been traffic manager of the Salt Lake & Utah Railroad since March 1, 1921. For six months prior he served as general freight and passenger agent for the road. He has been constantly connected with railroads of the West since he entered the service of the Union Pacific at Omaha in 1902 as telegraph operator. He consecutively became chief operator at the Omaha office, traffic agent for shipments in Wyoming, traveling freight agent with headquarters in Denver and contracting freight agent for Denver. During the war he had charge of the traffic department of the United States food administration for Colorado. Mr. Kipp's successor as traffic manager has not yet been named.

Don. C. Farra, for twelve years connected with the freight department of the Boston & Maine Railroad, has been appointed freight agent of the Springfield Terminal Railway Corporation, Springfield, Vt., owing to heavy freight movements over the Springfield-Charlestown, N. H., electric line.

Edward M. Raver has been appointed claim agent of the Chicago and West Towns Railway at Oak Park, Ill. For the past seven years he has served as supervisor of claims for the northern district of California, with the Union Automobile Insurance Company at San Francisco. He has been connected with the Fort Wayne & Northern Indiana Traction Company and as superintendent of transportation with the Michigan United Railways at Jackson and Battle Creek. For three years beginning in 1913 he was superintendent of transportation and claim agent with the Lincoln Traction Company of Lincoln, Neb.

Obituary

Edwin W. Olds, once prominent in the electric railway field, died recently in Long Beach, Cal., at the age of seventy-six. Early in 1911 Mr. Olds resigned as superintendent of rolling stock of the Milwaukee Electric Railway & Light Company and with that resignation severed his connection with the electric railway industry. He entered the service of the Milwaukee company in 1896. He was one of the organizers of the American Electric Railway Engineering Association and had always been prominent in the councils of that body. He served as president of the association in 1903-04.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Fewer Electric Railway Repair Shops Employ More Men

The reduction in the number of electric railway car repair shops in the United States is an outstanding feature of a report recently published by the Department of Commerce. Whereas there were in 1919 some 624 such repair shops, there were only 560 two years later. In spite of the reduction in the number of shops, however, the number of workmen employed increased from 33,120 to 35,638. Their wages increased from about \$39,000,000 in 1919 to more than \$47,000,000 in 1921. The number of salaried employees, as shown in the table below, increased more than did the number of wage earners. In 1921 such employees numbered 2,359, as compared with only 1,847 in 1919.

This report shows also the distribution of the shops by states. Pennsylvania leads in the number of electric railway car repair shops with 70, Ohio is second with 65 and New York is third with 45. Illinois, with 42, is not far behind. In number of employees, however, New York is first with 5,799,

Pennsylvania is second with 4,458 and Illinois third with 4,021. Ohio, which ranks second in number of establishments, ranks below California in number of employees. Wages have followed the same general trend as the number of employees, although Illinois, with fewer employees than Pennsylvania, nevertheless pays a considerably larger sum in wages.

American Couplers Going Abroad

During recent months the Ohio Brass Company has received a number of orders for Tomlinson standard automatic couplers for use in foreign countries. Cia. Metropolitano Alfonso XIII, Madrid, Spain (the subway of Madrid), has purchased eighty-four coupler equipments. Companies in Australia have purchased coupler equipments for 150 cars. Both of these orders call for couplers comprising automatic electrical coupling as well. The railway in Haarlem, Holland, recently bought couplers for seventy-five cars, and 200 coupler equipments were ordered from Rio de Janeiro. Japanese companies have ordered 120 couplers.

Brill Buys Service Motors

The J. G. Brill Company, Philadelphia, has purchased the railroad motor coach division of the Service Motors, Inc., Wabash, Ind., with exclusive rights for the production and sale of the type of gasoline driven rail cars heretofore known as the Service Model 55 railroad motor coach. While the Brill Company has heretofore furnished only the bodies for these cars, it will now furnish the complete unit without change in design. With its extensive facilities the company will be better able to meet the increased demand for this type of equipment. In the future this type car will be known as the Brill Model 55 gasoline car.

Cars of this type have been operated for more than 1,500,000 miles in the United States. Twelve similar cars are now being built for the Australian Government Railroad. They are about 44 ft. long and weigh in the neighborhood of 28,000 lb. The renewal part business for the cars now in service and the guarantees given by Service Motors, Inc., have been taken over by Brill.

The purchase gives the Brill Company a complete line of automotive cars for steam railroads ranging from the thirty-passenger, six-wheel type to the Model 55 with a maximum capacity of fifty-five passengers. This part of the business is handled by the automotive car division, with C. O. Guernsey, designer of the Model 55 and formerly vice-president of Service Motors, as chief engineer. C. J. McPherson, A. H. Hudson and A. F. McCormick, all formerly of Service Motors, have joined the Brill organization to assist in this work.

Dayton Air Brush Company to Be Sold

The assets of the Dayton Air Brush Company will be offered for sale at the Montgomery County Court House, Montgomery County, Ohio, on Nov. 24. They will be sold at such prices as may be approved by the court. The assets consist of patents, good will, accounts receivable, and a small amount of equipment and parts. The order for the sale was given by Judge Robert C. Patterson of the Common Pleas Court of Montgomery County, Ohio.

Metal, Coal and Material Prices

Metals—New York		Nov. 13, 1923
Copper, electrolytic, cents per lb.		13.375
Copper wire base, cents per lb.		16.00
Lead, cents per lb.		6.875
Zinc, cents per lb.		6.425
Tin, Straits, cents per lb.		44.50

Bituminous Coal, f.o.b. Mines		
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons		\$4.30
Somerset mine run, Boston, net tons		2.375
Pittsburgh mine run, Pittsburgh, net tons		1.925
Franklin, Ill., screenings, Chicago, net tons		1.45
Central, Ill., screenings, Chicago, net tons		1.05
Kansas screenings, Kansas City, net tons		2.25

Materials		
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.		\$6.50
Weatherproof wire base, N. Y., cents per lb		16.50
Cement, Chicago, net prices, without bags		2.50
Linseed oil (5-bbl. lots), N. Y., per gal.		0.93
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots		11.25
Turpentine, (bbl. lots), N. Y., per gal.		0.97

