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Monthly Mechanical and Engineering Edition

ELECTRIC RAILWAY JOURNAL

WESTINGHOUSE ELECTRIC

HL Control

Operators will recall the prophesy made twelve years ago that HL is—

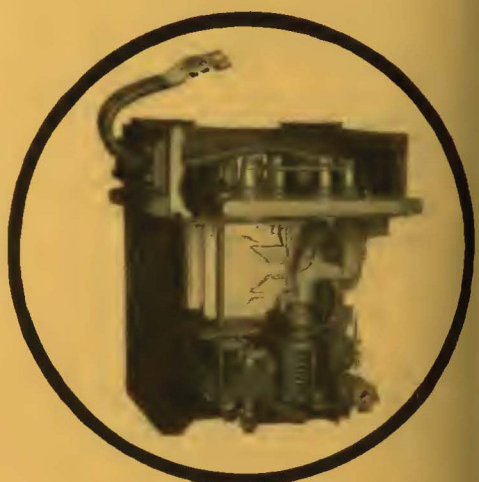
"The type of control that is destined to become *the standard of the country*"

Nearly 250 roads have since adapted it and a large number of those handling high speed—rapid and congested traffic depend on it.

Recent studies of the development of mass transportation have opened a new field of application. Progressive operating companies who realize their resposibility to the public are seeing the necessity for operating light-weight cars in multiple unit trams on their surface lines.

HL control is at their service—the self-same control of twelve years' test. It is used in regular city surface line transportation in Boston, Baltimore, Milwaukee, Los Angeles, San Francisco and Cleveland.

With its recent installation on the new cars for the Frankfort Elevated in Philadelphia, it is now in use on nearly every elevated and subway system in America.



Type 480 Unit Switch

MEMBER AERA 1922

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Westinghouse

Vol. 59, No. 15 New York, April 15, 1922 *Pages 623-664*

Electric Railway Journal

HENRY W. BLAKE and HAROLD V. BOZELL, Editors HENRY H. NORRIS, Managing Editor

CONTENTS

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(*Published in London*)

Member Audit Bureau of Circulations
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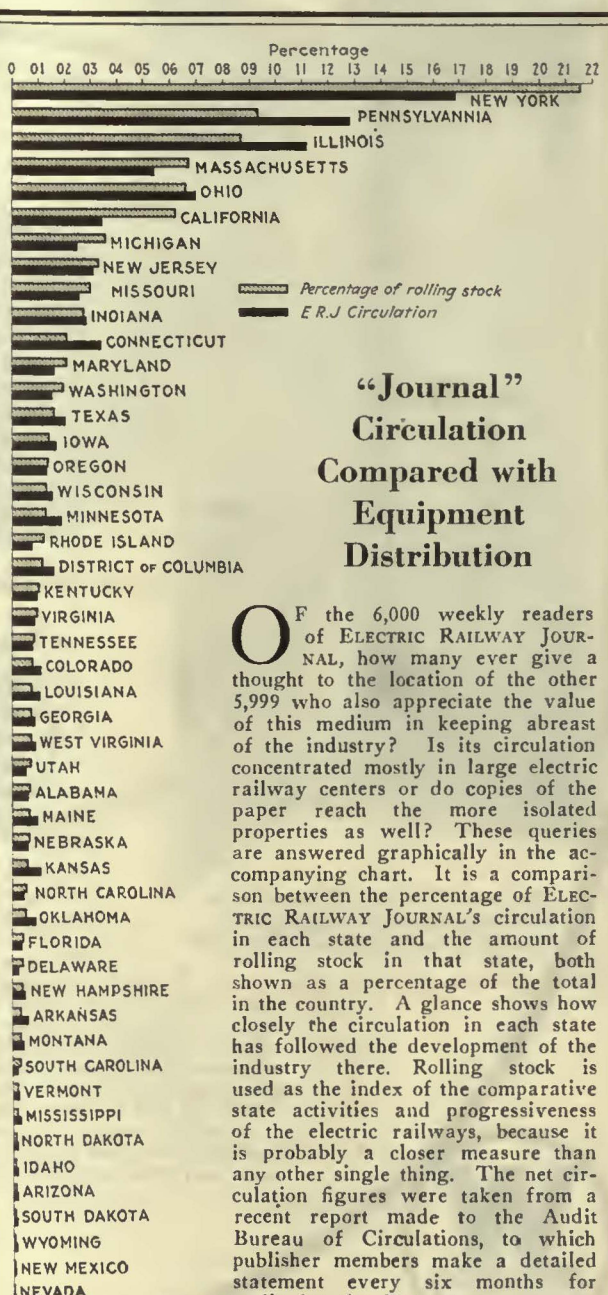
Change of Address—When change of address is ordered the new and the old address must be given. Notice be received at least ten days before the change takes place.

Published weekly. Entered as second-class matter, June 23, 1908, at the Post Office, New York, under the Act of March 3, 1879. Printed in U. S. A.

Circulation of this Issue, 6,150



"Journal" Circulation Compared with Equipment Distribution

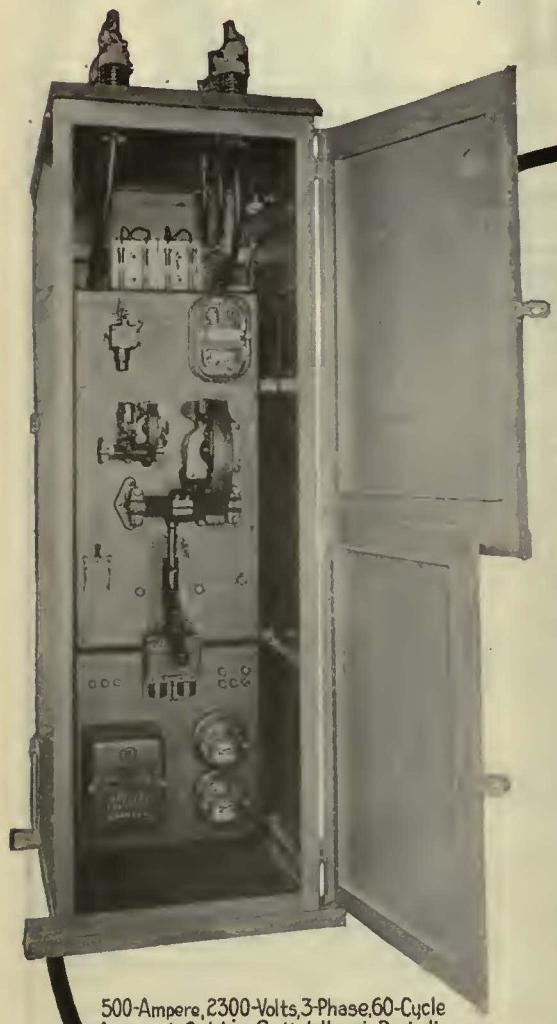
OF the 6,000 weekly readers of ELECTRIC RAILWAY JOURNAL, how many ever give a thought to the location of the other 5,999 who also appreciate the value of this medium in keeping abreast of the industry? Is its circulation concentrated mostly in large electric railway centers or do copies of the paper reach the more isolated properties as well? These queries are answered graphically in the accompanying chart. It is a comparison between the percentage of ELECTRIC RAILWAY JOURNAL's circulation in each state and the amount of rolling stock in that state, both shown as a percentage of the total in the country. A glance shows how closely the circulation in each state has followed the development of the industry there. Rolling stock is used as the index of the comparative state activities and progressiveness of the electric railways, because it is probably a closer measure than any other single thing. The net circulation figures were taken from a recent report made to the Audit Bureau of Circulations, to which publisher members make a detailed statement every six months for audit by the Bureau.

Proper allocation of subscribers, as well as volume, is a factor indicative of the worth of a publication's circulation. Likewise it is a measure of the thoroughness with which a paper is serving its particular industry and shows that circulation building efforts have been correctly proportioned and directed. To those readers of ELECTRIC RAILWAY JOURNAL who know that it is read year after year by 98 or 99 per cent of electric railway executives and operators, this analysis will be merely a confirmation of that fact. It should demonstrate to the other readers how ELECTRIC RAILWAY JOURNAL aims efficiently to keep the entire industry well-informed, unified and progressive.

Advertising Index—Alphabetical, 56; Classified, 52, 54; Searchlight Section, 51

Westinghouse Automatic Outdoor Switch Houses

Assure Uninterrupted Service



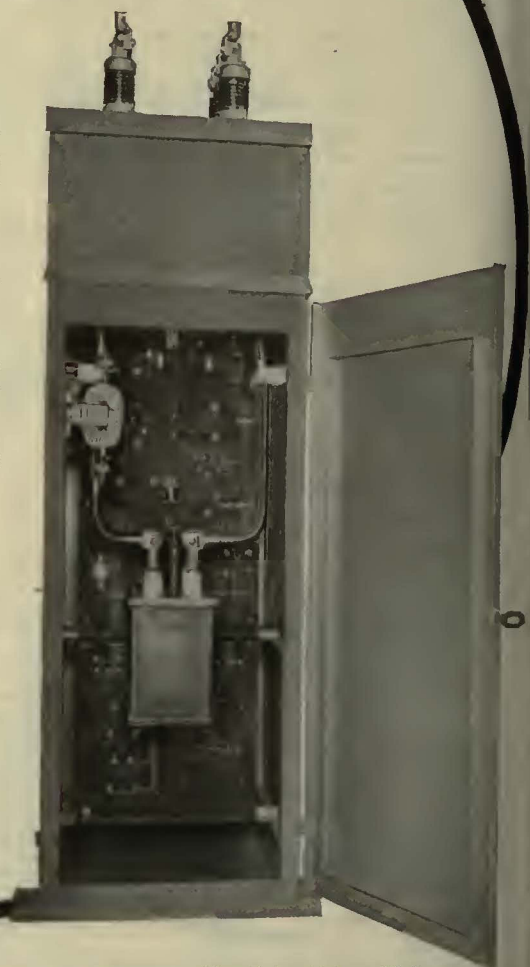
500-Ampere, 2300-Volts, 3-Phase, 60-Cycle Automatic Outdoor Switch House, Periodic Re-closing Feeder Equipment.-Front View.

The Westinghouse Company has developed two types of automatic outdoor switch houses; Service Restoring Feeder Equipment for control of circuits supplying a synchronous motor load, and small transformer banks: Periodic Reclosing Feeder Equipment for control of feeders on which the loss of the synchronous motor load is not important, and large transformer banks.

With the Service Restoring Feeder Equipment the circuit breaker closes in one to two seconds after opening.

With the periodic Reclosing Feeder Equipment the circuit breaker can be set to close at definite time intervals between ½ minute and 2 minutes, depending upon the setting of the timing relay.

The equipments are arranged to reclose the circuit breaker three times after they have opened automatically under the initial short circuit. Should the breaker open a fourth consecutive time, the equipment will be locked out with the breaker in the open position. After the line has been cleared, the breaker is closed by means of the control switch, or push button, and the relay automatically reset for normal operation.



500-Ampere, 2300-Volts, 3-Phase, 60-Cycle Automatic Outdoor Switch House, Periodic Re-closing Feeder Equipment.-Rear View.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Westinghouse

A New Westinghouse Suspension

Type B-1

Patent Applied For

This suspension is similar to our well-known Type B straight-line suspension, but has a longer stud fitted with a lock washer held in a recess by a thin copper washer. This enables the trolley ear to be aligned accurately and always assures a tight connection between the suspension and the trolley ear.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Westinghouse

READY FOR SERVICE

Some of the 50 large new all-steel cars going into operation on the Frankford Elevated Railway, Philadelphia.

—all equipped with ELECTRO-PNEUMATIC

Westinghouse Electro-Pneumatic brake equipment (Schedule AMUE) is recognized as an essential factor in the successful operation of modern high-speed elevated and subway trains.

Representing the highest development of the automatic brake plus the feature of electric control, the Electro-Pneumatic brake provides for instantaneous and simultaneous application of all brakes throughout the train, insuring short, smooth station stops and the shortest possible stops in emergency.

These are features which vitally affect the entire system of modern train operation in congested centers.

Electro-Pneumatic brakes not only save money. they point the way to increased earnings as well.

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

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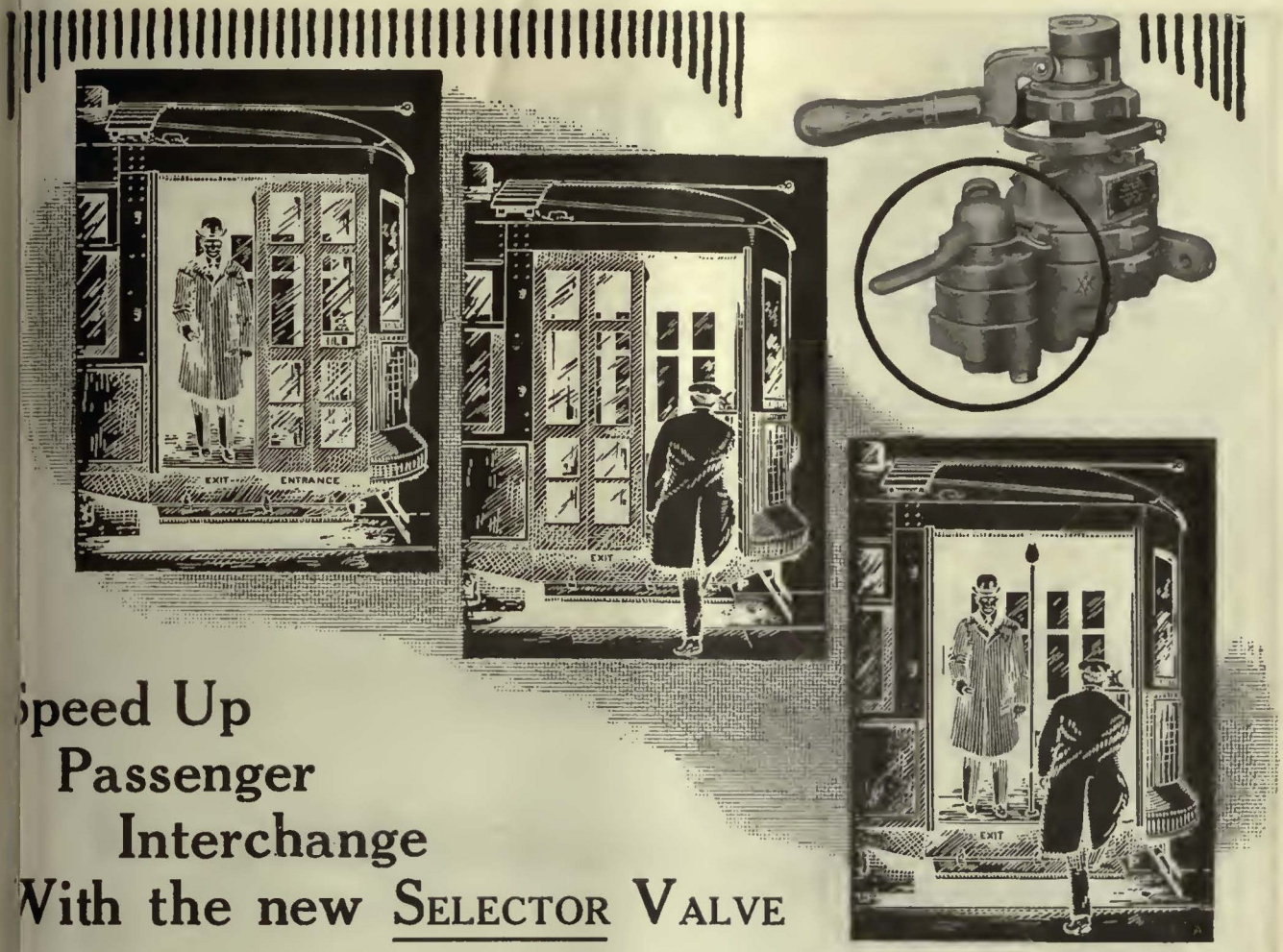
WESTINGHOUSE TRACTION BRAKES



Speed Up Passenger Interchange With the new SELECTOR VALVE

THE use of double passageways on Safety Cars to facilitate passenger interchange made thoroughly safe and practical by the new Selector Valve.

The Selector Valve, functioning in connection with the standard M-28 Safety Car brake valve, makes it a simple matter to open or close either door independently, or both together, as occasion demands.

The operator is enabled to regulate the entrance or exit of passengers to meet the highest requirements of speed and safety under all conditions. Thus the many recognized advantages of the double passageway are utilized to the utmost with every assurance of ease and security.

The illustration gives you a picture of efficient passenger interchange as effected with the new Selector Valve.

No time lost loading and unloading passengers. Greater car mileage. Increased revenue.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.

Postal and Telegraphic Address:
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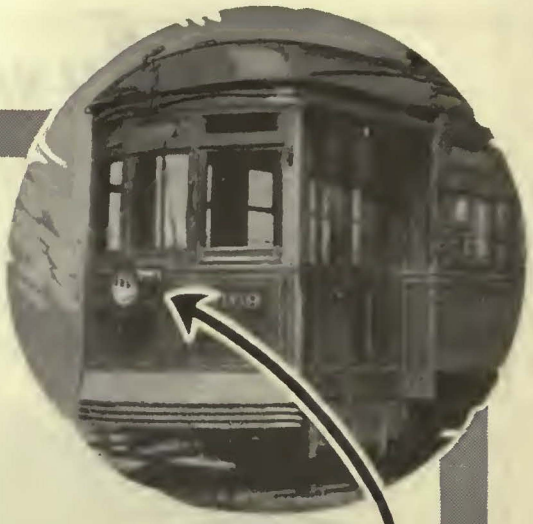
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH



IMPERIAL HEADLIGHTS FOR EVERY TYPE of CAR

Write out specifications for the ideal headlight for your cars. You will find that one of the many Crouse-Hinds Imperial Headlights will fit your requirements exactly.

You can have an Imperial to deliver any quantity of light you need.

You can get an Imperial of the right dimensions, ready for mounting in any way you please.

Best of all, you will find all types of Imperials are rugged, simple, enduring.

There are various Incandescent, Luminous Arc, Carbon Arc types in the Crouse-Hinds Imperial family. ***Send for catalog.***

The Ohio Brass Company

Mansfield, Ohio

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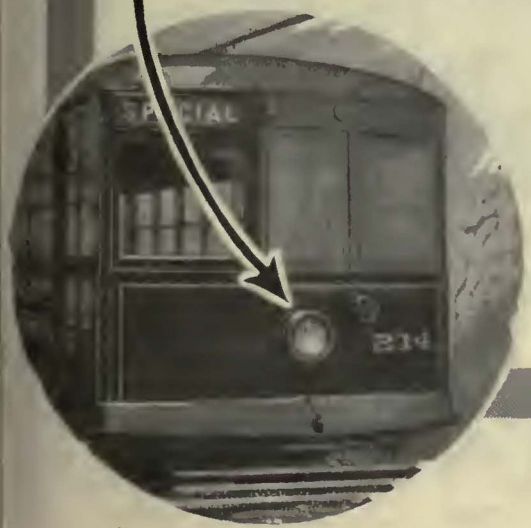
San Francisco Los Angeles

Exclusive Sales Agents in the U. S. for Crouse-Hinds Imperial Headlights.



Thirty per cent fewer rail fastenings with Steel Twin Tie Track. It has been assembled, aligned and surfaced for 12 cents a foot.

Check Steel Tie construction with these essentials of good paved track—

Bearing—The efficient design of Steel Twin Ties provides 156 square inches of effective bearing per track foot at the lowest cost per unit of bearing—and, where it is most needed, 468 sq. in. of bearing under each joint.

Permanent Materials—In Steel Twin Tie construction, the tie structure embedded in concrete is not affected by water, temperature variations or rot.