State	No. of Establishments	Total Persons Employed	No. Salaried Employees	Wage Earners, Average Number	Salaries	Wages	Paid for Contract Work	Cost of Materials	Value of Products
United States:									
1921.....	560	35,638	2,359	33,279	\$4,461,800	\$47,775,235	\$105,862	\$33,560,133	\$87,312,426
1919.....	624	33,120	1,847	31,272	2,979,367	39,073,154	118,335	32,025,484	75,210,701
1914.....	649	28,215	1,827	26,384	1,914,538	18,644,845	24,596	17,609,574	38,576,565
Alabama.....	7	205	10	195	23,963	279,793		256,705	560,461
California.....	22	2,602	118	2,484	218,434	3,977,151	8,124	2,217,467	6,426,872
Colorado.....	5	272	17	255	20,498	395,147	3,675	226,258	645,579
Connecticut.....	17	722	93	629	199,520	578,154		722,156	1,502,227
Georgia.....	8	343	19	324	36,313	258,770		231,573	526,657
Illinois.....	42	4,021	253	3,768	536,154	5,694,974	2,082	3,737,988	9,975,845
Indiana.....	29	1,180	113	1,067	148,418	1,318,309		889,252	2,393,856
Iowa.....	14	232	17	215	36,422	294,900	28,141	294,771	654,236
Kansas.....	10	162	17	145	29,852	204,914		176,737	411,505
Kentucky.....	6	223	10	213	20,272	281,272		134,793	450,183
Louisiana.....	7	438	36	402	81,500	703,715	11,398	541,980	1,340,049
Maine.....	10	184	14	170	24,925	218,104	637	217,788	662,740
Maryland.....	5	926	44	882	38,976	891,573		453,204	1,383,753
Massachusetts.....	30	1,704	87	1,617	123,226	2,378,630		1,493,302	4,072,298
Michigan.....	17	1,532	115	1,417	450,398	1,848,732		1,896,934	4,252,511
Minnesota.....	7	621	43	578	111,579	937,433		567,621	1,617,645
Mississippi.....	5	31	8	23	14,351	26,710		60,436	101,497
Missouri.....	8	1,216	62	1,154	114,390	1,828,173		1,574,774	3,517,337
Montana.....	4	36	3	33	7,764	52,952		30,773	91,438
N. Hampshire.....	5	78	4	74	7,569	126,201	1,000	49,877	184,985
New Jersey.....	14	1,455	37	1,418	91,634	2,270,570		1,966,685	4,328,891
New York.....	45	5,799	394	5,405	687,451	9,532,574	11,644	4,978,183	15,344,539
North Carolina.....	7	76	15	61	16,550	75,858		61,346	154,355
Ohio.....	55	2,340	108	2,232	202,978	2,158,521	23,343	1,731,569	5,170,617
Oklahoma.....	9	184	22	162	41,989	220,475		152,302	414,766
Pennsylvania.....	70	4,458	277	4,181	518,053	5,292,840	10,427	4,469,201	10,294,786
Tennessee.....	6	300	6	294	15,600	428,253		274,985	721,027
Texas.....	16	726	52	674	104,952	853,409	108	497,679	1,456,895
Utah.....	3	27	12	159	10,851	230,860		152,248	396,021
Vermont.....	4	27	2	25	2,626	30,809		21,066	54,501
Virginia.....	9	400	28	372	36,359	371,713		394,812	802,939
Washington.....	11	1,077	174	903	194,555	1,464,395	796	793,442	2,453,188
West Virginia.....	10	189	14	175	22,172	231,661		196,892	450,740
Wisconsin.....	14	604	71	533	141,723	769,115	2,737	785,914	1,700,753
W. others*.....	29	1,104	64	1,040	129,783	1,548,575	1,750	1,309,471	2,996,734

* Arizona, 2 establishments; Arkansas, 2; Delaware, 1; District of Columbia, 2; Florida, 5; Idaho, 2; Nebraska, 2; Nevada, 1; North Dakota, 2; Oregon, 3; Rhode Island, 4; South Carolina, 1; South Dakota, 1; Wyoming, 1.

Directors Declare Dividend

The board of directors of the Pressed Steel Car Company, Pittsburgh, met on Nov. 8 and declared the regular dividend of \$1.75 per share on the preferred capital stock and a dividend of \$1 per share on the common capital stock. No announcement was made, however, concerning the volume of business done nor the earnings. It is expected that this information will be contained, however, in the annual report which will be issued about the end of February, 1924.

Rolling Stock

The Illinois Traction, Inc., is preparing to purchase seventeen new, one-man, light-weight, double-truck interurban safety cars for its Ottawa division, which was formerly known as the Chicago, Ottawa & Peoria Railway.

Houston Electric Company will, if it follows the recommendation of John A. Beeler to the city, purchase fifteen new one-man cars at a cost of \$180,000.

Department of Street Railways, Detroit, Mich., has been authorized by the City Council to purchase fifty new double-truck Peter Witt type cars and one three-car train. The three-car train will be used for experimental purposes to determine its practicability on lines such as that on Woodward Avenue. A train of the kind proposed would be 122 ft. long and would require a motorman and three conductors to operate. The equipment would cost \$29,230 and the cars making up the train would have a seating capacity of 134 passengers. Delivery on the three-car train is expected about Jan. 1 and on the first of the Peter Witt cars about Feb. 1. The sale of fourteen of the city's one-man cars has been authorized by the Council. These cars will be replaced by larger ones.

Cleveland Southwestern & Columbus Railway, Cleveland, Ohio, has purchased twelve new interurban cars to be built by the Cincinnati Car Company.

New Orleans Public Service, Inc., has purchased twelve new double-truck cars of the Perley A. Thomas Car Company, High Point, N. C.

Toronto Transportation Commission is planning either to purchase seventy new cars or rebuild a number of its old cars.

Havana Central Railroad, Havana, Cuba, has placed an order with the Wasson Car Company for six new cars.

Track and Line

Community Traction Company, Toledo, Ohio, will double track Sylvania Avenue from Martha Avenue to Jackman Road with extension of service on Tremainsville Road on the tracks of the Toledo & Western line. Extension will be made at a cost of \$100,000. Double tracking in Sylvania Avenue is part of a pro-

gram to repave and widen the thoroughfare.

New Orleans, La.—Two franchises affecting the reorganization and rerouting of the New Orleans Public Service, Inc., on the lines laid down in the Beeler report have been offered the Commission Council by Commissioner Paul H. Maloney of the Department of Public Utilities. One, covering the Elysian Fields Avenue franchise, provides, as a compromise to the Beeler suggestion, that the New Orleans Public Service, Inc., shall construct a single-track line on the upper side of Elysian Fields Avenue from North Claiborne Avenue to Hope Street, with a shuttle service from North Claiborne Avenue. The other franchise provides for the extension of the Broadway lines with double-track service from South Claiborne Avenue to Broad Place; thence on Broad Place to Almonaster Street, where it will resolve into a single-track line, continuing out Almonaster Street through such streets as residents in that section of the city, who are opposed to the Beeler recommendations, have approved.