Economy—Steel Tie Track minimizes excavation, concrete and track labor. It costs no more than wood ties in rock ballast and its longer life decreases the cost per track-foot per year.

For estimating get the 1922 *prices at your delivery point.*

THE INTERNATIONAL STEEL TIE CO., CLEVELAND

Steel Twin Tie Track

Ajax Electric Arc Welder

Let's Go

into the question of welding

What are the vitally important features a railway man demands in his choice of welding equipment? Are they not, first of all, sufficient amperage to make a deeply-penetrating weld under any conditions, and next, low cost of handling and maintenance?

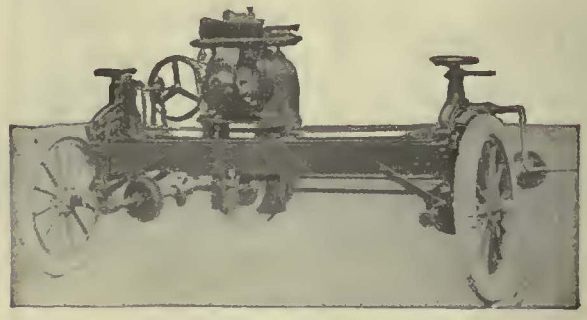
The Ajax Electric Arc Welder

— *meets all these requirements*

The highest capacity welder of its class. Its normal rating is 333 amperes at 600 volts; where the line voltage falls as low as 300 it still gives over 200 amperes. Thus a deeply-penetrating, firm and solid weld is certain under worst conditions.

The Ajax Welder is so rugged and simple in construction that any reasonably intelligent work-man can be taught to operate it efficiently and rapidly. It is so light that two men can pick it up and carry it anywhere. In case an accident damages a coil anyone can install a new one quickly. There's nothing else to get out of order!

Its usefulness extends to bonding, welding fish plates, building-up cupped joints and broken special work, repairing castings and in general shop work.



Universal Rotary Track Grinder

A Leading Line of Grinders

Atlas Rail Grinder

Reciprocating Grinder

Universal Rotary Track Grinder

Send for catalogues.

RAILWAY TRACK-WORK COMPANY

3132-48 E. Thompson St., Philadelphia, Pa.

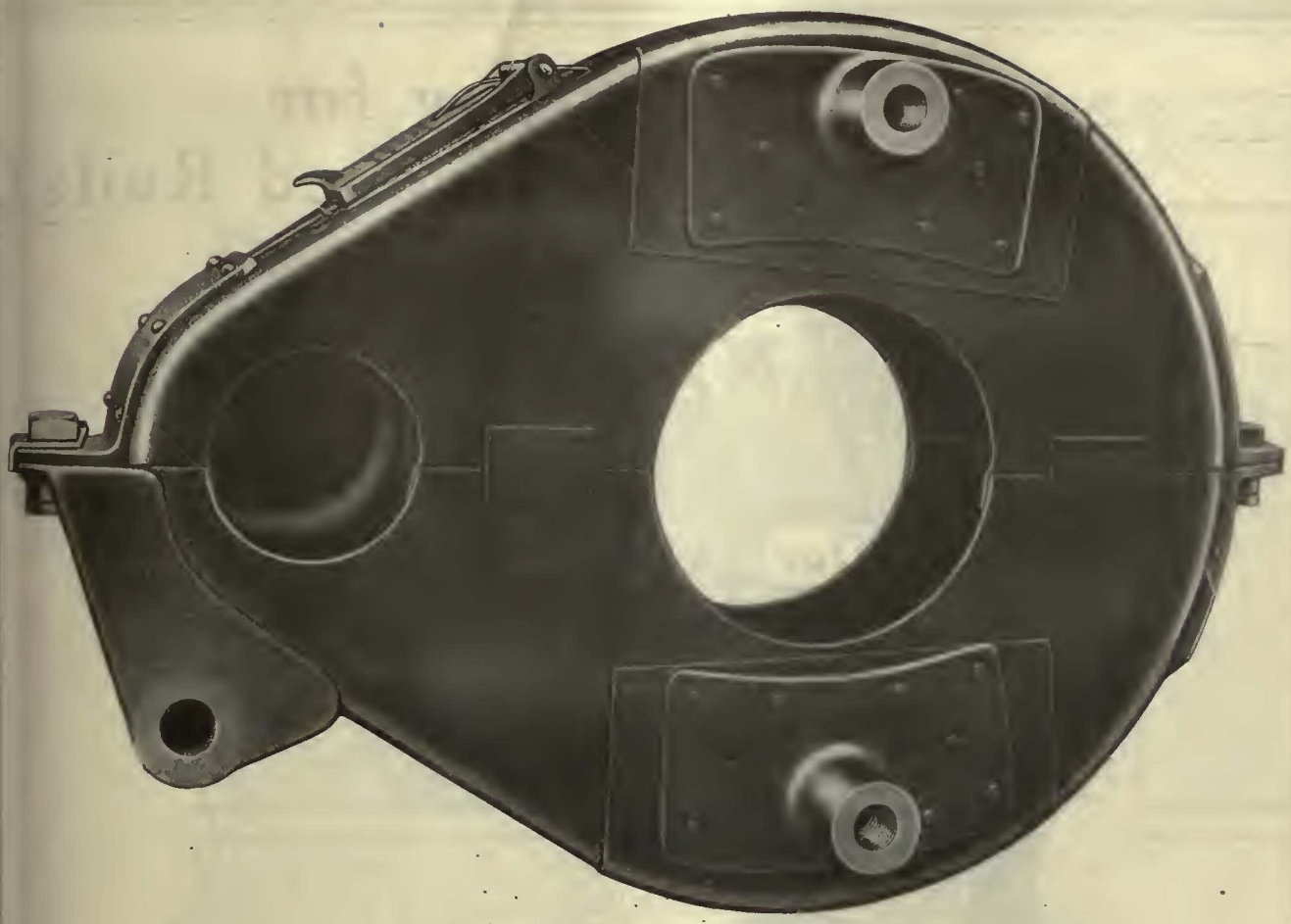
AGENTS:

Chas. N. Wood Co. Boston

Electrical Engineer & Mfg. Co. Pittsburgh

Atlas Railway Supply Co. Chicago

P. N. Wood New Orleans



Steel—Riveted—Welded—Light
Strong—Rigid—Durable—Tight

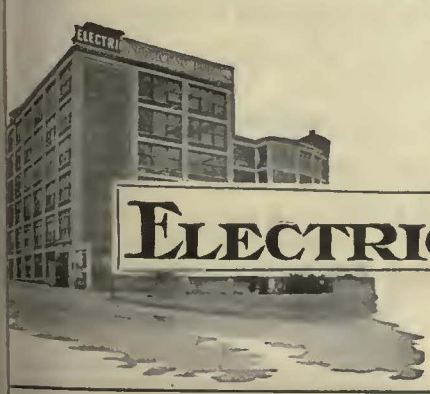
It's a KEYSTONE

The Keystone Steel Gear Case—"a real case of real service"—is known to hundreds of the largest operators of the country.

The operator trying and having been convinced as to the exceptional merits of the Keystone Case, has passed the good word along—with the result that Keystone invariably flashes in mind the instant motor gear protection is mentioned.

With the increasing popularity of the safety car the demand for Keystone Gear Cases is continually growing due chiefly, to the fact that the Keystone Case lightens the load without sacrificing any of the protective and wearing factors which make the gear case a common requisite.

Try a Keystone Steel Gear Case on any type of car. Write for data sheets.



ELECTRIC SERVICE SUPPLIES CO.

Manufacturer of Railway Material and Electrical Supplies

Philadelphia, 17th and Cambria Sts.; Pittsburgh, 829 Oliver Bldg.; Scranton, 316 N. Washington Ave.; New York, 50 Church St.; Chicago, Monadnock Bldg.

Modernize! *Pneumatize!*

Passengers Want Just Four Things

A—to get on quickly, easily, safely.
B—to get off quickly, easily, safely.
C—to avoid delay when paying, at either entrance or exit.
D—to have the car *keep moving.*

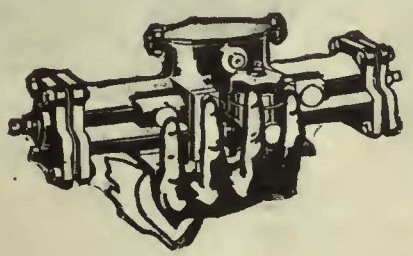
It might all be boiled down to *speed and safety*—for that matter!

And YOU want just ONE thing.

A—more revenue from more fares.

The rest of the alphabet doesn't matter much, which in turn boils down to the simple fact that when the four wants of your passengers can be satisfied by the conductor's merely moving a little lever or pressing a button—

leaving him free to concentrate all his attention on YOUR one want—



conditions will seem pretty near perfect, won't they?

No we're not speaking of the millennium, but merely of those cars whose doors, steps and signals are synchronized and controlled by

The National Pneumatic "Rushour" Line

Door and Step Control — Door and Step Operating Mechanisms
Motorman's Signal Lights — Safety Interlocking Door Control
Multiple Unit Door Control

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

National Pneumatic Company, Inc.

Originator and Manufacturer
50 Church St., New York — Edison Bldg., Chicago
Works: Rahway, N. J.

WHEN THE OUTLA
THEN—IT'

We invite your attention to certain fundamental principles in track construction which are worthy of consideration—

The foundation, the immediate support and fastening of the rail, the proper protection and support of the joints, the life of the street paving and the initial cost.

Each and every one of these points is given special consideration in the construction of Dayton *Resilient* Ties.

Years of service under the most severe conditions have proven that they are built on sound principles and are fundamentally correct.

DAYTON

USTIFIES THE LAYOUT
TRACK BUILDING TIME

When track costs per annum equal or exceed interest and investment costs on a new track, then it's time to consider complete reconstruction and—

When you consider new construction you certainly want to do the job right and at the least possible first cost.

You want permanency and freedom from joint repairs and adjacent street paving.

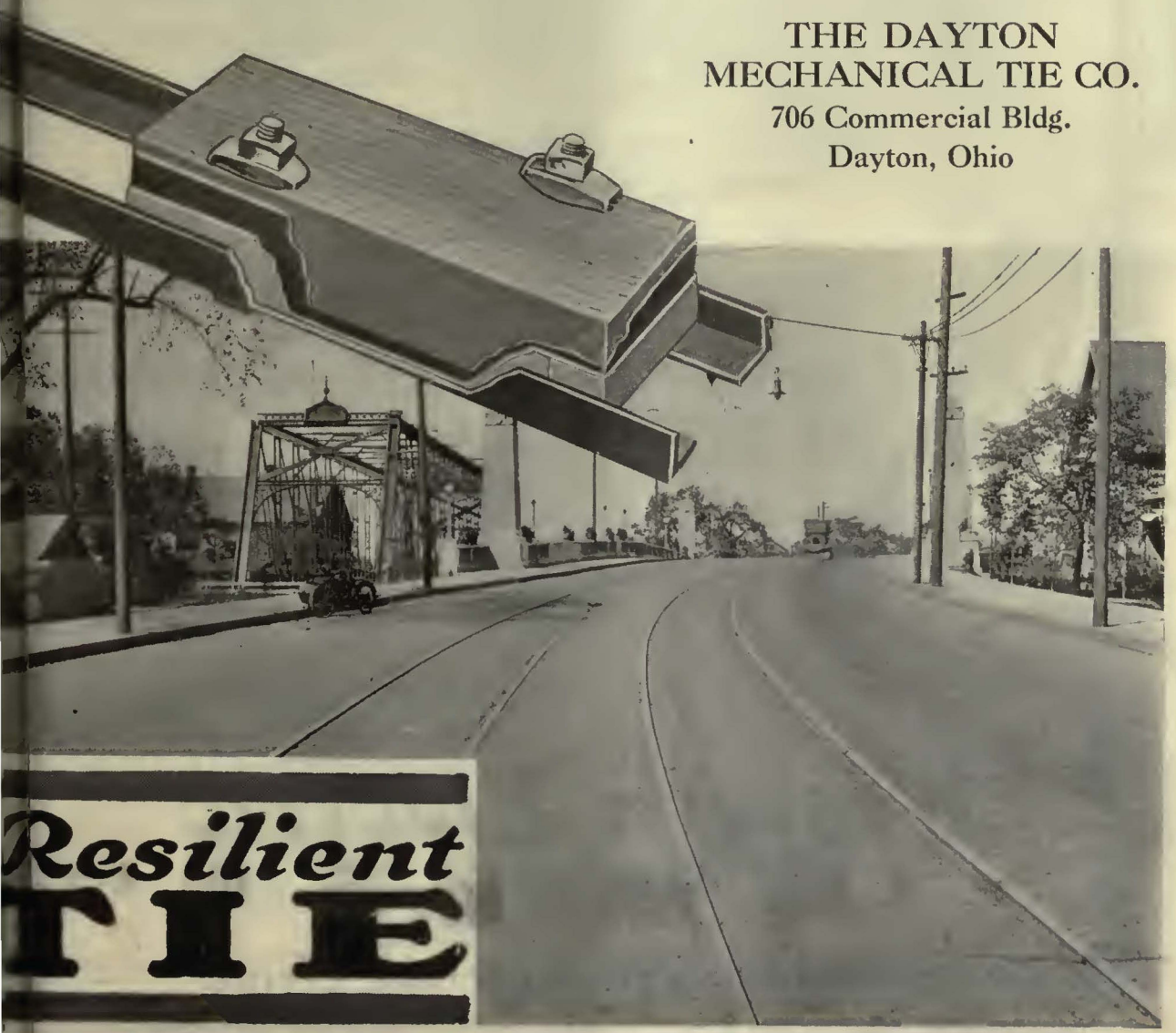
What you want is the coming thing in track construction — Dayton *Resilient* Ties.

Accurate cost figures show that this track saves $6000 a mile over wood ties in concrete and $2000 as compared with wood ties in gravel ballast.

In addition to these remarkable savings in first cost, Dayton *Resilient* ties insure longer life to track and paving — they reduce to a minimum both track and paving repairs—they reduce traffic noise and upkeep of rolling stock by cushioning the shocks and jars on foundations that lack *resiliency*.

Perhaps a two-cent stamp spent *now* will save you thousands of dollars next month in new track construction. Just drop us a line asking for complete information about Dayton *Resilient* ties.

THE DAYTON
MECHANICAL TIE CO.
706 Commercial Bldg.
Dayton, Ohio



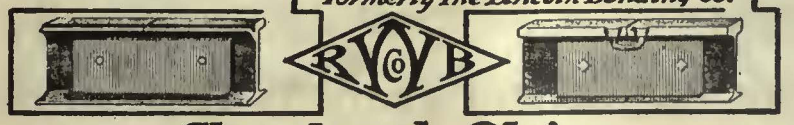
utting the 9th Avenue, New York, tracks in shape with an RWB Dynamotor

From coast to coast electric railway lines successfully use RWB equipment for building up worn rails, crossovers, etc., bonding, fish plate welding and repairing broken parts of rolling stock. RWB equipment has proved itself of utmost value to hundreds of railways on the line and in the shops. The economy of operation—excellence of work—and portability of the apparatus appeal to every practical maintenance of way engineer.

Our Engineering Department is pleased to furnish complete information on request.

Rail Welding and Bonding Company

formerly The Lincoln Bonding Co.



Cleveland, Ohio.

New York Office
30 Church Street

Chicago Office
343 So. Dearborn St.

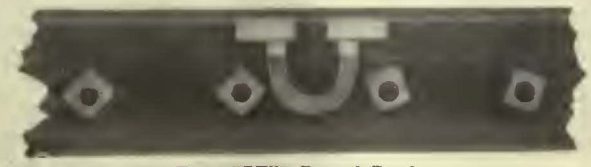
London Representative:
Scholey Construction Company, 56 Victoria Street, Westminster.

ERICO RAIL BONDS

HAVE STOOD THE TEST

THEY HAVE GIVEN HUNDREDS OF USERS ENTIRE SATISFACTION

ERICO BRAZED BONDS are in a class by themselves, without a rival; they may be brazed on the side of the head of the rail or on the web of the rail either underneath or around the fish plates.



Type "ET"—Brazed Bond

ERICO ARC WELD BONDS all have steel encased terminals electrically brazed to the copper conductor by a patented process, which insures maximum conductivity and durability.

Type "A"—Arc Weld Bond

Long cable bond for use around the fish plates, cross bonding and special work.

Short cable bond for application to head of the rail, and especially adapted to "Weber Joints."

Type "AA"—Arc Weld Bond

Type "AU"—Arc Weld Bond

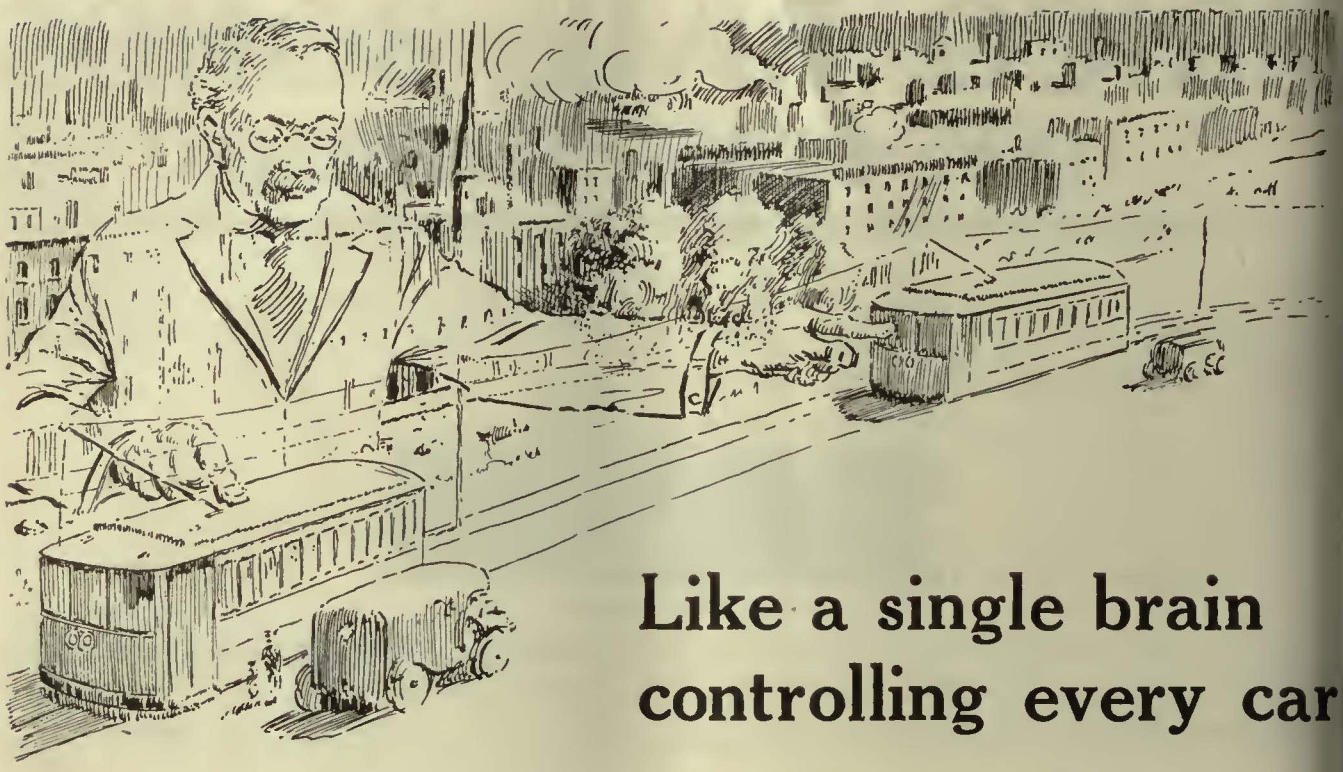
Ribbon bond for use on head of rail where preference requires a laminated copper ribbon conductor.

Bond with Drop Forged Steel terminals and twin conductors, permitting a higher arc current in welding them to the rail, thus speeding up their application, and allowing a novice to do the work without injury to the bond.

Type "ATF"—Arc Weld Bond

FOR EACH REQUIREMENT AN ERICO BOND TYPE—
FOR EACH TYPE THE LOWEST PRICE ON THE MARKET

The Electric Railway Improvement Co.
Cleveland, Ohio



Like a single brain controlling every car

If you could build a gigantic tower so high that one man could sit therein and personally direct the movements of each car—

You couldn't get any better results than you can by equipping each car with Nichols-Lintern Indicating Signals.

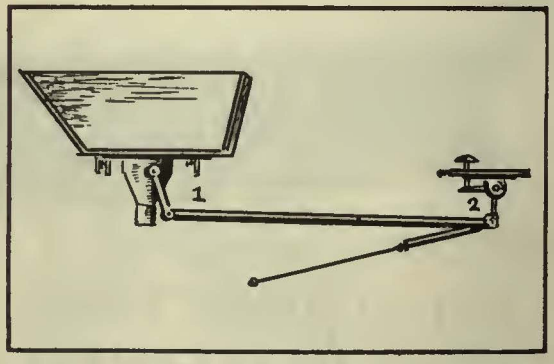
For these flashing rear-end signals make every motorman who sees them instantly aware what the car ahead is going to do.

He knows, as soon as the controller handle is moved in that distant car, whether it is going to stop, start, or go fast or slow.

He knows—and the Chauffeurs know and all kinds of drivers behind the car know—instantly—just whether to stop or start. And rear-end accidents recede into the realm of the impossible.

N-L Indicating Signals not only protect your cars; they also protect your fuel pile by making coasting safer. And they protect your motors, trucks and brakes by eliminating the many false moves made by motormen who don't know what the car ahead is going to do.

—and a single movement of the foot starts the sand and stops the car



Here is all there is to it for the Safety Car—rapidly and cheaply installed.

That is all there is to it. Just the pressure of a foot when the handbrake is applied. The sand comes out—and the car stops. Air can and will fail—sometimes. Mostly, it seems, just when most needed. No car is completely safe unless the hand brakes are assisted by N-L Mechanical Sanders. Full details and literature on request.

The Nichols-Lintern Company, 7960 Lorain Ave., Cleveland, Ohio

N-L Products Manufactured and Sold in Canada by Railway & Power Engineering Corporation, Ltd., 133 Eastern Avenue, Toronto, Ontario.

Despite these unfavorable conditions, an allocation of the present investment over the ultimate capacity of 200,000 kw. shows a construction cost per kilowatt capacity of $106.51. Elimination of the large item for the rubble mound and unusual amount of other marine, tunneling and excavation work, in order to put Lakeside on a more nearly comparable basis with the construction work on other recently built large generating stations, would seem to bring the cost of Lakeside into a favorable position.

There has not been sufficient time as yet to complete the research work involved in this development, nor have all of the opportunities been exhausted for research opened up in connection with the development of numerous original ideas which are incorporated in the design of this plant. However, the long series of tests made under the auspices of the United States Bureau of Mines have provided the basis for strongly expressed confidence on the part of the designers of the plant that their original expectations as to operating efficiency will be fully met. It is expected that full operating figures of the new station will later be made available. The true extent to which powdered fuel burning may affect future central station design will then be determinable.

Apply Modern Parts to Old Equipment Where Possible

THE task of furnishing more reliable service and of extending the life of railway operating equipment is an ever-present one with the superintendent of equipment and the master mechanic. Thoroughgoing maintenance includes both of these. Reliable service results from keeping all parts in a condition that will obviate trouble. Greater life from the various parts can come only with the use of better materials in construction and better methods in care and assembly and the selection of more satisfactory designs. But in the problems of maintenance the application to old equipment of improvements incorporated in late designs of equipment has not received the attention that it merits.

In an article in this issue John S. Dean discusses some improvements which form a part of most recent motor designs and which can be incorporated in old-type railway motors with beneficial results. For example, a number of modern designs of brush-holders are available for some of the old-type motors and, in cases when the complete brush-holder cannot be used, repairs can be made frequently with such improved parts as springs, ratchets, contact tips and braided shunts.

These changes from old designs have come about through the efforts of the manufacturers to improve their products and through results obtained in exacting service. Their adoption and application to present equipment will result in longer life and better service. Some improvements, like the use of spring pads under field coils to keep them tight, of brass or copper sleeves on brush-holder and field leads and of fiber or wooden cleats for wiring around the frame, are very simple and can be readily adopted without great expense.

With new equipment maintenance costs are comparatively low. But when repairs are necessary, methods and materials found most satisfactory by the manufacturer should be used. The use of correctly shaped armature coils, of pure tin solder instead of ordinary half-and-half solder and of a high grade of tinned-steel banding wire will do much toward producing high-class repairs. Proper maintenance means something more than restoring parts to their original new condition. It should include the use of the most modern parts and up-to-date methods.

Concentrate on Incentives for Best Results in Organization

WHY does a man who is in business for himself work, in general, with more satisfaction and interest to himself than one who works for others? In spite of his longer hours and greater financial risk, he is happier in his work provided that he has the requisite talent for business. The reason for this is obviously that he benefits directly by the results of his efforts and he is able, within limitations imposed by his financial and personal capacity, to carry out his ideas promptly. From this point of view it would seem as if everybody would want to get into business, but it is perhaps fortunate for the industrial condition of the country that only a small part of the population of the country have sufficient business capacity to enable them to be their own employers. Most of them must work for others, but if they are to do their best work they must be furnished an environment as nearly as possible like that which would surround them in their own business.

Recognizing the fact that the ideal condition for work is that under which the employee receives some tangible recognition for good service, electric railway managers are showing an increasing interest in bonus or premium plans of various kinds. Even where actual bonuses are not offered as rewards for good work, the fundamental principle underlying them is recognized. The problem of the executive is to furnish the most potent incentives to good work. What these incentives will be in each case is an individual problem to determine, but the manager must find them if he is to succeed largely. Probably the most extensive system in use is that employed in various departments of the Milwaukee Electric Railway & Light Company. It was inaugurated on a small scale in 1912 and since has been extended. The United Railways of St. Louis adopted a somewhat similar system in 1917. The plan of paying bonuses for fuel saving has been extensively used in power plants, as by the Manila Electric Railway & Light Company, and for accident reduction on a number of properties. Thus, last Christmas, the Los Angeles Railway distributed about $90,000 in awards to transportation employees, graduated on the basis of performance in this respect. Many received $60, and some as much as $120 for the year.

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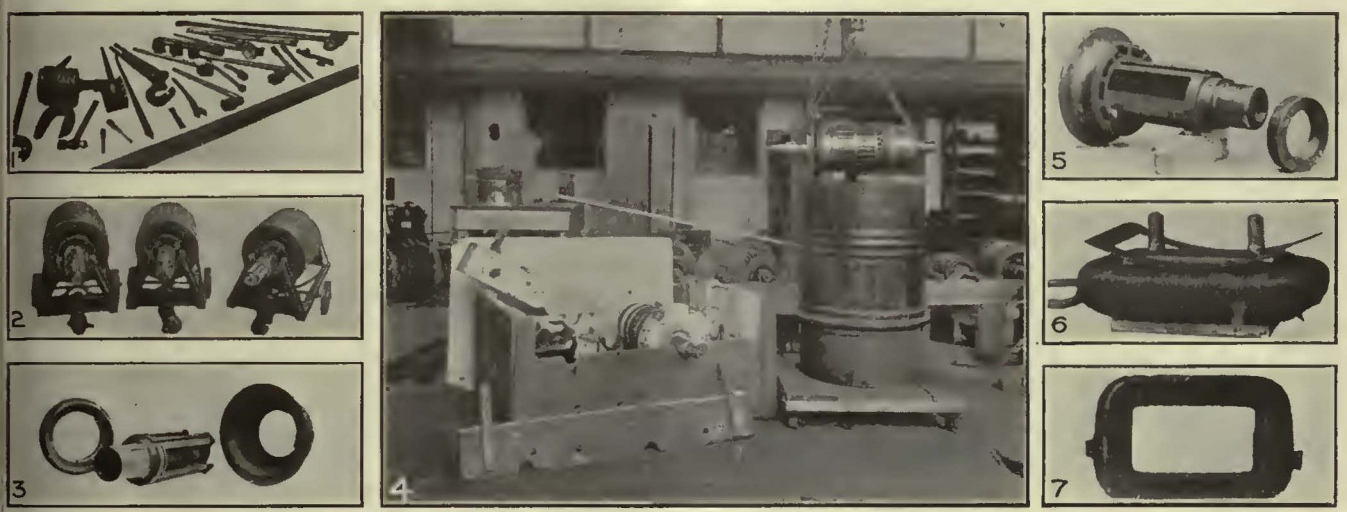

HANDY TOOLS AND IMPROVED DETAIL PARTS REDUCE MAINTENANCE COSTS

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1. It is essential to provide the necessary and most efficient tools and equipment in order to overhaul and repair these motors in good, workmanlike manner and without danger of possible damage to any of the detail parts.

2. It is desirable to have several spare complete motors and armatures available so that when overhauling motors this work will not have to be rushed through the shops. This will encourage careful, consistent work on the part of the men and will result in a more dependable rebuilt motor.

3. In replacing worn parts, a better grade of material should be substituted wherever possible to insure a longer life of these parts.

4. It is necessary to adopt all the improved methods of reconstruction, including up-to-date processes and treatments, and to use greater care in the assembly of the various parts of these motors.

5. All improvements in design of the detail parts which are available should be applied and adapted to older motors.

Some of the more important points that should be considered in connection with the revamping of these old motors will be given in detail for the benefit of operators and master mechanics who may be interested in making their motors more reliable and better able to meet present-day operating conditions.

Good Workmanship Requires Proper Tools

An extremely important factor in doing any kind of work is that it be done by efficient and reliable mechanics who are provided with the necessary suitable tools and equipment. There is nothing so discouraging to any kind of a workman as to be forced to do a job without the aid of the necessary tools adapted for the work in hand. Of course, the job will be done, but generally in a heartless, shiftless sort of way and when completed it may or may not hold together in service. A good selection of small tools, snug-fitting, open-socket and special-type wrenches, flat and pointed steel bars, pullers, jacks, hoists, etc., placed in the hands of the average workman will do much toward producing very good results in the maintenance and upkeep of railway equipment.

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Despite these unfavorable conditions, an allocation of the present investment over the ultimate capacity of 200,000 kw. shows a construction cost per kilowatt capacity of $106.51. Elimination of the large item for the rubble mound and unusual amount of other marine, tunneling and excavation work, in order to put Lakeside on a more nearly comparable basis with the construction work on other recently built large generating stations, would seem to bring the cost of Lakeside into a favorable position.

There has not been sufficient time as yet to complete the research work involved in this development, nor have all of the opportunities been exhausted for research opened up in connection with the development of numerous original ideas which are incorporated in the design of this plant. However, the long series of tests made under the auspices of the United States Bureau of Mines have provided the basis for strongly expressed confidence on the part of the designers of the plant that their original expectations as to operating efficiency will be fully met. It is expected that full operating figures of the new station will later be made available. The true extent to which powdered fuel burning may affect future central station design will then be determinable.

Apply Modern Parts to Old Equipment Where Possible

THE task of furnishing more reliable service and of extending the life of railway operating equipment is an ever-present one with the superintendent of equipment and the master mechanic. Thoroughgoing maintenance includes both of these. Reliable service results from keeping all parts in a condition that will obviate trouble. Greater life from the various parts can come only with the use of better materials in construction and better methods in care and assembly and the selection of more satisfactory designs. But in the problems of maintenance the application to old equipment of improvements incorporated in late designs of equipment has not received the attention that it merits.

In an article in this issue John S. Dean discusses some improvements which form a part of most recent motor designs and which can be incorporated in old-type railway motors with beneficial results. For example, a number of modern designs of brush-holders are available for some of the old-type motors and, in cases when the complete brush-holder cannot be used, repairs can be made frequently with such improved parts as springs, ratchets, contact tips and braided shunts.

These changes from old designs have come about through the efforts of the manufacturers to improve their products and through results obtained in exacting service. Their adoption and application to present equipment will result in longer life and better service. Some improvements, like the use of spring pads under field coils to keep them tight, of brass or copper sleeves on brush-holder and field leads and of fiber or wooden cleats for wiring around the frame, are very simple and can be readily adopted without great expense.

With new equipment maintenance costs are comparatively low. But when repairs are necessary, methods and materials found most satisfactory by the manufacturer should be used. The use of correctly shaped armature coils, of pure tin solder instead of ordinary half-and-half solder and of a high grade of tinned-steel banding wire will do much toward producing high-class repairs. Proper maintenance means something more than restoring parts to their original new condition. It should include the use of the most modern parts and up-to-date methods.

Concentrate on Incentives for Best Results in Organization

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1. It is essential to provide the necessary and most efficient tools and equipment in order to overhaul and repair these motors in good, workmanlike manner and without danger of possible damage to any of the detail parts.

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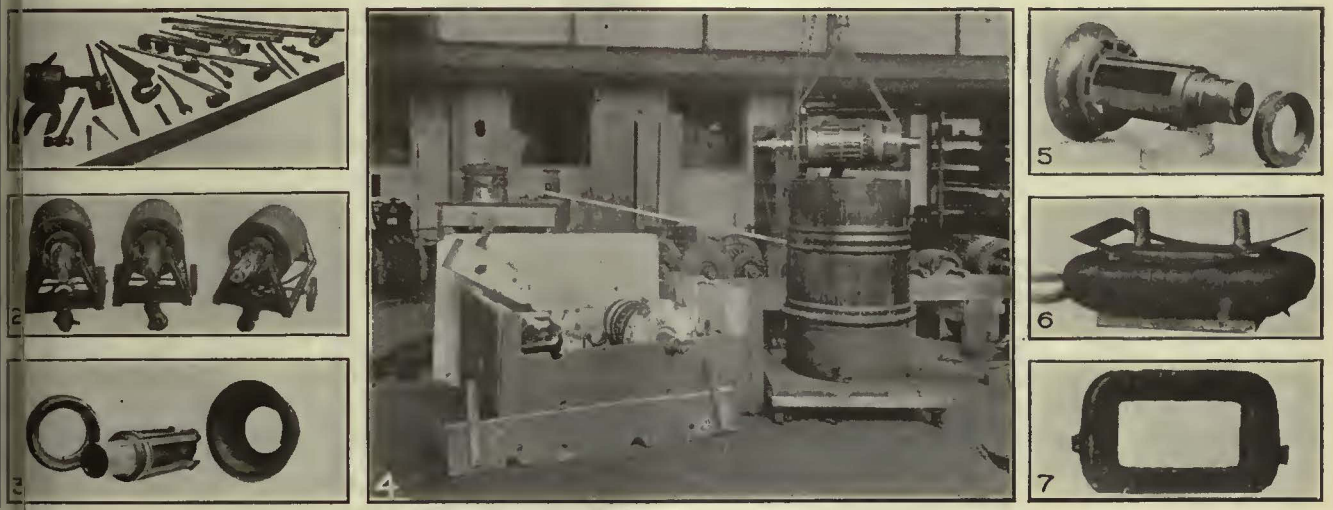

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are times when this work must be rushed through the shop so as to get the required number of cars out on the road to handle the rush-hour crowds. Granted that special rush jobs are sometimes forced upon the shop and cannot be avoided, there are instances where this method of making repairs becomes a habit with operators and all work is handled in this manner, resulting in establishing a standard of poor workmanship, which tends to increase the ultimate maintenance expense. A motor repaired under these conditions is only a makeshift job in many cases, and is very likely to be back in the shop again in a short time for other troubles that should have been detected when in for repairs the first time. It is needless to say that this oversight or apparent neglect on the part of the workmen is largely due to lack of time. This condition can be almost entirely remedied and, further, cars can be put back in service quicker by having extra motors to replace those taken from the cars for repairs or for overhauling. In the case of the split type of motors a number of extra armatures also greatly facilitates repairs and replacements.

In removing motors from the trucks some operators consider it advisable to keep the axle caps so marked that they go back on the same motor from which they were originally taken. Further, the axle bearings, if they are still in good running condition, are wired onto the axle in their original location. It is the practice of other operators wherever possible to have the partly worn pinion put back on the new or repaired motor on the same axle so that the original gear and pinion again work together. These precautions have been found to work out to advantage, as better fits are obtained which tend to reduce friction and noise of the car. After being removed for repairs the motor should be thoroughly blown with compressed air, and the surface scraped and cleaned of all dirt and grease. The motor is then taken apart and the work of overhauling is done in the various shop departments.

Heat-Treated Shafts Prevent Trouble

Worn and damaged shafts are usually repaired by means of the arc-welding process and if carefully done by experienced workmen this has been found to be quite successful, although it is well known that the structure of the steel is more or less weakened by this process. On properties that have considerable shaft trouble this condition can be greatly helped by the adoption of heat-treated shafts that are very much tougher and have approximately 60 per cent higher elastic limit than the ordinary axle steel shafts. These shafts have a tendency to wear less at the journals and will stand much more severe abuse under heavy loads, and are less likely to break. When using heat-treated shafts it is not advisable to do any electric or gas welding on them unless they are re-heat-treated after being welded.

Some of these older motors tend to develop loose iron on the spiders of the armatures, which some operators believe is largely responsible for broken armature leads. In a great many cases it will be found that these spiders are used in connection with a detachable rear-end bell generally made of cast iron with the laminated core iron held under pressure on the spider by a ring key locking device. Experience has shown that these end bells work loose, and in some cases the ring key springs out of place, thus allowing the laminations to move on the spider. An improved construction of spider that will overcome this trouble has the spider and rear-end bell cast in one piece made of malleable iron or steel, and with a ring nut at the commutator end threaded on the spider to hold the laminations under pressure. When this design is used in connection with old laminations it is advisable to have the spider furnished machined at the fit of the iron, from 0.010 to 0.012 in. over size, so that the old iron will be a tight driving fit on the spider. There may be some objections to the spider and end bell cast in one piece as it requires a more expensive renewal charge when the end bell is broken and needs replacement. But experience has shown that with this new type of construction made of malleable iron the end bell is not so readily broken and consequently requires less frequent renewals. The benefit derived from this more rigid construction more than offsets the anticipated objection.

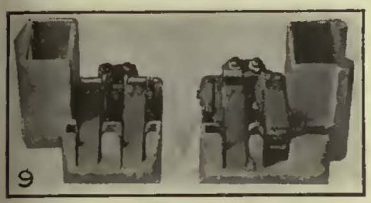
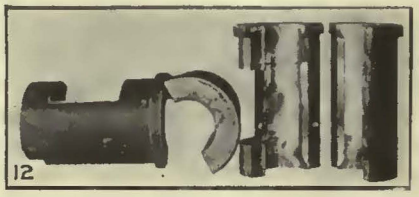
Use Good Grade Mica

If the commutator is worn down and needs refilling with a complete set of new segments, care should be taken in the assembly to use a good grade of properly treated and built-up mica cones or V-rings, and to tighten the commutator while not under pressure to secure a good solid job. It is advisable to consider the use of malleable iron or steel V-rings and spider if these parts have given trouble in service due to cracking or breaking. If the commutator is not worn out and only needs truing up, this should be done in a lathe after the armature is wound and soldered. In doing this work care should be taken not to cut down the width of the commutator neck, as this would reduce the contact area of the leads soldered into the commutator and might result in their heating up and becoming loose in service. After turning and truing up the commutator some operators grind its face, using a fine abrasive stone held in the tool post of the lathe. This gives a smooth surface and tends to increase the life of the commutator and the carbon brushes. It is considered good practice to round off the edges on the face of the commutator as this helps to keep down flashing. The mica should be under-cut about $\frac{1}{64}$ in. and all particles or slivers of mica in the under-cut grooves removed. The insulation over the front V-ring should be thoroughly coated with a good grade of insulating varnish.