Grand River Valley Railway, Grand Junction, Col., will be extended $3\frac{1}{2}$ miles into the High Line district, one of the best farm land sections of the state, at an estimated cost of \$65,000. The work will be started at once.

Citizens Traction Company, Oil City, Pa., is planning to lay a single track at the end of the double track on Main Street at Relief Street to the shops and offices of the National Transit Pump & Machine Company. This will provide service for the men employed in the Third Ward shops as soon after the closing of the suspension bridge as possible. Permission will have to be obtained from a number of sources, such as the city and the Erie Railroad.

Power Houses, Shops and Buildings

Wisconsin Public Service Corporation, Green Bay, Wis., completed work in replacing its 25-cycle generators at its High Falls hydro-electric plant with new 60-cycle generators. This is in line with its policy to change all plant equipment to 60-cycle generators and also to change all motors and meters on lines using current to 60 cycles, thus eliminating the need of frequency changers.

Paducah Electric Company, Paducah, Ky., is constructing a new power station which represents an investment of \$370,000. It is expected that the new unit will be in operation early in 1924. The structure when complete will house a new 2,500-kw. turbine and boiler equipment of the most modern type. The unit is being erected adjacent to the old power plant and in time the two will be linked together. The combined generating capacity will be 6,000 kw.

Trade Notes

Transit Equipment Company, New York, N. Y., is establishing a new method to bring the bus to the electric railways by taking the latter's obsolete material in part payment for any buses they purchase.

Standard Underground Cable Company, Pittsburgh, Pa., announces the following changes in its Perth Amboy, N. J., organization: H. W. Fisher has been advanced in title to technical director of electrical engineering, while continuing also as manager of the lead cable and rubber departments. R. W. Atkinson has been appointed chief electrical engineer. G. J. Shurts has been made production manager of the lead cable department.

New Advertising Literature

Beckwith-Chandler Company, Newark, N. J., paint and varnish manufacturer, has ready for distribution a comprehensive sample booklet of its line of motor coach colors. This pamphlet will be of particular interest to companies operating and maintaining motor buses.

Reliance Electric & Engineering Company, Cleveland, has issued a thirty-two page booklet on electric motors. It describes how electric motors are to be chosen and used. It also gives methods of installing motors, rules for determining the size of motors required for different applications and an analysis of some troubles which may be encountered. Copies of the booklet will be sent to interested persons without charge.

Edison Lamp Works, Harrison, N. J., has issued a thirty-two-page pamphlet entitled "Lighting for Traffic Control." The booklet contains illustrations of many types of traffic signals and how they are operated.

Miller Trolley Shoe Company, Boston has issued a new circular entitled "About Wire Wear." It features and describes tests of trolley wire wear over a period of six years on the Portland-Lewiston Interurban Railway division of the Androscoggin Electric Company. This road has been using Miller trolley shoes exclusively for many years, and the pamphlet gives interesting statistics of micrometer measurements made by the railway company's engineers on its trolley lines.

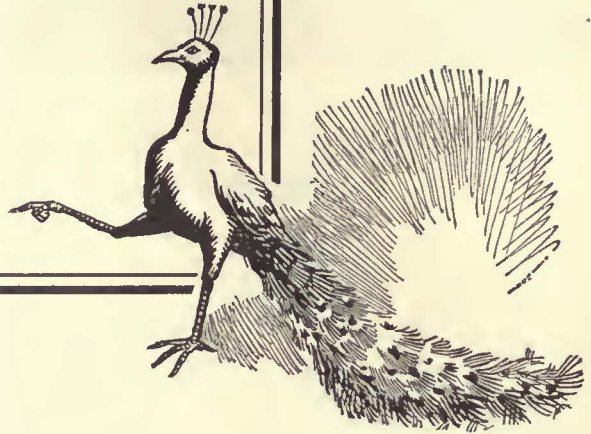
American Manganese Steel Company, Chicago Heights, Ill., has issued a six-page pamphlet, accompanied by illustrations, entitled "A Better Manganese Crossing."

Elliott Service Company, New York, N. Y., through its public safety division, has issued a pamphlet called "Reaching the Public with the Safety Idea." The pamphlet states that accidents can be prevented and it attempts to give the solution of the problem.

On the 5-yard Line!

Every so often the crucial game is saved by the ability of one particular man to tackle the on-rushing opponent, and drag him down to a stand-still—

before he hits the goal!



That's why—

PEACOCK BRAKES

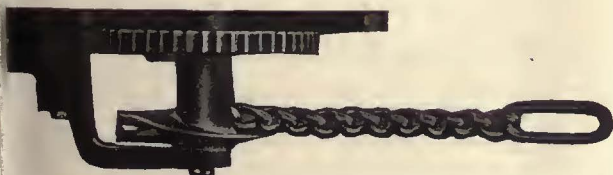
Make Good in the Railway Game!

They can be depended upon to stop the car *before it hits* the object or obstacle on the track.

Peacock Brakes are fast; they have great reserve power and their chain winding capacity is sufficient to take care of any amount of slack. But above all else is their reliability, like that of the guard who saves the football game for his team.

It is that reliability factor which makes Peacock Brakes the most dependable equipment for electric railway cars, whether used as the regular service brake, or merely for emergency conditions.

Investigate! Then specify—Peacock Brakes



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Vitrified Paving Brick is easiest to remove—



FROM the angle of repairs and maintenance, that pavement is best in electric railway work which withstands impact, protects ties, cross-rods and base from the seepage and resulting destructive action of surface water, yet is easy to remove when tracks are to be repaired or replaced.

Brick, asphalt-filled, meets these requirements and many others as well.

The asphalt filler forms a tight water seal which, nevertheless, is easily broken by a crowbar, leaving each brick an easily removable unit and giving the pavement surface 100% salvage value.

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PAVEMENTS
OUTLAST THE BONDS

In What Spirit Does the Workers' Committee Come?



With chins out prepared for an argument?