In rewinding, correctly shaped coils should always be used, thus permitting the winding operation to be made with the least abuse to the coils to get them down in place. There is a tendency to use a cheap make of coils which are poorly formed and lacking the required insulation at their weak points. When being wound these coils require more or less pounding and abuse and result in a finished armature that will soon break down in service. This is poor economy, as coils of a higher first cost which are properly formed and insulated will make a much easier winding job and will give a better armature that will stay out on the road. In connecting the windings, information as to the throw of the coils and the leads should be checked carefully with the winding diagrams furnished by the motor manufacturer.

If there is a tendency for the armatures to run hot in service and throw solder from the commutator necks it is advisable to solder these leads with a pure tin solder instead of the ordinary half-and-half solder, as the tin solder will stand higher temperatures and will not soften as readily, thus reducing the possibilities of the leads becoming loose in the neck. An acid flux should not be used in soldering. Alcohol and rosin make a good flux and will not damage the insulation.



BRUSH-HOLDER AND ARMATURE BEARING MUST BE KEPT IN GOOD CONDITION

No. 8—Brush-holder spring tension fingers with various detail parts completely assembled—at left, old type; at right, new type.

No. 9—New design brush-holders for old-type motors.

No. 10—Automatic temperature control for babbitting pots.

No. 11—Solid type pinion end armature bearing.

No. 12—Split type pinion end armature bearing.

While soldering the pinion end, the armature should be raised from 6 to 8 in. above the commutator to prevent the solder from running into the windings back of the commutator neck, as this will result in short circuits. Still better results will be obtained by doing the soldering at the side of the commutator instead of on the top.

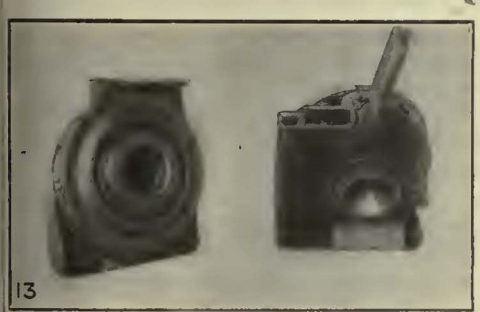
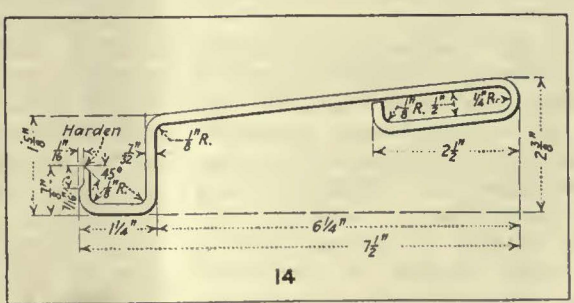
BAND HOT TO SECURE TIGHT ARMATURES

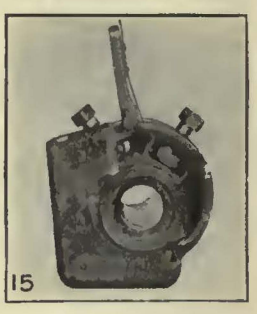
Banding armatures while hot gives a much tighter and more durable banding job, as it allows the coils to be pulled tightly down into the slots. It is preferable to use a high grade of tinned steel banding wire. If these bands are soldered with pure tin solder, instead of the ordinary half-and-half solder, they will hold together better in service, as the tin solder will stand higher temperatures before it will soften and allow the individual band wires to slip and become loose. Narrow strips of tinned sheet steel about 0.012 in. thick placed under the core band entirely encircling the armature, to which the band wires are soldered, strengthen these bands and reduce the tendency for them to become loose.

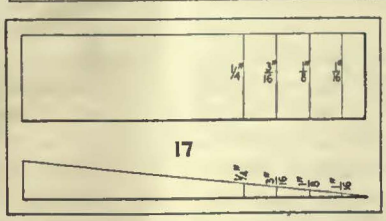
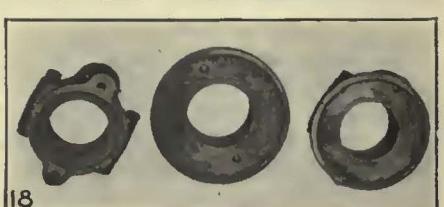
When the armature is completed, either dipping or rolling in a good grade of insulating varnish and baking at a temperature of from 95 to 105 deg. C. will increase its usefulness, as this will: (1) Fill up all the cracks in the insulation on the coils opened up during the winding process, and keep out the dirt and moisture; (2) tend to hold the coils solid in the slots, thus reducing vibration, and (3) form a good insulating coating over the entire surface of the armature, which reduces surface creepage.

Operators following the above practice report an increase in the life of their armatures, this being especially noted during the winter season when the equipment is subjected to severe moisture, water and snow conditions.

It is considered best practice in connection with all modern motors, and is recommended for old motors, to use cables coming out of the body of the coil instead of the heavy brass terminals to make the wiring around the frame connections. The main objections to the use of terminals is that they are more likely to break off due to vibration, or to develop loose connections which finally burn off the leads. Another disadvantage is the difficulty of properly insulating these terminals after the connections are made. Field coils should be well insulated and then dipped in a good grade of insulating varnish and baked. The dipping and baking should be repeated several times. Impregnating coils in an asphaltum gum further improves the insulation and makes a solid, compact coil that will better resist breakdowns.



VARIOUS TYPES OF HOUSINGS AND DUST SHIELDS FOR RAILWAY MOTORS

No. 13—Tap bolt type housing for split frame motor.

No. 14—Cold-rolled steel brush-holder spring tension adjuster.

No. 15—Through bolt type housing for split frame motor.

No. 16—Sheet steel axle dust shield fitted with inspection holes.

No. 17—Hardwood distance spacer for spacing brush holders from commutator.

No. 18—Malleable iron adjustable axle collars with double adjusting bolts.

Porcelains on the brush-holders should be kept clean and tight on the pins to prevent creepage of the current to the ground. If the moving mechanism becomes screechy and stiff, a little signal oil should be added to the moving parts. When repairs are necessary, the improved parts such as steel spiral springs, fifteen-tooth steel ratchet, flat contact tips and the heavier flat braided shunts soldered to the brush-holder castings should be used, as these parts tend to give longer life and better service. Pressures should be adjusted to approximately 5 to 6 lb. per finger. However, if there is a tendency for the motor to flash in service it is advisable to increase this pressure to approximately 8 to 9 lb. per finger. Various modern designs of brush-holders are available for some of the older type motors and their use is recommended. Where these modern-type brush-holders have been used in place of the old original holders, better results have been obtained in connection with the operation of these old motors.

All dirt and grease should be cleaned from parts of the motor frame inside and outside, and the drain holes in the bottom of the frame should be kept open. After thoroughly cleaning, the inside of the frame should be painted with an air-drying insulating varnish. On split motors the surfaces at the split and at the housing or bearing seats should be well cleaned, removing all burrs and high spots by means of a file.

In replacing field coils sufficient spacing washers, preferably of sheet steel, should be used under the coil to insure a tight fit of the coil. In addition to the washers, the use of a flat steel spring washer is recommended to prevent coils from vibrating and chafing which would finally damage the insulation. These washers and springs should be temporarily taped to the field coil to prevent them from working out of place while the coil is being assembled on the pole. The surface of the poles and pole seats should be thoroughly cleaned and all high spots removed by filing before putting together.

Poles may be driven into place by means of a block of wood or a chunk of babbitt, but should not be pounded with a sledge. When pulled up tight these may be tested by hitting lightly with a hammer and noting the sound. Under the heads of all tap bolts and nuts on stud bolts used to hold the poles in place a lock washer should be used to insure that these parts will not work loose in service.

The pads or seats for the brush-holders should be cleaned off and all burrs removed and the repaired or new brush-holders securely clamped in place. In connecting up the field coils reference should always be made to the winding diagrams furnished by the motor manufacturer, which give the correct method of doing this work. After coils are in place and temporary connections are made, the polarity of the various coils should be checked to insure the flow of the current through the coils in the proper direction to produce the required magnetic field strength.

The soldering of all connections to the field coils and wiring around frame leads should be made by or under the direction of some one man experienced in this work to insure a good electrical job. All leads should be cleaned and tinned before soldering. Brass or copper sleeves should be used on the brush-holder leads and on field coil leads when terminals are used on the field coils. If, for any reason, sleeves cannot be used, the wires of the cable should be soldered together. When cables are in place all set screws on the field coil terminals and the brush-holders should be drawn up tight and locked. The field-coil terminals should then be well insulated and shellacked and painted. Leads should be well cleated and protected by wood, fiber or rubber bushings where they pass through the motor frame. The leads coming out of the motor frame should be marked plainly so that the workman will not have any difficulty in making the right connections to the car wiring.

Armature Bearings Need Thorough Cleaning Before Tinning

Armature bearings if made of bronze should be carefully tinned and lined with a good grade of tin base babbitt metal. In doing this work the bearing shell should be thoroughly cleaned before tinning. While pouring the babbitt metal its temperature should be kept at from 460 to 482 deg. C. in order to get the best results. After bearings are lined, if the job has been well done the finished bearing will sound with a clear metallic tone when hung up by a wire and tapped with a piece of metal. Malleable-iron bearing shells if tinned before lining with the babbitt will tend to prevent the lining of babbitt from cracking away from the shell, and will give very much longer life in service. On some of the older types of motors, the pinion end bearings were split to facilitate repairs. Where the split type of bearings are used, longer life and better service will be obtained by replacing them with the one-piece solid type of bearing. All bearings should be provided with oil grooves and have the edges at the window chamfered to allow the oil to find its way into the surface of the journal throughout the bearing. If bearings are loose in the bearing seat it may be necessary to use an oversize shell. Some operators have used a shim of thin sheet iron to tighten loose bearings and report fairly good success. Other operators have expanded their bronze bearing shells by forcing a mandrel through them, to make them tight in the housings, and have found this to be quite successful.

Clean Oil Wells Carefully

Housings in split-frame motors should have a good clamping fit between the two halves of the motor frame. After the two halves of the frame are clamped together on the housing the clearance at the split as measured at the commutator and pinion end should be from 0.008 in. to 0.012 in. If this clearance is not obtained, the housings may be shimmed up with strips of canvas treated in white lead. The oil wells should be thoroughly cleaned out, removing all old soggy waste and dirt, and the oil box lids lined with felt should be made to close positively by means of a stiff spring to keep dirt and water from getting into the oil well. Housings should be securely doweled as an emergency precaution. If the threads in the tap-bolt type housings are worn a longer bolt will sometimes hold better as it will be found that the threads at the bottom of the tapped holes have not been damaged. Where the old tap-bolt type of housings are too badly worn to be used, these should be replaced with the new through-bolt type of housings available, for some of the older types of motors. If the housing seats in the frame are badly worn, an oversize housing should be used to secure a good tight clamping fit. This design of housing fitted with through bolts is now being used by a large number of operators and has done much to reduce the maintenance cost of these parts.

After the armature is assembled in the frame it

should be carefully checked for the proper air gap and the correct end play. If there is any question as to the air gap being too small, it may be due to the poles not being pulled down tight on their seats. If for any reason the armature end play is excessive this can be remedied by placing thin brass or fiber washers on the shaft between the bearing and wiper rings, or by the use of a steel collar placed over the bearing shell between the bearing collar and the housing. All armatures to give satisfactory operation should have approximately $\frac{1}{16}$ in. initial total end play.

With the armature in place, the brush-holders should be carefully checked and adjusted with respect to the following points:

1. Brush-holder box should line up parallel with the commutator bars.
2. Distance from center line of one brush-holder to the center line of the other brush-holder should be equal to one-fourth the circumference of commutator.
3. Brush-holders should space $\frac{1}{8}$ in. to $\frac{3}{16}$ in., preferably $\frac{1}{8}$ in., from the face of the commutator.
4. Carbons should have a smooth sliding fit in the carbon box of the brush-holder.
5. The carbons should be seated on the surface of the commutator, by means of a strip of sandpaper cut the width of the commutator face.
6. A good grade of unplated graphitized carbon brush is recommended and approved by the motor manufacturer.

Be Sure That Bolts and Nuts Cannot Work Loose

It is very important that lock washers be used under the heads of all tap bolts and under the nuts of all through or stud bolts. Operators are learning the importance of using special heat-treated bolts in connection with the housings, axle caps and frames of railway motors. These bolts have 60 per cent more tensile strength and are tougher and more reliable than the general "run-of-mine" standard hardware bolts, and thus will stand more abuse and are less likely to stretch or break in service.

Bearings should be packed with a good quality of wool waste which has been saturated in an approved grade of car oil for about twenty-four hours. All bearings arranged for side feed and using oil and waste for lubrication depend upon the capillary or wick action of the waste to carry the oil up to the bearing window. Thus, in this type of bearing to insure clean oil reaching the journal, the oil should be poured into the oil well so it must feed up through the waste. If the oil is poured in on top of the waste the tendency is to flood the inside of the motor and to waste the oil. The normal average height of the oil as gaged in the oil well should be $3\frac{1}{2}$ in. maximum and 1 in. minimum for the armature bearings and $2\frac{1}{2}$ in. minimum for the axle bearings.

After field coils are connected up permanently and the armature is assembled in the motor frame, the field coils should be tested for polarity by connecting *F* plus field lead to the trolley through several grid resistors or a headlight resistor and *F* minus field lead to the rails, and with current passing through these coils check the polarity by means of a compass needle. This same testing circuit may be used to give the motor a running test to check the condition of the bearings. Before doing this, it should be made sure that the bearings are packed and oiled and that the carbon brushes are in place. To make this running test, connect *A* plus lead to the trolley circuit, *A* minus lead to *F* plus lead and *F* minus lead to the rails. To reverse the rotation of the armature, connect *A* plus to the trolley *A* minus to *F* minus and *F* plus to the rails. Be sure to open the test circuit after the motor has attained a speed of approximately 800 r.p.m. Test the armature and field windings for ground by means of a lighting-out line connected through a bank of lamps, or by means of an alternating-current testing box. If the motor meets all the above tests satisfactorily it can be passed for service as O.K.

Heat Pinions for Installation

All pinions should be heated in a tank of boiling water for several hours before applying. (Use $\frac{1}{4}$ lb. of washing soda to 5 gal. of water to prevent rusting.) The pinion bore and taper fit on the shaft should be carefully cleaned and all burrs and high spots removed. Keys should have all sharp corners rounded off and should fit properly. The pinion should be driven in place while hot, using a bar of soft metal. On pinions which drive up on the taper too far, some operators report very good results from the use of a paper liner placed between the pinion and the pinion fit.

When mounting the motor on the truck it should be seen that the axle bearings are in good condition, and that the dowels or keys in the axle caps are securely held in place. In addition to the dowels it is essential that the axle caps should securely clamp the axle bearings to prevent movement and rapid wear. To get this clamping action on old bearings worn on the outside, some operators use thin sheets of fiber at the bearing seat, while others have placed metal shims between the two halves of the bearing at the split. Another scheme used to get the desired clamping action is to machine from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. of metal off the axle cap at the split. Special heat-treated bolts fitted with lock washers will hold the axle caps in place more securely. Axle cap oil wells should be thoroughly cleaned out and the oil box covers put in good condition.

If the gear case has a large clearance at the opening for the axle bearing flange it should be provided with two half rings of felt and the grease box cover should be put in good operating condition. If the gear seats on the motor or the suspension pads on the gear case are worn, it is advisable to place sufficient strips of canvas treated in white lead on the gear-case seats to insure that the case will be drawn up tight by the clamping bolts, thus preventing any movement of the two halves.

In order to increase the life of the axle bearings, it is very desirable to provide a reliable dust shield covering the axle between the axle bearings. This shield should be provided with peepholes to facilitate the inspection of the bearing wear. The inspection holes should be protected by a cover which is kept closed by a strong spring so as to keep out the dust and dirt.

In order to take up the end wear of the motor axle bearings, and to keep the motor in its proper position on the axle, thus preventing the gear from cutting through or otherwise damaging the gear case, it is advisable to use a suitable adjustable type axle collar. A good reliable collar for this purpose is made of malleable iron provided with a double adjusting bolt and having an overhanging lip engaging the axle bearing flange which keeps the dust and dirt from working into the wearing surfaces of the axle bearing.

Convenient Forms Simplify the Making of Cost Records

On Medium-Sized Roads with Limited Office Forces Collection and Preparation of Accurate Data for Costs of Construction and for Maintenance Work Present a Considerable Problem

BY A. J. STRATTON
Assistant Superintendent of Railways,
Eastern Pennsylvania Railways, Pottsville, Pa.

THE head of the maintenance of way department of the medium-sized traction company usually has but little time to devote to extensive office work. There are, however, certain records that for the benefit of all concerned must be compiled. A great deal of this information depends upon the wishes of the management, but some data are necessary for the use of the head of the department. Clerical help is often restricted to the services of a timekeeper or clerk of material and supplies with the joint use of stenographer with some other department. The result is that the head of the department must give a certain amount of time to the collection and preparation of these data.

On properties where costly valuations have been made or where the physical property of the company is carried on the perpetual inventory system, it is of great importance that a record be kept of the new material that goes into the property, its location, and the time of its use. On reconstruction work this may be most conveniently handled by the work order system. Normal maintenance work such as the installation of ties, the surfacing in open track, replacement of parts of special work layouts, painting and repair of bridges, repairs to bonding, and other kindred charges not usually made under work orders may cost more in a year than all of the reconstruction work, but except for the gross cost, the replacement of materials is lost sight of.

Three reports are in use by the maintenance department of the Eastern Pennsylvania Railways covering trackwork, bonding and welding and repairs to bridges and structures. These reports are made daily by the foremen and collected by the timekeeper who checks the material used and the amount of work reported. Every man on the payroll must be included on these reports. Track greasers and other employees working individually are grouped on one report unless the work performed by the individual is of sufficient importance to warrant an individual report. The trackwalker is an example of the latter. When the work reported is covered by a work order the report is filed under the work order number. Maintenance work is filed under line and division. These reports are made for use on a standard 5-in. x 8-in. card file.

REPORTS SUMMARIZED MONTHLY

At the end of the month reports are summarized and a brief narrative report is made to the general manager's office covering the activities of the department for the month. Lists of material are taken from these reports monthly and are grouped for record purposes under the proper division, and at the end of the year a complete report is made covering all changes to physical property.

From an operating standpoint the compilation of these reports has assisted in increasing the efficiency of the various employees. For example, the number of bolts used by trackwalkers increased 300 per cent the month following the use of the daily report. A study of the

Eastern Pennsylvania Railways Co
Company

Work Order Requisition

W. O. No. _____

Date March, 1 192 2 Executive Ac. No. 737

Item	DESCRIPTION OF PROJECT	Charge Account No.	COST Estimated	COST Actual
	Reconstruction of tracks Broad Street, 19th to 23rd Streets, 4750 feet of single track.			
	Engineering and Superintendence	CR-1		
	Grading:			
	Excavation	CR-4-A		
	Removal of Excess Materials	CR-4-B		
	Ballast	CR-5		
	Ties	CR-6		
	Rail, Rail Fastening and Joints			
	Rail	CR-7-A		
	Rail Joints	CR-7-B		
	Miscellaneous Fastenings	CR-7-C		
	Track and Roadway Labor			
	Handling and Delivery of Track Materials	CR-10-A		
	Track Laying	CR-10-B		
	Track Surfacing	CR-10-C		
	Joint Welding	CR-10-D		
	Protection of Work (Watchmen etc.)	CR-10-E		
	Miscellaneous Trank Labor	CR-10-F		
	Paving			
	Delivery of Paving Materials	CR-10-A		
	Paving Materials	CR-10-B		
	Labor Installing Concrete Base	CR-10-C		
	Labor Paving	CR-10-D		
	Cleaning Up	CR-10-E		
	TOTAL			
	DIFFERENCE			

To be started Date April 1 192 2 To be completed Date 192

Reasons and Benefits: Reconstruction necessary on account of debilitated condition of tracks and pavement, also to comply with new grade and pavement to be established by the city.

Issued by M. of W. Department
Estimated by C. F. Brown
Approved by J. J. Smith

Approved Date 192
Gen. Mgr.

FORM OF WORK ORDER REQUISITION

work of several foremen engaged in similar work showed a divergence in the production per man too great to have been influenced by local conditions. It was then possible to give those foremen making the poorer showing more supervision and assistance to raise the product of their gangs to a general average. The work report was not designed to take the place of the time report, but the space in the lower left-hand corner showing the number of men and the rates gives the head of the department an opportunity to check the quantity of work produced against the cost. It also gives him an instant perspective of the work of his department day by day, a view presented by facts alone and unsupported by local color in the shape of a plausible story by the foreman.

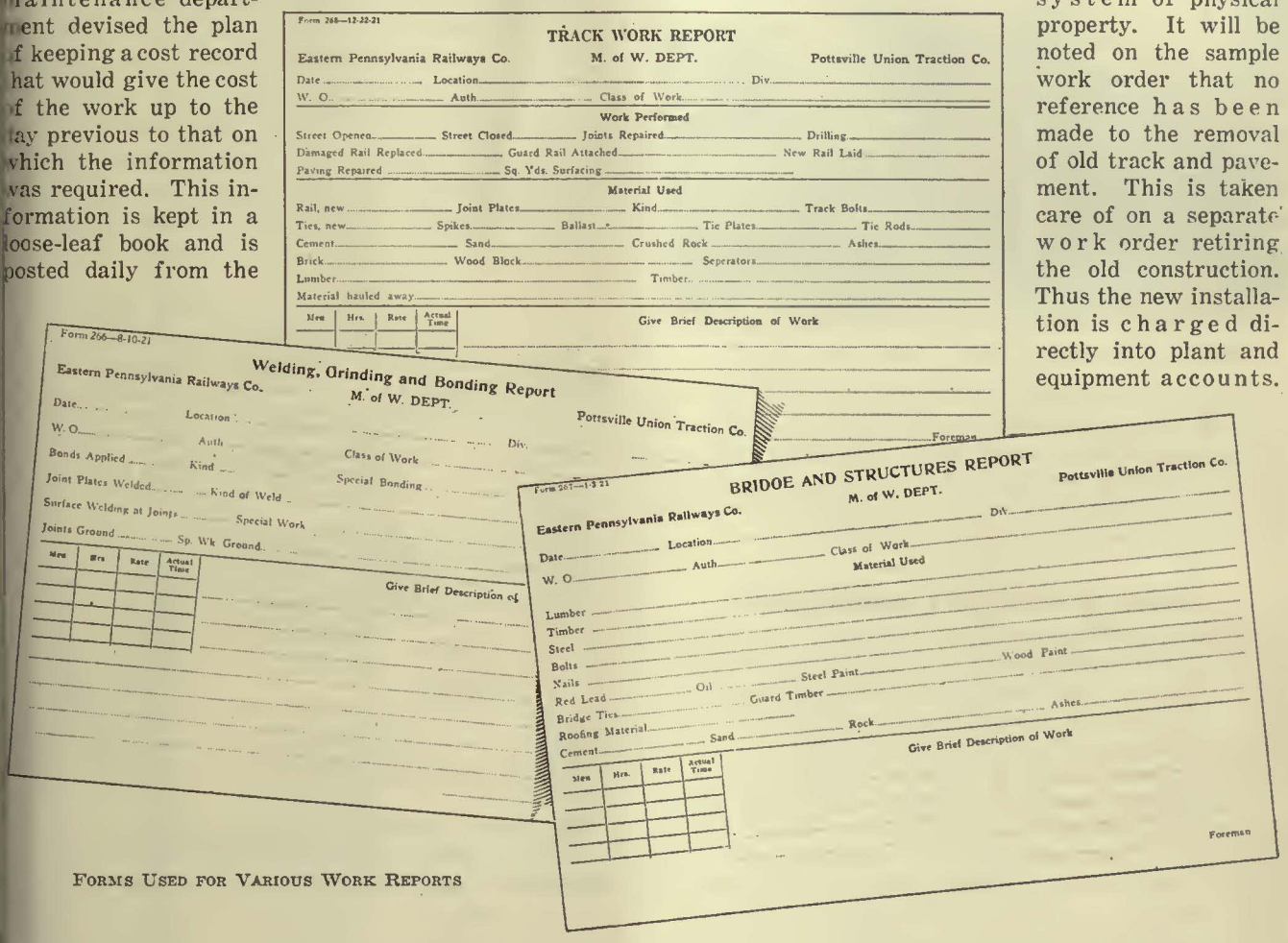
All engineers are interested in cost data. Auditing departments are usually ready to co-operate as far as they can, but they look upon this work as being of secondary importance to their routine work, with the result that the desired information is not obtainable until long after the completion of the work. All work of importance should be done under the work order system. The maintenance department of the Eastern Pennsylvania Railways prepares work orders that are given numbers by the auditing department. The main

tems on the work order consist of the accounts affected by the proposed work, in the system of accounting used on the property. Accounts involving labor charges are subdivided so that the cost of the labor operation may be segregated and analyzed. The timekeeper's report each day carries the work order number with the account number and the subdivision of the account if such is used.

As the information from the accounting department was received too late to be of immediate benefit the maintenance department devised the plan of keeping a cost record that would give the cost of the work up to the day previous to that on which the information was required. This information is kept in a loose-leaf book and is posted daily from the time sheets and from requisitions for material. Not only is the actual expenditure included but the man-hours also. From an estimating standpoint the latter is of more value than the former in so far as the labor items are affected. From these data the average rate may be obtained, and in the event of an increase or decrease in labor costs a percentage may be applied to the average rate and the resulting new rate can then be readily applied to the man-hours so that a new result is obtained.

It has been found of great value to subdivide the items involving labor. It is not enough to know that the cost of track and roadway labor on a certain job was $1.05 per foot of single track. The operation of track laying may be divided into several divisions, all closely related but nevertheless clearly defined, without involving so great detail as to confuse the entire labor account for the job. The first subdivision of track and roadway labor is logically the handling and distribution of materials from the point of storage to the point of use. Track laying and the surfacing of track are two distinct operations, but unless care is used they may be confused in the time report. Joint welding is also a separate consideration. The cost of watchmen and the protection of the public as reflected on the time sheets in the labor cost of temporary crossings, for fire equipment at hydrants, etc., form no inconsiderable item in the cost of track construction in our city streets. Last but not least is the "miscellaneous" subdivision used to cover all of those unexpected expenditures that cannot be estimated by any stretch of the imagination.

Reference has been made to the perpetual inventory system of physical property. It will be noted on the sample work order that no reference has been made to the removal of old track and pavement. This is taken care of on a separate work order retiring the old construction. Thus the new installation is charged directly into plant and equipment accounts.



FORMS USED FOR VARIOUS WORK REPORTS

It being quite improbable that in the event of a physical valuation being made at some remote period the book value would be accepted, consequently a careful record is made of all changes to physical property so that should a future valuation become necessary unit prices could be applied to quantities as shown in the perpetual inventory. Work orders are letter size and are filed at the completion of the work, together with the original estimate and supporting data, a complete plan of the work, also sections showing the type of construction, all correspondence, computations relating to paving bills or contract work, copies of all requisitions for material, and at the completion of the work a complete statement from the auditing department of all the expenses entering into the job. With this information available a reconstruction of the work for valuation purposes may be made at any time by applying such unit prices as may be desirable to use.

The use of the various forms also simplifies the clerical work necessary, provides a means for accurate checking of costs when the work is completed and decreases the probability of errors.

A More Substantial Substitute for Canvas Curtains on Snow Sweepers

MOST snow sweepers are equipped with canvas curtains to prevent the snow from being thrown too great a distance from the tracks. This scheme of restricting the throw of the rotary brushes has not been very satisfactory, however, on the Youngstown (Ohio) Municipal Railway. Hence, A. B. Creelman, master

WOOD SLATS REPLACE CANVAS SNOW PLOW CURTAINS

mechanic, devised the curtains pictured herewith. These consist of four lengths of ordinary fender support chain to which are bolted wood slats. No opportunity has been afforded to give these new curtains a real tryout, but it is believed that they will be much more effective and durable than the canvas curtains displaced.

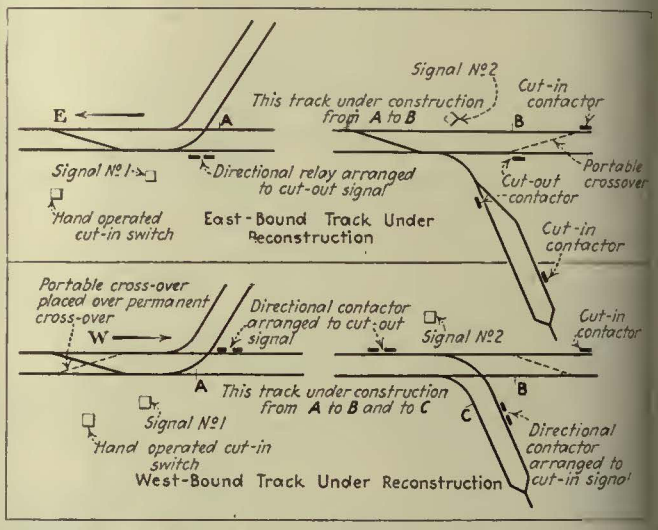
Safety Device for Circular Saws

ACCOMPANYING illustrations show a safety device which has been applied to several of the saw tables in the shops of the Third Avenue Railway, New York, N. Y. This device is the invention of Thomas E. Jenkins, mill foreman for the railway, and its use is proving of particular benefit in reducing accidents.

The device consists of a hinged metal piece which fits into the saw table around the circular saw. This is hinged at one end and in its normal position the end farthest from the hinge projects above the saw table slightly. It is held in its raised position by a small spring which acts on the underside of the guide. When lumber is being sawed the weight of the material forces the device down so that it is flush with the top of the saw table. When the cut has been finished the end of the board slides off the end of the safety device and this rises, so that the material cannot again be drawn back and engage the saw. If the material is drawn back toward the operator it will be forced to the side the distance that this projects out, so that there is no danger of accident. The accompanying drawing and photographs show how the device is installed.

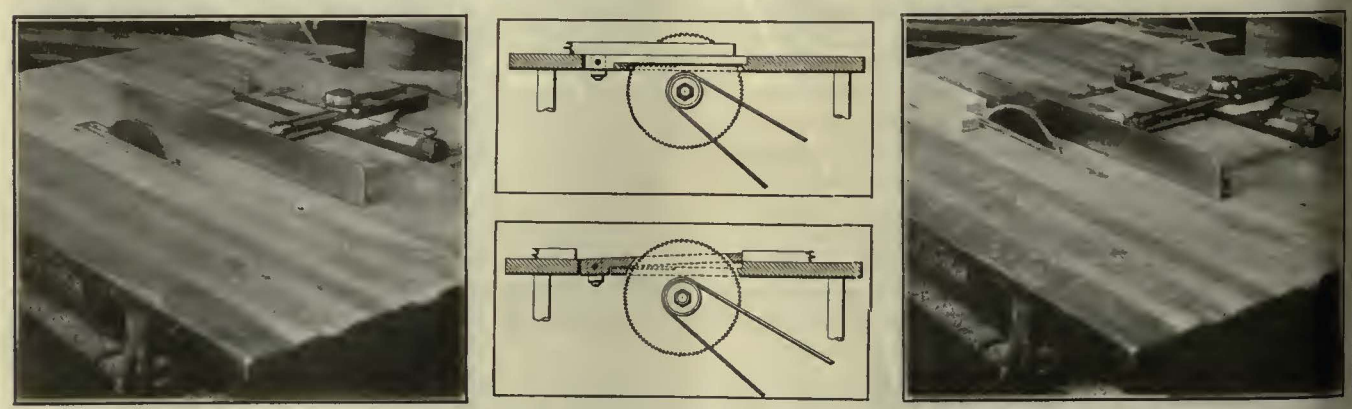
Temporary Signal Installation Saves Flagman During Construction

IN THE reconstruction of track during last summer, the Youngstown Municipal Railway, of which J. B. Stewart, Jr., is general superintendent, found that the single-track operation necessary was greatly expedited and the cost of a flagman eliminated through the temporary installation of Nachod signals. The manner in which the signals were used is shown in the accompanying diagrams. One shows the location of the signals while the eastbound track was under construction and cars were operated in both directions over the westbound track and the other shows the signal installation



DIAGRAMS SHOWING HOW TEMPORARY SIGNAL INSTALLATIONS WERE USED TO PROTECT TRAFFIC DURING TRACK RECONSTRUCTION

for the opposite condition, that is, while the westbound track was under construction. On account of the three lines of traffic, some signaling or flagging protection was absolutely necessary and the automatic signals made a nice economy. The hand-operated cut-in switch shown was used instead of an overhead contactor and operated by a switchman, because it was necessary to have the switchman there anyway to look after the portable crossover and because the electric switch on the branch-off at this point was disconnected and the switchman also handled this.



AT LEFT, VIEW OF SAFETY DEVICE AS INSTALLED IN SAW TABLE. IN CENTER, TOP, VIEW OF SAFETY DEVICE PRESSED DOWN BY MATERIAL. BOTTOM, SAFETY DEVICE IN NORMAL POSITION. AT RIGHT, MATERIAL AFTER BEING SAWED CANNOT BE DRAWN TOWARD THE OPERATOR SO AS TO MAKE CONTACT WITH THE SAW

LAKESIDE POWER PLANT, MILWAUKEE. THE COAL PREPARATION BUILDING IS AT THE LEFT

Milwaukee's Powdered Coal Station

First Great Generating Plant Equipped for Burning Pulverized Fuel in Operation for a Year—Station with Ultimate Capacity of 200,000 Kw. Has Many Interesting Features—High Over-All Economy Expected to Be Realized with Use of Low-Grade Coal

OUTSTANDING among many features of the new 200,000-kw. Lakeside generating station of the Milwaukee Electric Railway & Light Company is its design and equipment from the ground up for burning powdered coal. It is the first large railway and central station power plant to be so equipped and therefore marks a development the outcome of which is of greatest interest to large power generation companies generally. The decision to make this largely untried departure from common practice was based primarily on tests made on boilers equipped for burning pulverized fuel at the company's Oneida Street station in Milwaukee. The results of this test, related in ELECTRIC RAILWAY JOURNAL, page 473, Vol. 55, indicated that better efficiency could be expected with pulverized fuel than with stokers, particularly if a plant were built and equipped specifically for this kind of firing.

The new Lakeside power plant has now been in continuous operation since Dec. 15, 1920. Despite the fact that it went into service with a new organization of men largely unacquainted with pulverized-fuel systems, no interruptions attributable to the mechanical equipment have been experienced up to the present time. The company officials feel that the test results so far obtained give promise that the specified thermal efficiency of the station will be reached when the operating and design problems incident to such a radically new system have been mastered. The station economy expected of Lakeside will be that which will result from a combined boiler, furnace, superheater and economizer efficiency of 88.15 per cent, using Illinois coal of approximately 11,000 B.t.u. heat value as received.

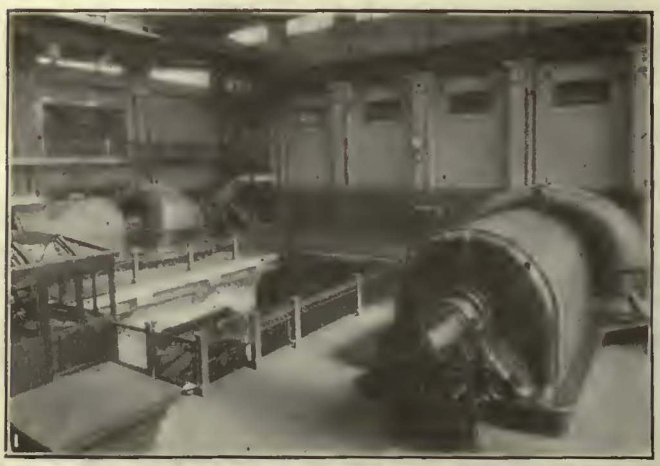
Other features of the new Milwaukee power plant are the unique circulating water system and $400,000 pebble mound in Lake Michigan; the location of the plant in a deep excavation to reduce the lift of circulating water with the attendant construction difficulties, and the practical completion of the first section of the station in less than a year. The ultimate development of the plant will reach an hourly capacity of 160,000 kw. with an installed capacity of 200,000 kw., 40,000 kw. being the initial installation and two additional 80,000 kw. sections the future plan. The final boiler capacity will be three times the initial installation and will comprise twenty-four 1,306-hp. boilers.

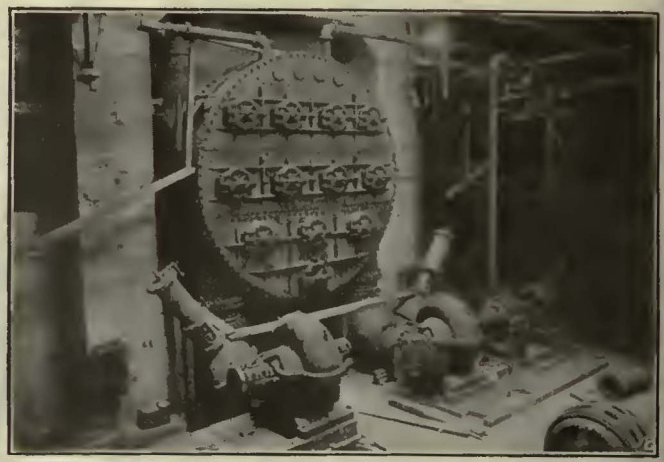
Work has just recently been started on the installation of an additional turbo-generator unit. This will be of 30,000 kw. capacity, and as it will be run in conjunction with one of the two 20,000-kw. units, no additional boiler capacity is needed for the time being.

The following matter descriptive of the new plant is abstracted from three papers presented before the Technical League of the Milwaukee company by R. H. Pinkley, John Anderson and G. G. Post, respectively engineer of way and structures, chief engineer of power plants and electrical engineer.

Owing to the rapidly increasing demand for electrical energy in the Milwaukee district, the Milwaukee Electric Railway & Light Company found it necessary, in 1915, to begin plans for increasing its power producing capacity. A study made at that time indicated that the best plan would be to construct an entirely new power plant which would provide the necessary increased capacity and would ultimately relieve the existing power plants of the major portion of their load. The general plan was to make provision for a 200,000-kw. plant, building the first section for 40,000 kw. Due to the experience with the old plants located in the heart of the city with an inadequate water supply, restricted coal and ash handling facilities and where smoke is objectionable, a suburban location was considered preferable. After canvassing the district for the most suitable

Here and There in the Lakeside Plant





No. 1. Two 20,000-kw. turbo-generators were the initial installation in Lakeside plant.