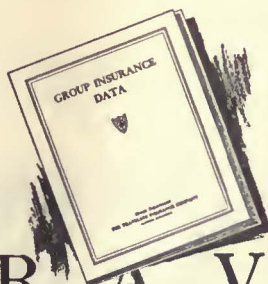
This difference of attitude might be of less importance if it were reflected only in the results of the conference between the spokesmen of the men and the boss. But the attitude, be it inimical, indifferent, or friendly, exists throughout the eight working hours of the day. It may be thrown into sharp relief only when there is a grievance to discuss, but it is reflected constantly in the quality and quantity of production within the plant.

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When buying seats for cars and buses consider more than appearance, economy, serviceability. Provide for the *comfort* of your passengers, because on *their comfort* rests the popularity and success of the service.

Hale & Kilburn seats are used by many roads because they provide *passenger comfort* and still meet the economy and serviceability demands of operators. Our forty years of seat manufacturing experience has produced types of seats suited to all requirements.

Lightest
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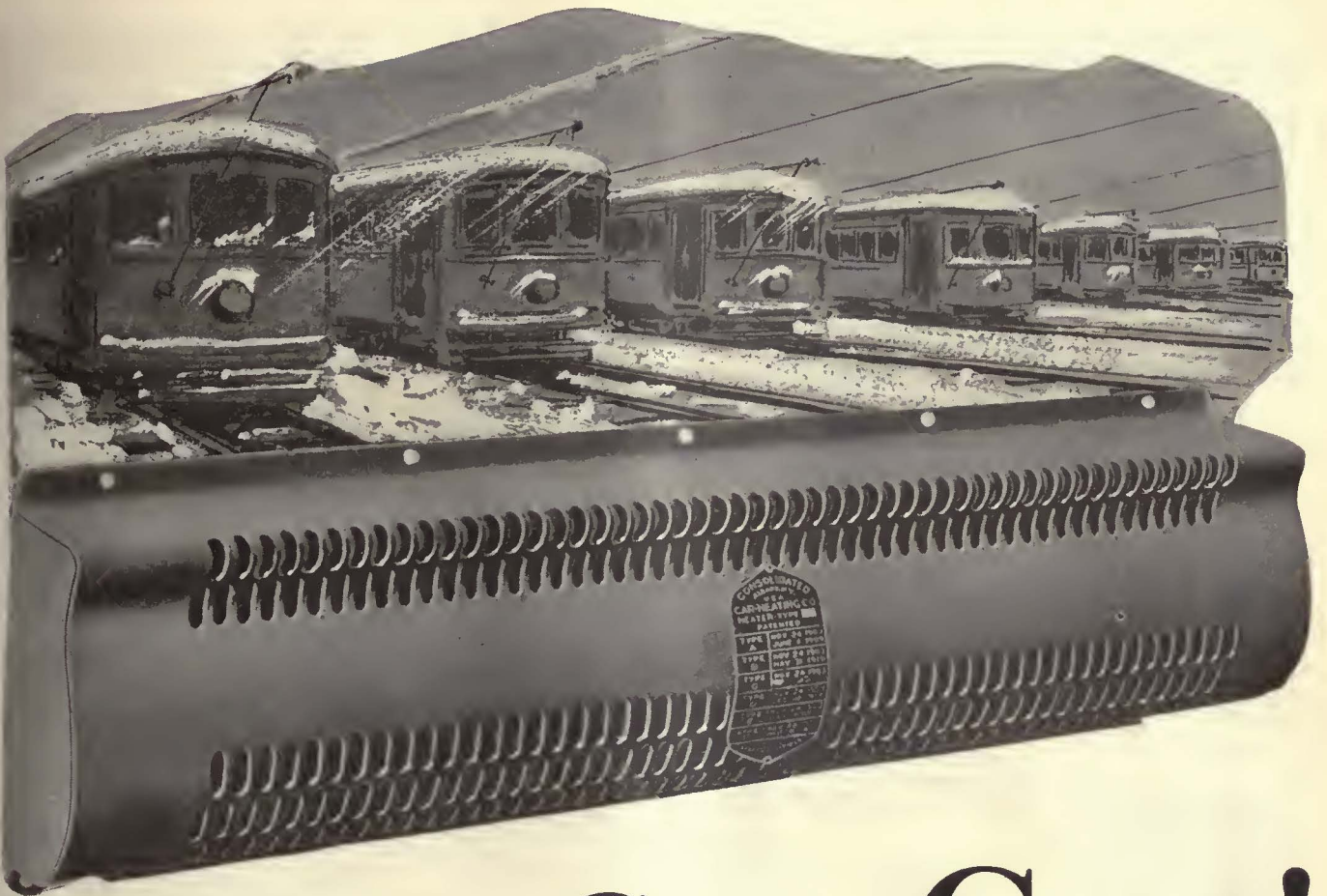
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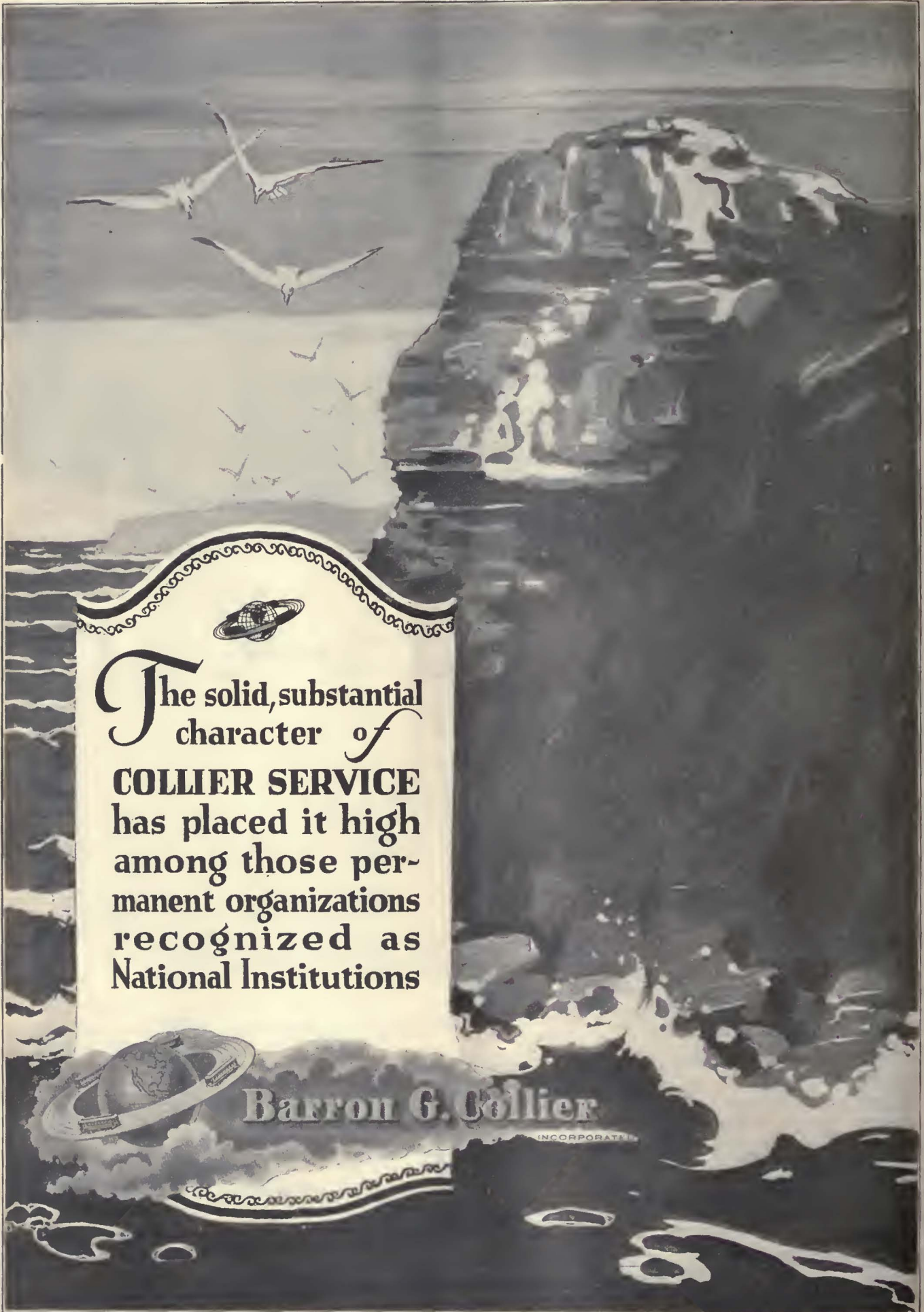
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--	---------------------------	--

At the conclusion of a sale the buyer thanks the seller.

The theory is that the purchaser gets at least as much good out of the transaction as the merchant.

A good idea! And one that we might adopt. For selling a worthy product at a fair price is an honorable transaction.

Now let us relate this to Texaco Lubricants. We can hardly expect you to thank us at the time you sign a contract.

But we are patient. For we know that sooner or later, before the termination of a Texaco contract, your Road will give thanks for the good judgment which prompted you to select Texaco Lubricants and Texaco Service.

And your future thanks will be more than lip service, for you will say it with Renewed Contracts.

Now, that isn't cock-sure. It's justifiable Confidence. We know that the thing we have to offer is *exclusive* with us. And more and more Roads are realizing it. They say it with Contracts.

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- 3—Prompt delivery of every kind of lubricant used by the Electric Street Railways, whether for rolling stock, shop or power plants.
- 4—Prompt delivery of burning oils, or kerosene, if you need them.
- 5—Unstinted Engineering Service through experienced and capable lubricating engineers.
- 6—A degree of friendly co-operation you never realized until you took up with Texaco.

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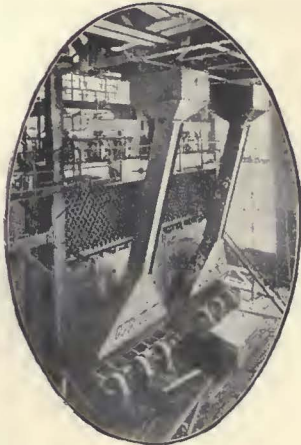
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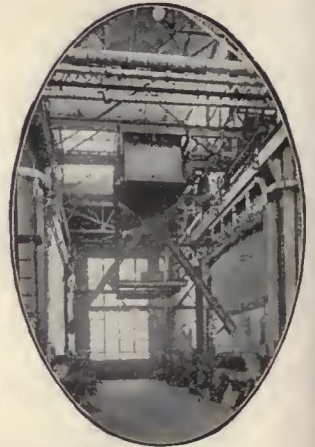
Center: Milwaukee Electric Railway & Light Co., Milwaukee, Wis.
 Left: Consolidated Gas, Electric Light & Power Co., Baltimore, Md.
 Right: Southern Power Co., University, N. C.

Big Boilers in Big Plants



Turners Falls Power & Electric Co.,
Turners Falls, Mass.

THE seven plants illustrated on this page represent the latest and most modern central station construction. The equipment throughout each of them has been selected because of its superior advantages of economy, efficiency and durability.



Dominion Power & Transmission Co.,
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There are in service in these seven plants 185 Edge Moor Boilers totalling approximately 160,000 boiler horsepower — an average of about 866 H. P. per boiler.



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Twenty concerns have a total of more than 400,000 H. P. of Edge Moor Boilers—averaging over 20,000 H. P. for each user.

The fact that every one of these twenty purchasers has sent in several repeat orders is proof of the quality of service rendered by the Edge Moor Boiler in large plants and large units.



Metropolitan Edison Co.,
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Have you written for your copy of the Edge Moor catalogue?

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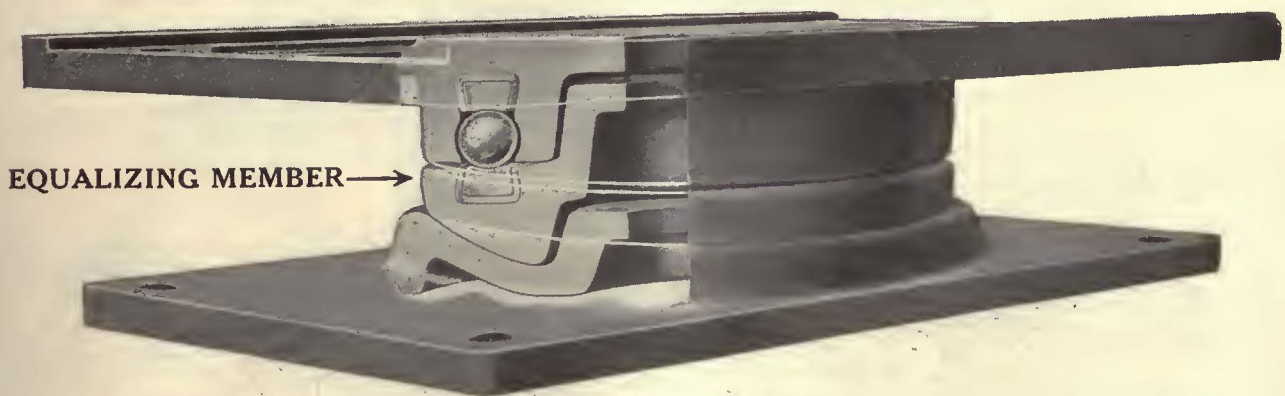
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FOR INCREASED FUEL ECONOMY

SYMINGTON

BALL BEARING EQUALIZING CENTER PLATES



A Practical Way To Save Dollars

A free turning center plate saves money—it reduces flange and rail wear and power consumption.