No. 2. End view of condenser, showing turbine-driven and motor-driven circulating water pumps.

No. 3. Rear view of the boilers, showing fuel pipes, main steam headers and connections to economizers.

No. 4. Operating levels in center aisle of the boiler room.

No. 5. Feeder group oil switches with structure and mechanism as the floor level, easy to get at.

No. 6. Main operating switchboards located in switch house.

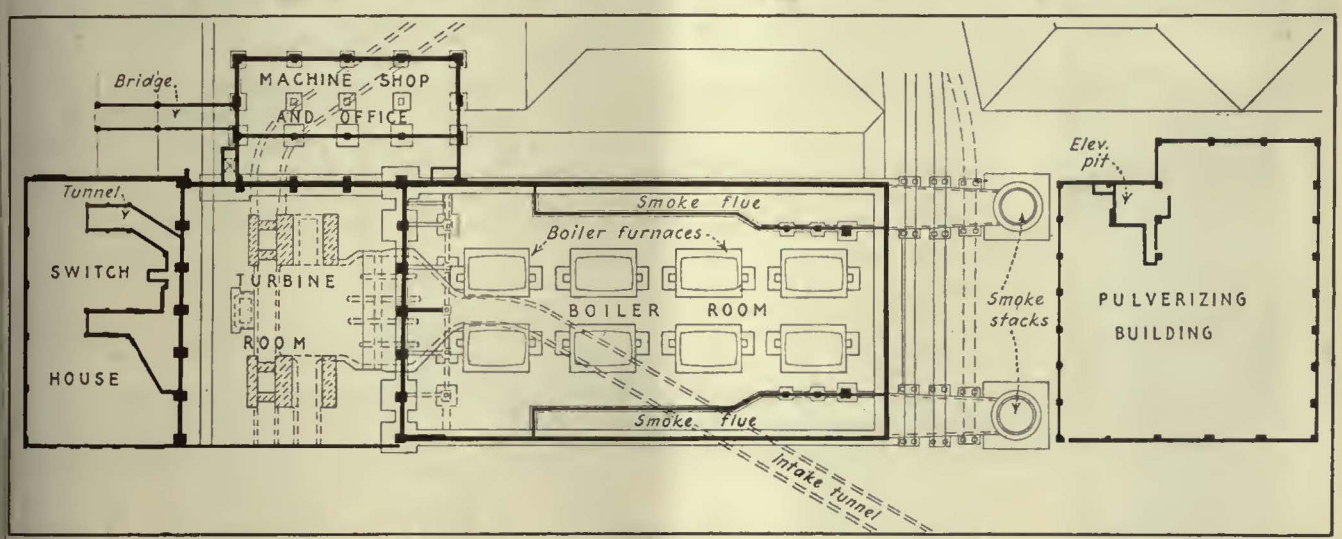
No. 7. Inclined belt conveyor running from crusher house to the raw coal storage bunkers.

No. 8. Belt conveyor drive house located at the center of the incline.

location, the Lakeside site, situated on the shore of Lake Michigan about 1 mile south of the south city limits of Milwaukee, was chosen. This site is not far from the electrical center of gravity of the company's load and is adjacent to the most important industrial centers in the district served.

Accordingly, in 1916, land was purchased, including 6,000 ft. of frontage on Lake Michigan and a railroad right-of-way connecting to the Chicago & Northwestern Railroad. Up to that time coal for power purposes was being received by the company entirely by lake transportation so that coal docks and a protecting harbor were considered essential features of the plant.

Owing to the conditions occasioned by the World War, in 1917 it was found impossible to go ahead with the project. The company set aside all thought of continuing and directed its efforts toward getting the utmost capacity out of every piece of the existing generating equipment. But at the end of 1919 the increased load made it imperative to begin again. Accordingly, on Dec. 22, 1919, orders were issued to proceed with the plans and rush through the construction of the first section of the new plant, including two 20,000-kw. turbine units, so as to have this capacity in readiness, if possible, to deliver power on Nov. 1, 1920. The entire engineering, designing and drafting work was done by the company's own forces and the work was executed under the direction of the company's engineers, the company acting in the capacity of general contractor and sub-contracting the various items of the work.



PLAN OF MAIN BUILDINGS OF POWER PLANT

The power plant proper is made up of three parts—the switchhouse, the turbine room and the boiler room. The switchhouse at the west end is directly joined to the turbine room, but separated by a solid wall except for necessary door openings and a glass panel over the bench board on the second floor. The south wall of the turbine room is a temporary one to be removed when the second unit is added. An auxiliary bay forms the connecting link between the turbine and boiler rooms, separating them to a certain extent but not interfering with the unity of design of the whole structure.

Just north of the turbine room is a two-story structure, 95 ft. x 52 ft., on the lower floor of which is the repair shop, completely equipped to handle work required in maintaining such a plant. On the second floor are the offices of the operating engineer and of the testing department. There is also found there a fine room, 47 ft. x 52 ft., for the use of the Employees' Mutual Benefit Association. To the east of the power plant is the pulverizing plant, 108 ft. x 125 ft., its east end reaching to the edge of the bluff at the Lake Shore. It is equipped to do pulverizing for the entire plant when completed. The stacks rise direct from the ground from a location between the boiler room and the pulverizing plant, each reached from the boiler room through an underground flue 8 ft. x 11 ft. average size. To the north of the pulverizing plant, distant about 400 ft. from it and placed against the side of the bluff to take advantage of the slope to secure a gravity flow for the coal, is the car-dumping and coal-crushing plant, from which the coal is carried by a covered belt conveyor to the pulverizing plant. This also has been planned to meet the requirements of the completed 200,000-kw. plant.

The ultimate 200,000-kw. plant will require water for condensing purposes at a rate of 360,000 gal. per minute or 518,000,000 gal. per twenty-four hours. In order to secure this supply from the lake without going out into deep water, it was decided to build a rubble mound inclosure extending approximately 485 ft. out from the shore and 850 ft. long to provide, in effect, a pond of still and clean water for this purpose. It is the function of the rubble mound to break the force of the waves and prevent rubbish, sand and ice from washing into the intake, thus permitting the intake tunnel to be terminated near the shore line. The discharge tunnel is arranged to discharge either inside or outside of this basin, so that in the winter time the warm discharge water can be used to prevent the basin from freezing. This rubble mound is designed with a height of 8 ft. from the normal surface of the water, with a width of 10 ft. on the top and a slope of 2 to 1 on the lake side and 1½ to 1 on the inner face. As the outer wall is in over 15 ft. of water, the base at the maximum point is 91 ft. wide. The core of this rubble mound consists of quarry run limestone having a minimum size of 3 in.; the cover stones weigh 500 lb. up to 15 tons each. All stone except the inner core are of granite from Wisconsin quarries and are keyed in rubble fashion. There was required in the construction of this rubble mound more than 80,000 tons of stone, the core stone being placed by dumping from

scows and the heavier stone being handled by derricks mounted on barges.

The intake tunnel, which has its top 5 ft. below the water level, is terminated about 50 ft. beyond the water line at the lake shore and a channel was dredged out 15 ft. in depth leading up to this tunnel, which required approximately 7,000 cu.yd. of dredging by dipper dredge. This tunnel is protected at the lake end by a timber ice boom, a submerged sheet pile weir having its top 5 ft. below the surface and a steel bar screen with 6-in. spacing. Inside the plant, the circulating water passes through revolving screens having ½-in. mesh, into a large suction chamber between the foundations of turbines Nos. 1 and 2. Gate houses are provided at the lake termini of both intake and discharge tunnels, so that stop logs can be placed for shutting off the water at these points.

TUNNELS FOR CIRCULATING WATER

Over 1,100 lineal ft. of tunnel and 150 ft. of construction shaft were required for the circulating water system, together with gate houses and a large screen and intake chamber below the condensers and pumps in the turbine room. This location of the traveling screens was decided upon because it saved excavation, permitted the use of overhead crane for lifting the screens for inspection or repair, and gave better operating supervision than if located at the tunnel mouth. As stated above, these tunnels have 10 ft. inside diameter and have a minimum thickness of concrete lining of 12 in. and an average thickness of 18 in.

SIGNALING AND SYNCHRONIZING PANEL FOR EACH MAIN GENERATOR

At the site of the plant, the general level of the ground averages about 50 ft. above the lake level, with a steep bluff at the lake shore. It was desired to provide a suction chamber at the lake level, and to place the condensers at such a level that the water could be circulated through them with a minimum lift, as otherwise an enormous amount of energy would be expended in raising the large quantity of water required for condensing purposes. This necessitated placing the condensers at a low level, which, in turn, determined the level for the turbines and boilers. The deepest excavation required was to an elevation 20 ft. below lake level for turbine foundations and intake chamber, placing the main condenser floor at elevation plus 1 and the main boiler room and turbine floor at elevation 32 or about 18 ft. below the ground level.

These requirements, together with the inclined cuts for railroad tracks, necessitated excavating approximately 131,000 cu.yd. of soil from a pit having a maximum depth of 70 ft. below the surface of the ground, resulting in an exceedingly difficult grading job.

The main smoke flues leading from the boilers to the smokestacks are in the form of concrete boxes approximately 8 ft. high and 11 ft. to 18 ft. wide. Two reinforced concrete smokestacks were constructed, having a height above foundations of 220 ft., inside diameter at top 15 ft. and bottom 16 ft. 6 in. These smokestacks were lined with a 4-in. concrete lining for a height of 60 ft. The main shell of the chimney was 5 in. thick at the top and 16 in. thick at the bottom. The concrete foundation for each chimney was 28 ft. square and 5 ft. thick, heavily reinforced. Each of these chimneys was constructed in about sixty-four days.

The construction of the main buildings involved the use of about 2,250 tons of structural steel, a part of this being in the form of steel plate coal bunkers, steel supports for machinery, galleries and stair work. In the pulverizing building, the steel frame was designed for supporting overhead coal bunkers having a capacity of 3,500 tons.

The coal dumping and crushing plant presented peculiar construction difficulties, being located on the slope of the bluff at the lake shore. The coal cars are brought in to the dumper on the high level at elevation 56. The crushing building is surrounded on three sides by high retaining walls, the west wall of the building forming a retaining wall nearly 50 ft. high and the two end walls being braced to the building floors by means of concrete struts, thereby greatly reducing the spans for the concrete and the materials required for the walls.

The quantities of principal parts of the work performed and materials used may be summarized as follows:

Cubic yards of rough excavation	131,895
Cubic yards of finish excavation	18,500
Miles of railroad track laid	5.5
Tons of stone placed in rubble mound	80,294
Cubic yards of concrete	25,000
Tons of reinforcing steel	1,250
Bags of cement	155,000
Feet of lumber	2,326,000
Number of brick	1,445,000
Tons of structural steel	2,237
Lineal feet of 10-ft. tunnel	1,145

MECHANICAL EQUIPMENT OF LAKESIDE POWER PLANT

The main units at Lakeside station consist of two 20,000-kw. turbo-generators, 13,200-volts, three-phase, 60-cycle, operating on 250 lb. steam pressure, 200 deg. F. superheat, with 1 in. absolute back pressure. The auxiliaries for each unit comprise one 35,000-sq.ft. three-pass condenser; one 24-in. 18,000-gal.-per-minute circulating water pump driven by 170-hp. motor; one 24-in. 18,000-gal.-per-minute circulating water pump driven by 170-hp. steam turbine; one condensate pump driven by a 50-hp. motor; one turbo-air pump driven by 100-hp motor; one steam jet air pump, and one air washer.

Each condenser is thus provided with two half-capacity circulating water pumps of 18,000 gal. per minute each, one being motor driven and the other connected to a steam turbine. Both of these pumps will be required during the summer months when the water is warm, but only one will operate during the winter.

An air washer is installed for each generator which draws its supply of air from the main turbine room, eliminating a separate screen house and an air duct to outside the building. Suitable means of admitting air into the turbine room from the outside during the cold weather has been made in the monitors on the roof, while during the milder weather it is admitted through ventilators in windows. The generators discharge the air into the basement of the boiler room through sheet metal ducts, thereby using the heated air to augment the regular supply to the boiler furnaces. Provision was

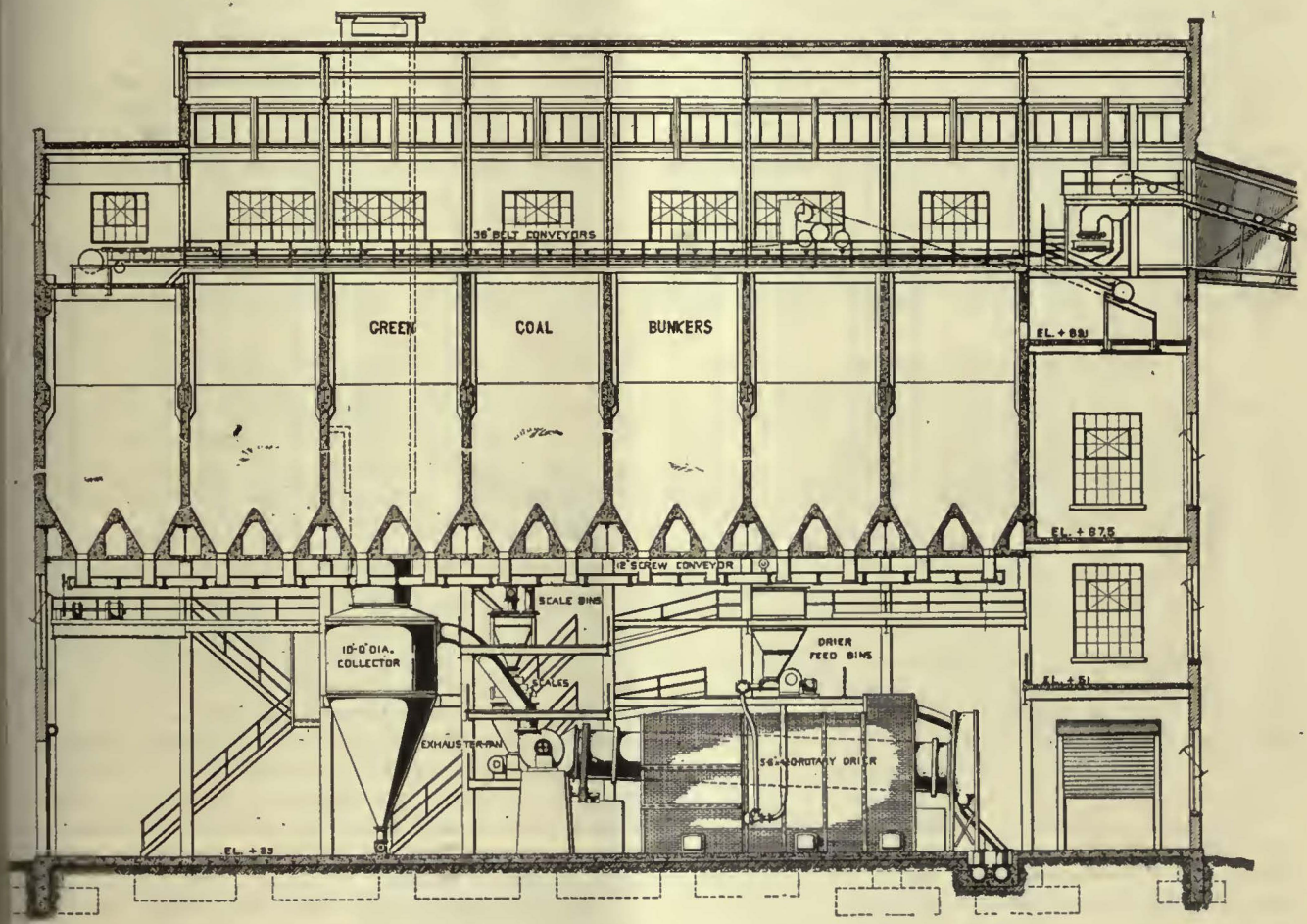
nade in these discharge ducts to by-pass a sufficient mount of air back into the turbine room during cold veather so as to temper the air and reduce the openings f the ventilators to a point that will give a proper tur- ine room temperature. This design of air ducts for enerator cooling gives the best results with least in- estment cost, and also provides for noise reduction.

Automatic dampers have been installed in both the ir intake and discharge ducts as close to the generator s possible as a means of fire protection. These close hen an unusually high temperature is attained, such as night be occasioned by fire. Arrangement will also be nade for admitting carbon tetrachloride, or other fire xtinguishing liquid. The station is equipped with the

Each boiler is fitted with a Foster superheater, having a capacity to increase the temperature of 90,100 lb. of steam per hour from 411 deg. F. to 611 deg. F., thus realizing a superheat of 200 deg.

The boiler furnaces are arranged for burning pulverized fuel, which is fed into them by screw feeders from pulverized fuel storage bins overhead. Six out of the eight boilers are equipped with the Lopulco system, that being the design which was tested out in Oneida Street and found satisfactory. Two boilers were fitted with the Fuller system for experimental purposes.

There are installed eight Sturtevant economizers of 7,603 sq.ft. heating surface, one for each boiler, arranged with by-pass connection to the stack for flue



LONGITUDINAL SECTION THROUGH PULVERIZING PLANT

cessary pumps for sanitary service, which pumps are connected as to be available for reserve feed tank rvice. An air compressor for cleaning generators and her electrical equipment, operating pneumatic tools, iler tube cleaners and general service also forms part the station equipment.

INITIAL BOILER ROOM EQUIPMENT

There were installed eight 1,306-hp. Edge Moor ilers, designed for 300 lb. pressure. The boilers are ranged four in each of two rows. They operate rmally at 200 per cent of rating. At this rating three ilers are sufficient to furnish steam for one 20,000-kw. rbine, leaving two spare boilers to allow for cleaning d maintenance. This number of boilers will also be cessary in order to furnish steam in the future for the rger generating units which are expected to be in- alled in the next section built.

gases. Each economizer is equipped with an induced draft fan driven by a steam turbine. The economizer receives the feed water at 140 deg. F. temperature and raises it to 255 deg. F.

The condensate from the condensers on the large turbines is pumped to an overhead hot well tank, the water from which feeds by gravity to two Hoppes heaters, maintaining a fairly constant pressure on the supply pipe thereto. The heaters raise the temperature of the feed water from approximately 80 deg. to 140 deg. F. The overhead hot well tank is equipped with an overflow to a reserve feed water basin located below the basement floor of the boiler room. The water is reclaimed from this basin by means of centrifugal pumps and is delivered to the overhead hot well tank as needed. From the heaters the feed water passes by gravity through an 800,000 lb. per hour "V" notch feed water meter of extra storage capacity. This meter is located

on the floor above the feed pumps and gives a 15 ft. suction head on the pumps.

There is also installed a common test line with connections from condensate pumps on each condenser which discharges into a test meter of the "V" notch type of 300,000 lb. per hour capacity, from which it flows by gravity into the heaters. The test meter is located on the floor level with the overhead hot well tank.

The feed water pumps installed consist of two 6-in. centrifugal 650-gal.-per-minute feed pumps driven by 250-hp. steam turbines and two 4-in. centrifugal 400-gal.-per-minute feed pumps driven by 150-hp. motors. The maximum quantity of feed water required for eight boilers operating at 200 per cent rating is 1,254 gal. per minute. This leaves two motor-driven pumps or one steam-driven pump as spare. These pumps are located on the boiler operating floor level at the west end of the boiler room.