The Symington Ball Bearing Equalizing Center Plate is a sure and practical way of making this saving.

The ball bearings insure an extremely low turning resistance.

The intermediate equalizing member, free to move in a limited arc, compensates for any tilting of the bolsters and gives to each ball its share of the full load.

Symington Ball Bearing Equalizing Center Plates effect economies in maintenance and operation.

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An Anderson Sleet Cutter in time will save the line



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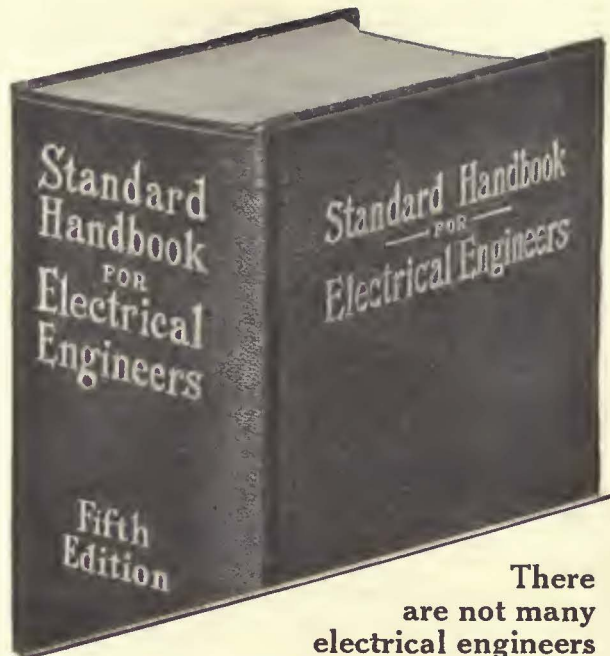
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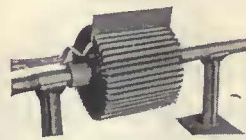
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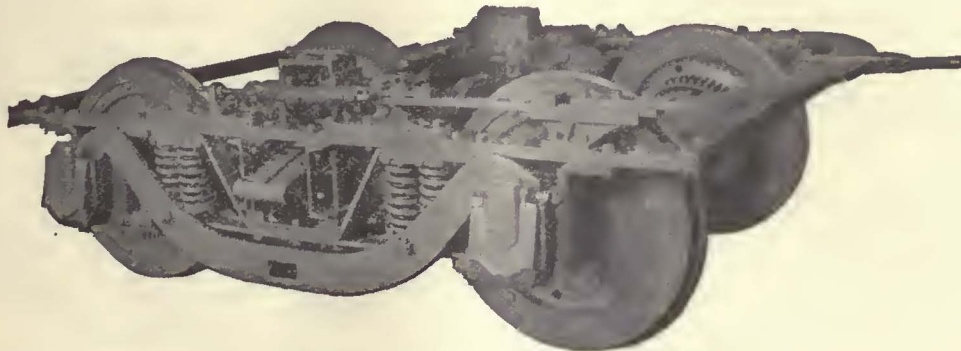
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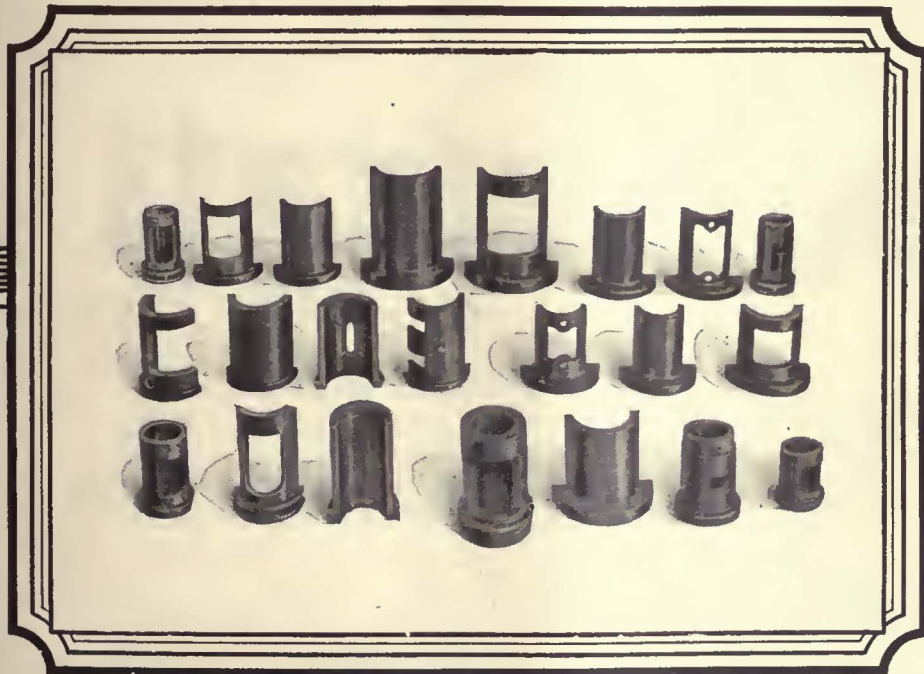
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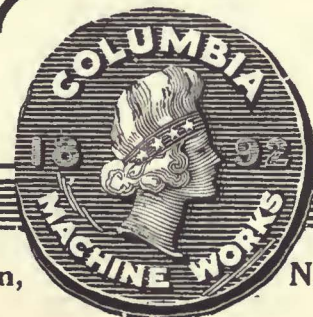
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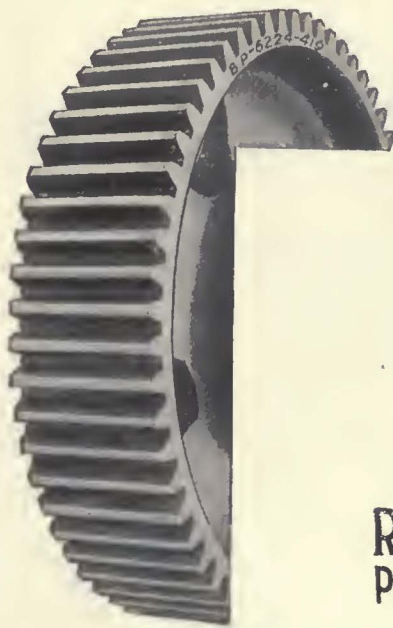
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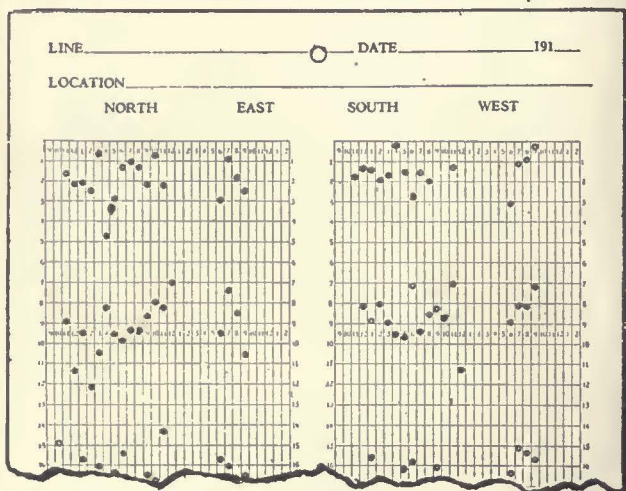