As the quantity of ash from pulverized fuel furnaces is very small and very fine it is easily conveyed by means of steam jet ash conveyors. A system of steam jet conveyors is installed with main runs leading to furnace ash pits and branches leading to combustion chambers at the rear of boilers and soot pits under the economizers. This conveyor discharges into an ash bunker which spouts into cars on the railroad track at the east end of boiler room.

Plant for Preparing Coal

The coal bunker is located in the pulverizing plant and has a storage capacity of 3,400 tons, which is slightly more than three and one-half days supply for maximum operation of all boilers in this section. The coal is taken from this bunker by means of three screw conveyors, which convey it to automatic weighing scales. From the scales it is taken by another set of screw conveyors and fed into the dryers. With this arrangement it is possible to take coal from any point in the bunker and deliver it to any one of three dryers. It also allows the coal to be weighed just before reaching the dryers, which is much to be preferred over the method of measuring coal as it enters the coal bunkers inasmuch as it permits of a close daily check on coal consumed in the plant.

Three dryers capable of reducing the moisture content in the coal from 10 per cent to 1 per cent have a capacity of 17½ tons per hour each. From the dryers the coal is discharged into screw conveyors, which convey it to bucket elevators, which in turn deliver it to other screw conveyors to be transferred to dried coal bins over the pulverizing mills.

Eight mills each having a capacity of six tons per hour pulverize the coal so that 85 per cent will pass through a 200-mesh screen and 95 per cent through a 100-mesh screen. The mills are each direct connected to a 100-hp. motor. Each mill is also provided with a fan for separating the pulverized particles which have been reduced to the necessary fineness, discharging them into cyclone separators overhead, where the fuel is separated from the air and falls by gravity into a screw conveyor located at the base of the separators. This conveys it to the pulverized fuel bins. From these bins it is conveyed to fuel bins in the boiler room by means of the Fuller-Kinyon system of transporting pulverized material.

Coal is removed from cars by means of a rotary car dumper of the Robins-Scherzer type and dropped into a track hopper fitted with bottom shaker feeders. Belt conveyors carry the coal from the track hopper over a magnetic pulley for the removal of such iron as may be in the coal. It is then passed through a two-roll crusher and hammer mill, where it is reduced to ½ in. size. It next discharges directly onto an inclined belt, which carries it to the distributing belts over the coal bunker in the pulverizing plant. There are three such distributing belts over the bunker, each having a traveling tripper which discharges coal at any point along the length of the belt.

The crusher and hammer mill have a capacity of 150 tons of mine run coal per hour. The conveyors are 36-in. belts, having a capacity of 250 tons per hour at 250 ft. per minute. Provisions have been made for the installation of another crusher unit which will double the capacity when required in the future. Provision has also been made for the future storing of rail coal on the dock by means of by-passing the crusher and conveying the coal by belt to the dock, where it will be taken up by coal bridge and stored. Coal from the dock will be reclaimed by reversing the operation and delivering coal reclaimed into crushers. Lake coal will be taken into the plant in the same way.

Method of Maintaining Heat Balance

It was decided in order to obtain a well-balanced heat condition for use in connection with heating feed water to a suitable and regular temperature before introducing it to the economizer to install steam drive for boiler feed pumps, induced draft fans and half of circulating pump capacity, leaving the balance of steam required for heating feed water to be supplied in varying quantities by the house unit, or so-called heat balancer. All other auxiliaries are direct motor driven.

Electrical Features of New Power Plant

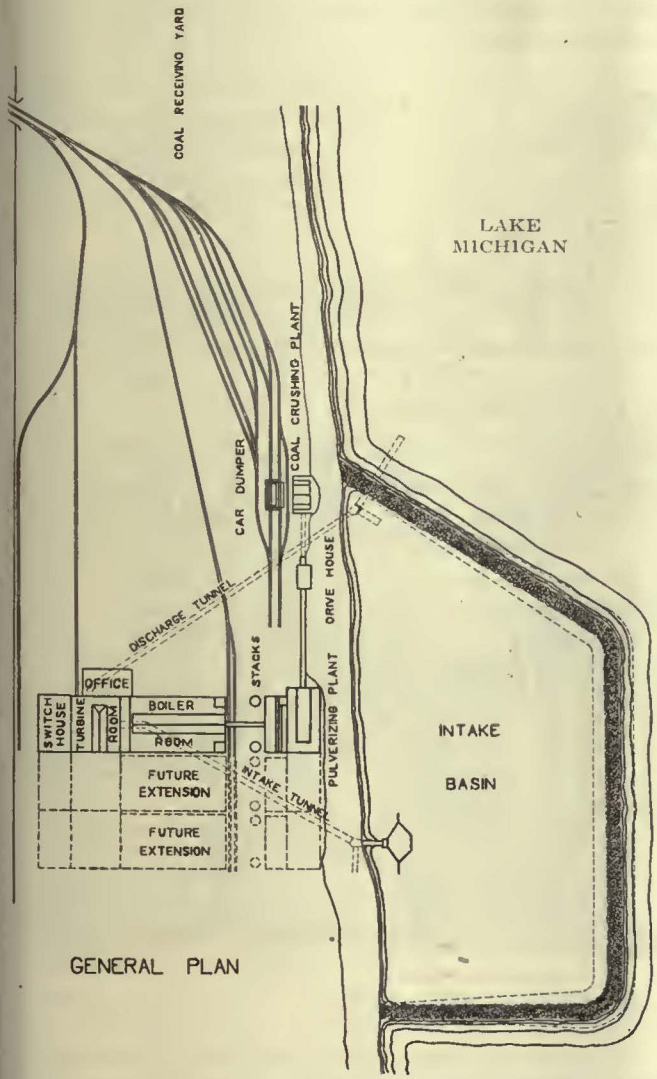
Current at the Lakeside plant is generated at 13,200 volts and all outgoing high-tension lines operate at 13,200 volts and leave the station underground. Many of the lines have been connected to the Commerce Street power plant and other stations in Milwaukee, but others will be connected to an outdoor transformer station near at hand, which will step the pressure up to 26,400 volts for transmission to distances in general exceeding 6 miles. It is possible that at a later date some energy will be stepped up to 66,000 volts or more for transmission to remote points.

The generators in the initial installation are General Electric Company, 20,000-kw., 0.8-power factor, three-phase, 13,200-volt, 60-cycle, 1,800-r.p.m. machines. Excitation for the generators is furnished at 240 volts and is normally supplied for each generator by its own direct-connected exciter. Emergency excitation is furnished from the d.c. station power service. The oil switch control system is 120 volts d.c., regularly supplied from a separate storage battery and special motor-generator sets. If necessary the oil switch control may be transferred immediately to the battery on the d.c. station power system by connecting it across one-half of the cells.

The 13,200-volt main connections and circuit breakers are located exclusively in the switch house. There are two main bus bars with sectionalizing switches between generator sections. Possible future sectionalizing reactors will be installed. To promote safety and prevent electrical trouble from spreading, all 13,200-volt bare copper and cables are taped with approximately ¼ in. of varnished cambric and covered with a layer of

cotton tape impregnated with a fire-resisting substance. Each generator may be connected to either main bus through selector oil circuit breakers. Feeders are connected in groups of three to feeder group bus bars, which in turn may be connected to the main bus bars through group circuit breakers.

The arrangement of equipment in the switch provides for reliability of operation. Some of the features of the arrangement of apparatus are these: The main circuit breakers of different generators are separated a considerable distance from one another with from three to



GENERAL LAYOUT OF LAKESIDE POWER STATION FACILITIES

four groups of feeder breakers between them. Because of this it will be difficult for trouble on one set of generator breakers to be communicated to the breakers of other generators. The group breakers of any one feeder group are located as far as possible from one another, one being at one end and the other at the opposite end of the feeder section. This makes it unlikely that trouble in one group breaker will involve the other group breaker on the same feeder group.

Oil circuit breaker mechanisms are located on the fourth floor, oil circuit breakers on the third floor, main bus bars, potential transformers, feeder current transformers, feeder reactors and feeder group bus bars on the second floor, and generator current transformers, lightning arresters, feeder potheads and disconnecting switches on the first floor. The generator leads pass in a nearly horizontal direction from the generator foundation through a tunnel underneath the switch house and then rise vertically to the generator selector bus on the second floor. The generator leads each consist of two 1,000,000 circ.mil, single-conductor, stranded copper cables insulated with $\frac{7}{64}$-in. cambric and covered with a flame-proof braid. Although these cables are in a dry place and insulated for the operating voltage they are nevertheless supported clear of everything on porcelain bus bar supports spaced approximately 3 ft. apart. Cables are continuous without joints from the generator to the current transformer on the first floor. From the current transformers to the main circuit breakers the leads consist of two $\frac{1}{4}$-in. x 3-in. copper bars. The main generator oil circuit breakers are General Electric type H-6, rated at 2,000 amp., 15,000 volts and capable of rupturing 18,000 amp. at the rated voltage. Each pole of these breakers is located in an entirely separate compartment and the crossheads are in another separate compartment underneath the operating mechanism on the fourth floor. The main bus bars on either side of the room consist of two or more $\frac{1}{4}$-in. x 4-in. copper bars suspended from the ceiling on substantial porcelain insulators and separated from one another by gypsum barriers 2 in. thick. The main bus bars are on opposite sides of the room, making it practically impossible for trouble on one set of bus bars to involve the other.

The feeder group bus is connected between the group oil circuit breakers, one of which is directly over the west main bus and the other over the east main bus. Feeders are tapped off between the group circuit breakers. Conductors run from the feeder bus through porcelain bushings in the wall, thence upward to the feeder oil circuit breaker and down through current transformers and feeder reactors to disconnecting switches and cable terminals. Group oil circuit breakers are of the same type as the main generator bus bar, but rated 800 amp. and having a rupturing capacity of 18,000 amp. The crossheads, as in the case of the generator breakers, are located in a separate compartment underneath the operating mechanism on the fourth floor. Feeder breakers are General Electric type H-3, rated 300 and 500 amp., depending upon the size of feeders connected, and will rupture 10,000 amp. at 15,000 volts.

STATION SERVICE POWER

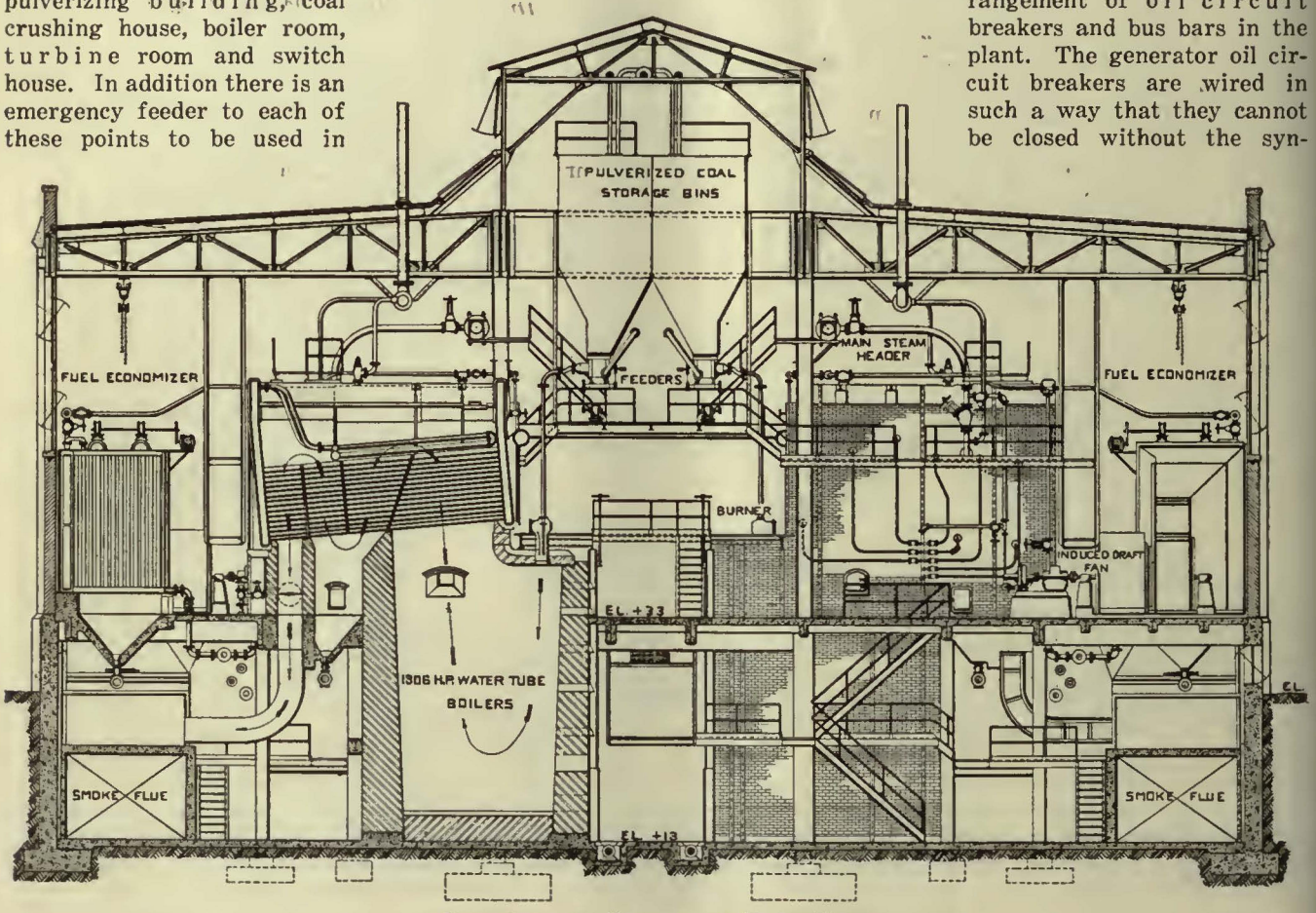
On account of the fact that some of the motor-driven plant equipment, such as that for coal crushing and pulverizing, is located a considerable distance from the source of supply, it was decided that such auxiliaries should operate at 480 volts. It was further decided that some d.c. auxiliary service should be furnished on account of the turbine room crane, motor-operated steam valves, car dumper, magnetic pulley and certain operations requiring variable speed. To make this service available as an emergency source of excitation, 240 volts was selected. To simplify the station power service, the control of main emergency auxiliary feeders was placed under the control of the switch house operator, who handles this system exactly as a substation supplying a group of customers. For the purpose of adding to the safety of workmen, safety switches have been adopted for use at the various motors. All bare copper bus bars, cable and wire are insulated adequately to safeguard the service.

Service for a.c. auxiliaries is furnished by two 3,000-kva., 13,800-13,200-volt primary, 480-volt secondary, 60-

cycle, three-phase, water-cooled transformers, one serving as a reserve for the other. These transformers are located in the turbine room basement underneath the mezzanine floor on which the generator field and exciter rheostats, neutral oil circuit breakers and other electrical auxiliaries are located. Located as they are, the 13,200-volt cables supplying them are short and do not pass through any part of the plant where they may be subjected to too much heat and consequent liability of trouble. Bus bars, transformer circuit breakers and oil circuit breakers on feeders to distribution points throughout the plant are all in duplicate. There is one main feeder to each main division of the plant, such as pulverizing building, coal crushing house, boiler room, turbine room and switch house. In addition there is an emergency feeder to each of these points to be used in case of trouble on the main feeders. The auxiliary bus bars consist of ¼-in. x 4-in. copper bars supported on substantial porcelain insulators in horizontal compartments above the oil circuit breakers on the auxiliary feeders. Large air brake circuit breakers are used instead of oil circuit breakers on the secondary side of the auxiliary transformers. These breakers are provided with reverse power relays so that with both transformers in operation trouble in a transformer or on its primary breaker will cause the proper breakers to open, thereby clearing the trouble without interfering with the service. Station distribution switchboards, located in various parts of the plant, are constructed in such a manner as to make it possible to kill half of them for work to be done without interfering with service on the other half.

The general arrangement of the d.c. auxiliary supply is similar to that of the a.c. This system is supplied by two 300-kw. motor-generator sets, one serving as reserve for the other and each consisting of a 480-volt, 60-cycle, squirrel cage induction motor, direct connected to a 250-volt d.c., 1,200-r.p.m. shunt wound generator. These sets are supplied from the 480-volt a.c. station power system. To guard against a shut down, a 150-cell G-15 battery in G-23 tanks is kept floating across the 240-volt bus. The main d.c. busbars and switches are located on a switchboard in the operating room. Each main feeder is provided with an ITE circuit breaker and at the various distribution panels and cabinets in the plant fuses are provided on branch circuits.

The main station wiring is represented by mimic busbars on the bench sections and the arrangement of control switches is such as to conform exactly with the arrangement of oil circuit breakers and bus bars in the plant. The generator oil circuit breakers are wired in such a way that they cannot be closed without the synchronizing plug being in its receptacle. The same is true of feeder oil circuit breakers. The signaling equipment on the bench board is exactly the same as that on the instrument panel at the turbine throttle. Since the switchboard operator is in an entirely different room from the steam engineer, it is necessary for them to make use of signals in bringing machines up to speed and cutting them in or out.



CROSS-SECTIONAL VIEW OF THE BOILER PLANT

There are three feeders per panel, each panel corresponding to a feeder group. The equipment per feeder on each panel consists of three ammeters, one voltage indicating lamp, one synchronizing receptacle, one pull button control switch with red and green indicating lamps and three overload induction relays with test links.

To make it possible to communicate with all parts of the plant at any time of the day or night with the minimum of operating expense, an automatic telephone system has been installed. The exchange controls twenty-five circuits with an ultimate capacity for 50.

Letters to the Editors

The Trolley Shoe or "Slide" at Low Speed

LEAGUE CITY, TEX., April 8, 1922.

o the Editors:

I have read considerable discussion on the merits of e sliding contact shoe as against the standard trolley heel, but there is one feature of the case as I have perienced it that has never been touched upon in ything I have read or heard. This is the unusually eat wear on the trolley wire by the sliding shoe at w speeds. And while this might not be a deciding ctor on high speed roads it would have a bearing in lecting a current collector for city cars, which of cessity must run slowly in the downtown sections, or r interurbans, which use city lines for entering the city.

My experience has been exclusively on high-speed terurban trolley,* and about three years experience oves conclusively that the wear on the trolley wire is ry much greater at slow speed with the slide than with e wheel. And it would seem that the extra wear is e almost entirely to increased friction at slow speed. his is proved by tests which I have made.

For a period of about seven years we used wheels, and icrometer measurements of the trolley wire wear at tervals revealed no noticeable difference in the wear points of high and slow speed, but after adopting the ntact slide this became very noticeable without measements. This extra wear was so great that in less an three years it was necessary to renew the wire at ints where frequent stops were made, as in front of ations. And the first places to be renewed were those most frequent stops. It has been suggested that the creased wear might be due to increased current draft starting, but this is disproved by the fact that increased current draft with the wheels showed no difference in wear.

Another proof that it is increased friction is the fact at at high-speed points the wire takes on a gloss on e underside when the slide is used while the gloss is tirely absent where the speed is slow, indicating that e wire is being cut away with every passing trolley. e distance of increased wear is not very great, however, it being necessary to renew but little more than 0 ft. of trolley wire at each place renewed. This is e to the rapid acceleration of the trains in starting. have also noticed that the slide is more destructive of lley wire fittings—as splicing sleeves, section insulators, frogs and crossovers—than the wheel. This is e to the fact that a smooth under-run is never secured these devices, and a hammer blow results with the ssing of every slide, which forms a "shoulder" which aggravated with each blow struck. The wheel *rolls* on this uneven place with the result that the wear is t so great. This hammer blow tends also toward ystallization of the wire, making breaks at the trance of the wire more liable. The tendency to run e slides after they are badly worn also is destructive fittings, more so than the wheel, due to the fact that e slide takes on a more restricted groove than the heel. After passing the end of a fitting the shoe has upward thrust, and the resulting blow may tend to ystallize the wire.