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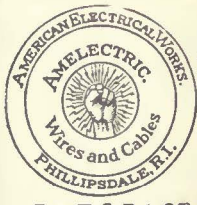
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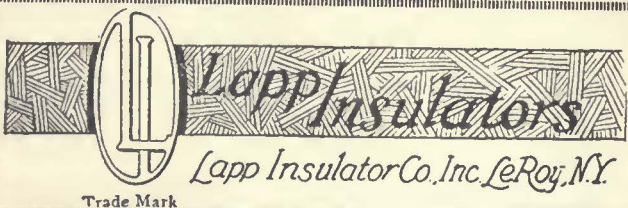
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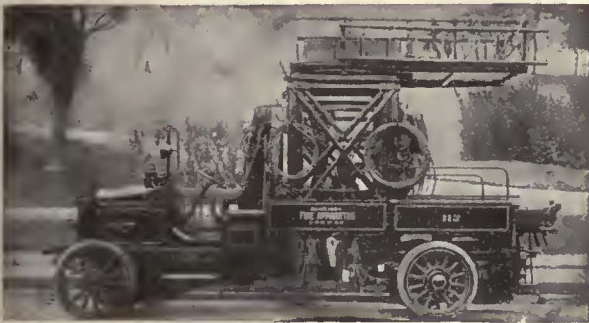
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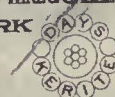
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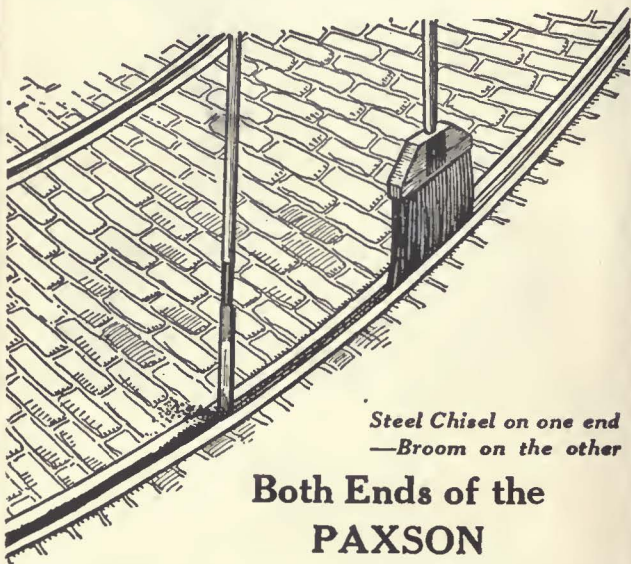
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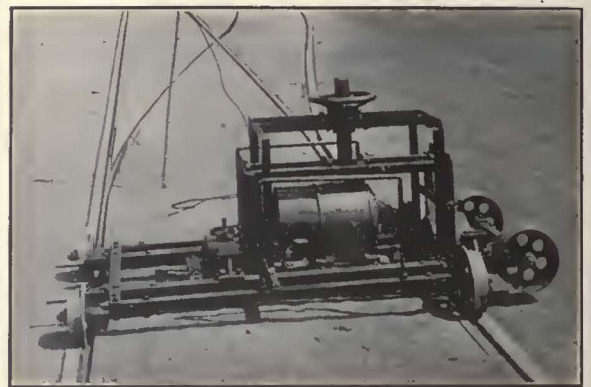
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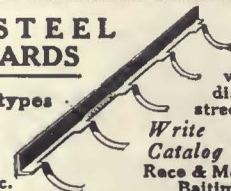
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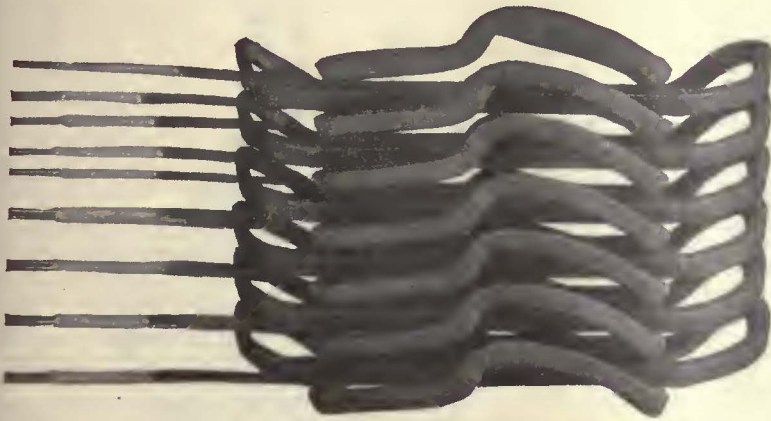
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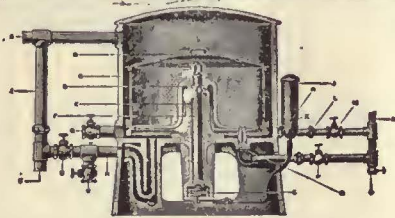
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the oily
waste away!*



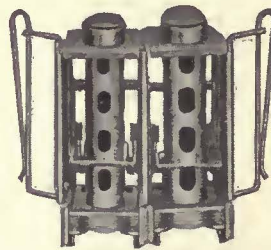
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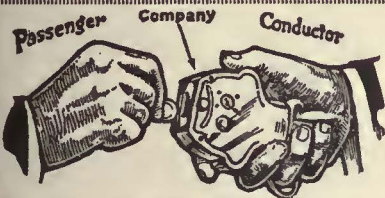
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The best changer on the market. Can be adjusted by the conductor to throw out a varying number of coins, necessary to meet changes in rates of fares.

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Each barrel a separate unit, permitting the conductor to interchange the barrels to suit his personal requirements, and to facilitate the addition of extra barrels.

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By the
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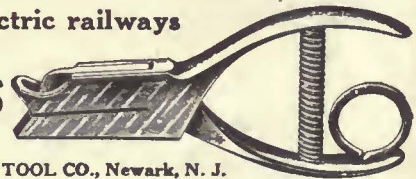
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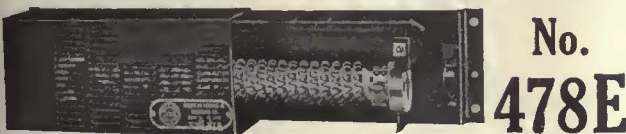
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B-V Punches



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No. 478E
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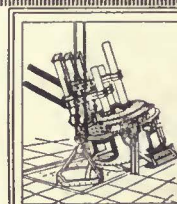
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Unexcelled for ventilation and appearance.

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Ten Standard Sizes 1/2 to 24 Tons Capacity
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100 New Users in the Last Nine Months KASS SAFETY TREADS

HIGH
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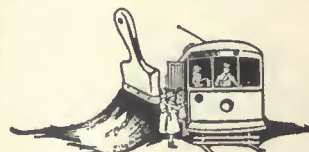
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1—Double truck express car with snow plow ends. Operated by air. Brill truck. Complete equipment overhauled.

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50 to 100 used 36-in. or 37-in., not less than 34-in. diameter.

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35—B-2 Compressors.

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Anchors, Guy
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Stands
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Bethlehem Steel Co.
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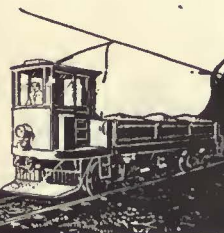
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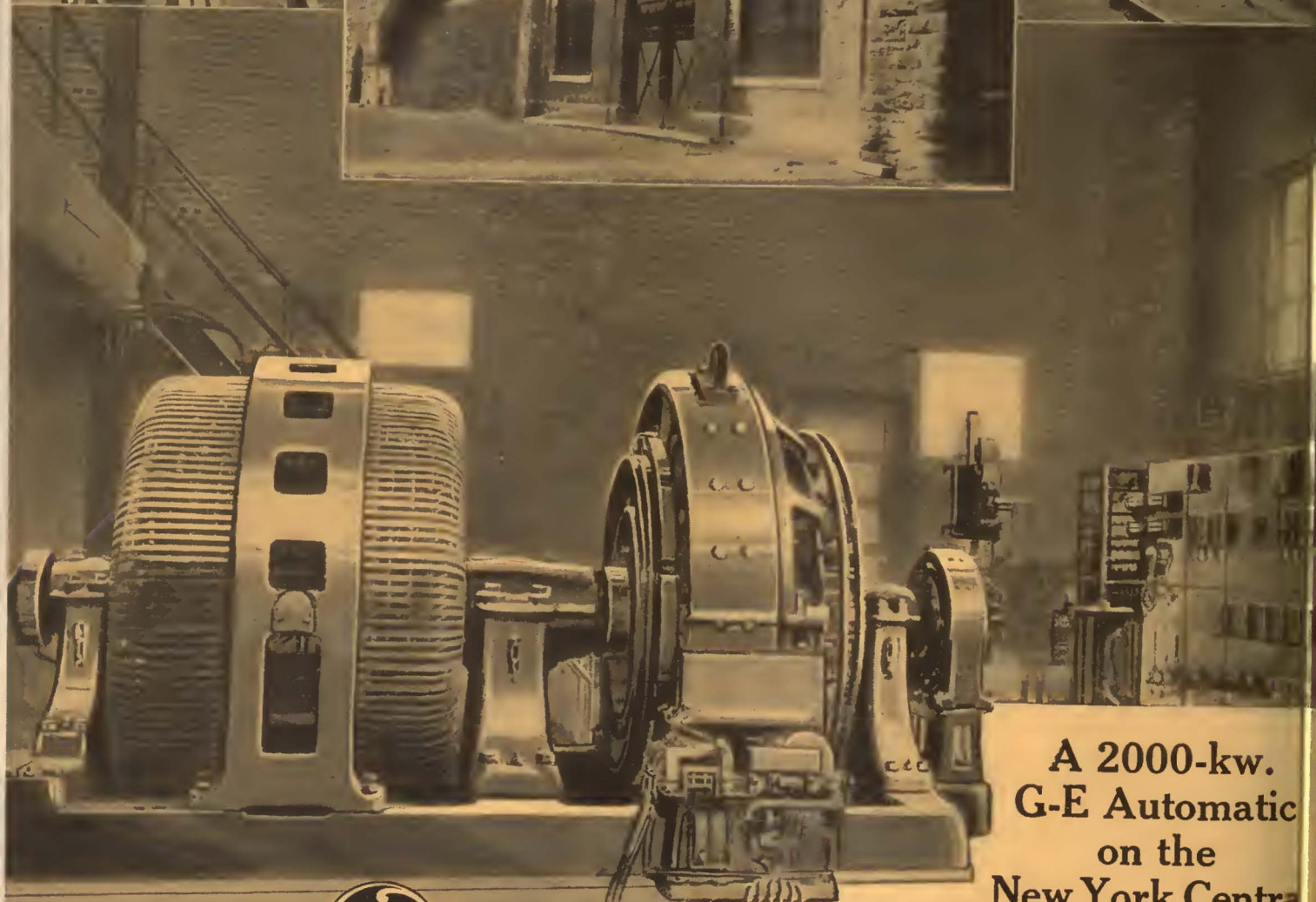


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