This is not to be construed as being written in condemnation of the sliding contact, but only to point out certain results which may be expected from its use, results which I have never heard mentioned in discussions. My experience is that the slide stays on the wire better than the wheel, has much less arcing and pitting of the wire, and except in the faults mentioned is superior to the wheel. But in using it, it is well to pay special attention to fittings and points of slow speed, putting secure anchorage for the trolley wire on each side of such places, to catch breaks which may occur.

C. L. GREER.

The Galveston-Houston (Texas) Electric Railway.

What the Committee on Welded Rail Joints Is Doing

BROOKLYN RAPID TRANSIT COMPANY
BROOKLYN, N. Y., April 11, 1922.

To the Editors:

The committee on welded rail joints has been making considerable progress in its preliminary work and it seems advisable to make a statement concerning its organization and the nature of the work so far accomplished. While the work, from its very nature, must be somewhat slow it will be realized by those who have tried to answer the questions in the four sets of data sheets recently sent out that the task of preparing them was no small one. It is quite certain that from this time forward the work will proceed faster because the committee is now in possession of enough preliminary data to permit the assignment of the various subjects requiring special research to definite sub-committees. It is now expected that a meeting of the general committee will be called early in May.

The American Electric Railway Engineering Association, through its 1921 committee on way matters, initiated the formation of a special committee on welded rail joints for the purpose of having an authoritative investigation made of the various types of welded rail joints now in commercial use. The American Bureau of Welding, as the co-ordinating agency in the general field of welding research and standardization, undertook to organize the committee.

Welding in one form or another is being widely used in making joints in street railway rails, but more or less trouble has been experienced in all types of welded joints from breakage. Very few scientific data exist as to the correct procedure to be followed in making the welds by the several processes. Several of the larger electric railway companies are spending many thousands of dollars yearly on such joints. Much of this expense is being made without a sufficient knowledge of the underlying principles involved.

A preliminary organization meeting of the committee on welded rail joints was held in June, 1921, at the office of the American Welding Bureau in New York City. At that meeting a plan of organization was prepared and the method of conducting the work outlined. A relatively large committee has since been organized, including representatives of users, consumers and the best technical experts in the field. For the purpose of directing the work during the formulative period the following were asked by the Welding Bureau to serve as an executive committee: Dr. G. K. Burgess, United States Bureau of Standards, chairman; E. M. T. Ryder, way engineer Third Avenue Railway, vice-chairman; C. A. Adams, director American Bureau of Welding;

H. M. Steward, superintendent of maintenance Boston Elevated Railway, and the writer.

It should also be noted that the Engineering Association has become a member of the American Bureau of Welding, with E. M. T. Ryder as its official representative, in order to further the important work which the bureau is conducting in its direction of the work of the welded rail joint committee.

The members of the general committee are:

F. E. Abbott, consulting inspection engineer Lackawanna Steel Company.
C. A. Adams, Harvard University, director American Bureau of Welding.
E. O. Ackerman, engineer of way Columbus Railway, Power & Light Company.
G. K. Burgess, Bureau of Standards, Washington, D. C.
Alexander Churchward, consulting engineer Wilson Welder & Metals Company.
R. C. Cram, engineer surface roadway Brooklyn Rapid Transit Company.
J. H. Deppeler, chief engineer Metal & Thermit Corporation.
H. M. Gould, City of Detroit Department of Street Railways.
H. F. A. Kleinschmidt, superintendent track welding department Lorain Steel Company.
C. F. Lederer, Metal & Thermit Corporation.
J. C. Lincoln, president Lincoln Electric Company.
E. J. McIlraith, superintendent of way Philadelphia Rapid Transit Company.
J. K. Punderford, vice-president and general manager the Connecticut Company.
E. M. T. Ryder, way engineer Third Avenue Railway System.
William Spraragen, engineering division National Research Council.
W. C. Starkey, chief engineer Ohio Brass Company.
G. Wallace Smith, engineer San Antonio Public Service Company.
H. M. Steward, superintendent of maintenance Boston Elevated Railway.
H. L. Whittemore, Bureau of Standards, Washington, D. C.
G. L. Wilson, engineer maintenance of way Minneapolis Street Railway.
W. W. Wysor, chief engineer United Railways & Electric Company of Baltimore.
F. A. Weymouth, sales metallurgist Bethlehem Steel Company.
G. C. Estill, superintendent way and structures New Orleans Railway & Light Company.
E. Vom Steeg, General Electric Company, New York.
R. H. Dalgleish, chief engineer Capital Traction Company.
H. H. George, engineer maintenance of way Public Service Railway.
John H. Hanna, vice-president Capital Traction Company, Washington, D. C.
C. S. Kimball, engineer way and structures Washington Railway & Electric Company.
E. C. Price, the Indianapolis Switch & Frog Company.
Jonathan Wolfe, assistant superintendent track and roadway Chicago Surface Lines.
H. A. Currie, the New York Central Railroad.
D. D. Ewing, Purdue University.
A. P. Way, American Railways Company.

The general scheme of conducting the work, subject to such changes as may be made at the meeting of the committee, is as follows:

1. Preparation of a bibliography and critical summary of our present knowledge, including the gathering together of all available experience in this field.

2. Consideration of the results of (1) and the laying out of specific experiments to be performed.

3. The assigning of each of these experiments or researches to an appropriate laboratory, or in the case of field experiments to one or more appropriate operating companies. These assignments would, of course, cover the men under whom these specific experiments will be conducted.

So far the work of the committee has been financed principally by the American Bureau of Welding. The committee is without funds and it is hoped that t various railway companies, together with the seve manufacturing interests, will contribute toward the e pense of the work, either by furnishing test specime conducting field tests, laboratory experiments and tes or with direct cash contributions. R. C. CRAM,
Engineer Surface Roadway.

Motormen Need Knowledge as Well as Good Physique

PORTLAND, ORE., April 8, 1922.

To the Editors:

I read with interest the letter from the Georgia Ra way & Power Company, in the April 1 issue of t ELECTRIC RAILWAY JOURNAL, concerning the selection employees. From the viewpoint of a motorman I hea ily agree with the points raised in that letter. If a m has some physical defect he is a dangerous man arou any kind of railway.

But there's something else just as important as phy ical fitness—that is, knowledge. Knowledge as appli to the motorman comprises three things: common sens judgment and training. Over the first two the emplo ing company has very little control, but over the last has, and here is where a good many fall down.

Take, for example, two interurban electric roa operating heavy trains. On the first the motormen a required to take rigid air-brake and technical examin tions and the discipline is very strict as to operati rules. On the other no examination on air-brakes other equipment is required and discipline on operati rules is very slack.

Now which of these roads will come out better in t end? I believe the first one, and it is my conte tion that no electric road, particularly an interurba can afford to get along without the air-brake examin tion. GEORGE W. BOOTH,
Interurban Motorman.

Is Salesmanship in Transportation Possible?

THERE are not a few railway managers who s that salesmanship on the other fellow's proper may be all right and possible, but how can it apply their properties? Salesmanship such as evidenced l the following appears to be possible anyway:

"A traveling business man reports as follows: . . . , a couple of weeks ago, I was very agreeab impressed by a conductor, who, when I thanked him f information, replied with a smile, 'You're welcom

"In . . . (another town) too, they seem to ha conductors who take an interest in passengers. O conductor who carried me past my destination, stopp the car, came to me and said, 'I owe you a fare. I ha carried you five blocks past your stop.' He then ga me a ticket (good for 8 cents) and told me where stand to get the return car.

"The conductor on the returning car was a salesma also. I told him where I wanted to get off, describir the location as near a certain factory I desired to reac and he not only told me where the corner was, but, as was alighting, told me which way to walk to reach t factory I was looking for.

"I was impressed with the fact that while these we homely acts yet they were acts which evidenced a re instinct toward salesmanship."

Equipment and Its Maintenance

Short Descriptions and Details of New Apparatus of Interest to the Industry. Mechanical and Electrical Practices of All Departments

New Double-Truck One-Man Cars in Bangor

x Light-Weight Cars Embodying All Safety Car Features Have Been Placed in Service by the Bangor Railway & Electric Company

BY HORACE B. BALDWIN
Master Mechanic Bangor Railway & Electric Company, Bangor, Me.

THE Bangor Railway & Electric Company has operated fifteen Birney safety cars equipped with eneral Electric type-258 motors since October, 1918. his operation has been very successful, but now as it is cessary to purchase new rolling stock the officials ve decided to develop a light-weight double-truck car r one or two-man operation. This car can be used on her city or suburban lines, will weigh about 28,000

EXTERIOR OF NEW LIGHTWEIGHT CAR, AND AT RIGHT VIEW SHOWING INTERIOR AND PLATFORM ARRANGEMENT

l seat fifty-two passengers and be equipped with r motors of the same type as used under the ety cars. The same general construction and all ts above the underframing will be standard with Birney cars.

Six of these cars have been built by the Wason nufacturing Company. The first two cars were put o service on Feb. 10, 1922, on the Bangor and mpden line and will replace cars weighing 46,000 lb. the semi-convertible type seating forty-four passens, and equipped with four 40-hp. motors. During snowstorm of Feb. 16, 1922, these cars operated y satisfactorily and we had no trouble in making the ning time. The company now feels that this type car will prove as efficient in snow as the heavier e car which it displaced. Some general dimensions he cars are given in the accompanying table.

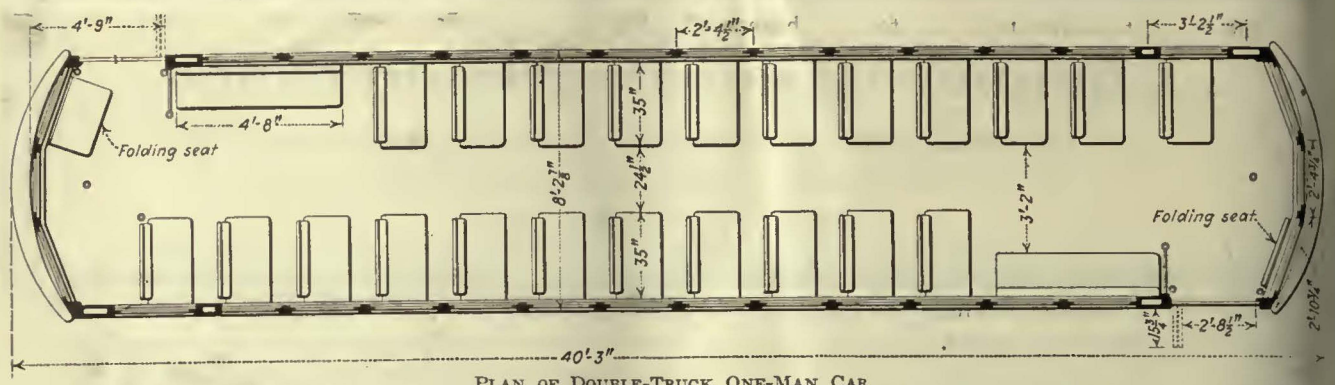
hese cars have the general appearance of an elonged Birney safety car. The trucks are the Brill 77 , specially designed for low floor, with 26-in. wheels. Other details include A.E.R.E.A—E 2 standard axles, 4 General Electric 258 Form C motors, K 35 HH control, General Electric CP 27 B air compressor, Safety Car Devices Company full safety equipment provided with whistles, Root air-operated snow scrapers, operators 14-in. foot gong, Keystone trolley catchers and Cleveland fare boxes. Two sliding curtains are provided which inclose the end of the car around the operator. Simplex No. 3 trolley bases, Golden Glow type S M 95 headlights and 22 Consolidated Car Heating Company's type 392 cross seat heaters are also used.

SOME DETAILS OF CONSTRUCTION

The body is framed for thirteen windows on each side. The side posts are 1½ in. x ⅞ in. tees which run in one continuous length from side sill to side sill, and thus form the carlines. The post spacing is 28½ in. center to center except that of the extreme window opposite the door opening, which has a spacing of 38½ in. The side sills are 3 in. x 3 in. x ⅜ in. angles in one continuous piece from end sill to end sill. The cross sills are 4-in. 5¼ lb. channel, and the bolsters are of the truss type with plates of 8-in. x ⅝-in. and 8-in. x ¾-in. soft steel. Corner posts are pressed steel. The

GENERAL DIMENSIONS AND WEIGHTS OF CAR

Length over bumpers	40 ft. 3 in.
Length of platform	4 ft. 9 in.
Distance between bolster centers	20 ft. 1 in.
Wheel base of truck	5 ft. 3½ in.
Width over side sheets	8 ft. 0 7/16 in.
Width over all	8 ft. 3½ in.
Height, from track to top of roof	10 ft. 1⅜ in.
Height from track to sill	2 ft. 2½ in.
Height from track to top of floor	2 ft. 8 7/16 in.
Height from track to step	16 in.
Height from step to platform	15½ in.
Width over side sheets	8 ft. 0 7/16 in.
Width over all	8 ft. 2¼ in.
Width of door opening	2 ft. 8½ in.
Width of aisle	2 ft. 0½ in.
Side post spacing	2 ft. 4½ in.
Weight of car body with air brake and control equipment	15,110 lb.
Weight of trucks	9,100 lb.
Weight of four G. E.-258 Form C Motors	4,450 lb.



PLAN OF DOUBLE-TRUCK ONE-MAN CAR

side sheets are ⅜ in. thick patent level rolled steel in four sections, the belt rail is 2½-in. x ⅜-in. steel and the letterboard No. 18 steel.

Vestibule top plates, hood rim, hood carlines, posts and ribs are of white ash. Dashers of No. 14 sheet steel in three pieces are used and platform floors are ⅞-in. hard maple. The bumper is a 3-in. 6-lb. channel.

The roof is of the plain arch type having ½-in. grooved poplar planking laid lengthwise, and covered with No. 8 cotton duck laid in white lead. The car floor is double laid with the bottom half of ⅝-in. clear spruce and the top half ¾-in. hard maple. The aisle flooring is covered with ⅛-in. corrugated rubber matting 18 in. wide, which extends to the middle of the vestibule floor. The steps are the folding type 34-in. x 10½-in. x 1¼-in. maple fitted with a 3-in. special safety treads.

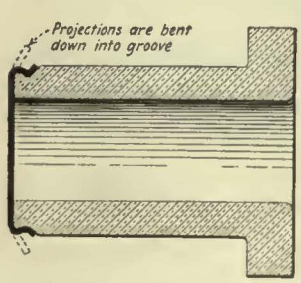
Cherry has been used for the interior finish including the moldings. No headlining was used and the carlines and roof boards are white enameled. The interior of the car body below the belt rail is lined with ¼-in. Agasote painted to match the cherry finish.

There are 22 Brill "Waylo" type reversible cross seats having cherry slats, pressed-steel ends and pedestals. The longitudinal seat at the opposite ends of the car are also of cherry.

The body panels and letterboard are painted Pullman green, the posts cream color and the sash mahogany. There are ten 23-watt lamps on each side of the car, two over each door and two in the illuminated signs, with 46-watt lamps in the headlights. The lower side windows are fitted with storm sashes for winter service and with window guards during the summer.

An Inexpensive Armature Bearing Cap

THE New York State Railways, Rochester lines, is using a cap made of tin as a substitute for the counterbored cap sometimes used as a waterproof and dustproof covering for the outside ends of armature bearings. Trouble was experienced with the usual type of cap falling off and becoming loose when used on bearings that were worn, so that proper attachment could not be secured. The tin cap which is now used is stamped out and given a slight angular turn at the edges. In order to fasten the tin cap to the bearing a tapered slot is cut in the outside near the end. The tin is then crimped into the slot so as to give a secure fastening. This is done by a tool at the same time that the bearing is turned to fit the armature shaft. When the bearings require rebabbitting again the tin cap is thrown away and a new one used.



TIN DUST GUARD FOR ARMATURE BEARINGS

A method quite similar to this is used by the Kansas City (Mo.) Railway and was described in the ELECTRIC RAILWAY JOURNAL for July 29, 1916, page 197. Another method using a thin sheet steel disk which fits into the end of the armature bearing is used by the Elmira Water, Light & Railroad Company and was described in the July 7, 1917, issue, page 23.

Positive Switch Combined with Signal Provides Desired Protection

AT A POINT where the track leads off the main line of the Pennsylvania-Ohio Electric Company, to serve the Haselton car shops at Youngstown, Ohio, a simple spring switch, normally set for main-line traffic, was formerly used. There are frequent car movements out of the shop yards onto the main line and much trouble was had with split switches because the men were not careful to get the following trucks out clear of the switch before starting back on the main line. To overcome this possibility of trouble, a Bethlehem safety switch stand which locks in both positions was installed. This is a switch stand which always revolves in one direction and which snaps and locks into the new position as soon as a car forces the switch point over slightly, or as soon as pressure is applied to the switch stand handle. This has completely overcome the splitting of the switch, for there is no dependence placed on the spring to bring the switch to main-line position and the switch point is locked positively in either one position or the other. This makes it necessary for a crew bringing a car out on the main line to throw the switch by hand before starting back on the main line yet permitting movement through the switch onto the

SAFETY SWITCH STAND AT SHOP YARD TURNOUT EQUIPPED WITH MAIN LINE ELECTRIC SIGNAL INTERLOCK

ain line without having to set it for the branch-off advance of the car.

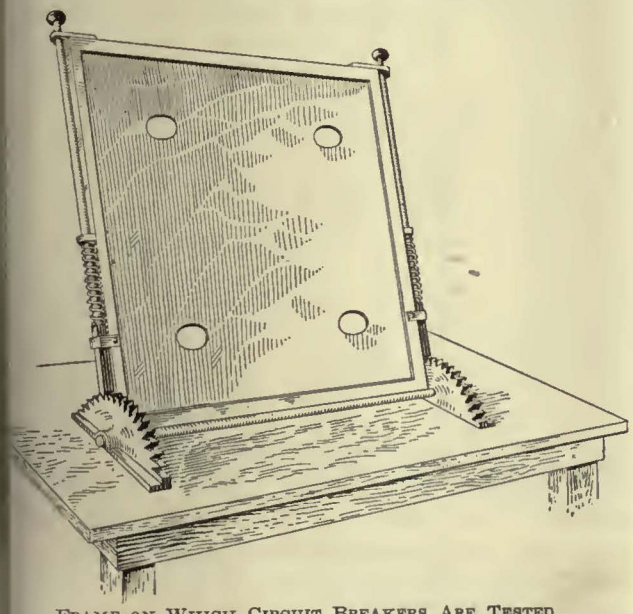
The installation of this type of switch necessitated me protection for the main line, for it will readily be en that the switch point might be left in the wrong sition for main-line traffic. This signal protection was geniously provided by A. B. Creelman, master meanic. An ordinary control finger was mounted on the d connected between the switch stand and switch int and arranged to make connection with either one two contacts. When the switch point is in the shop ack position, the connection lights a red signal, and en it is in the main line position, the connection gives e green light signal for main-line traffic. This simple ntact mechanism was housed in a steel box located st in front of the switch stand, providing ample protion from the elements.

Practical Kinks from Hampton

me of the Devices Which Have Proved of Great Assistance in Maintenance Work Include a Hydraulic Portable Pinion Puller, Tank for Cleaning Various Parts and a Rig for Testing Circuit Breakers

HE repair shops of the Newport News & Hampton Railway, Gas & Electric Company are in Hampton, a., adjoining the main offices and carhouse of the mpany and are in attractive surroundings. There is nty of room to expand and the shops have light on sides. Perhaps it is because of these attractive rroundings that much original work in the way of proved methods of doing things has been developed the Hampton shops.

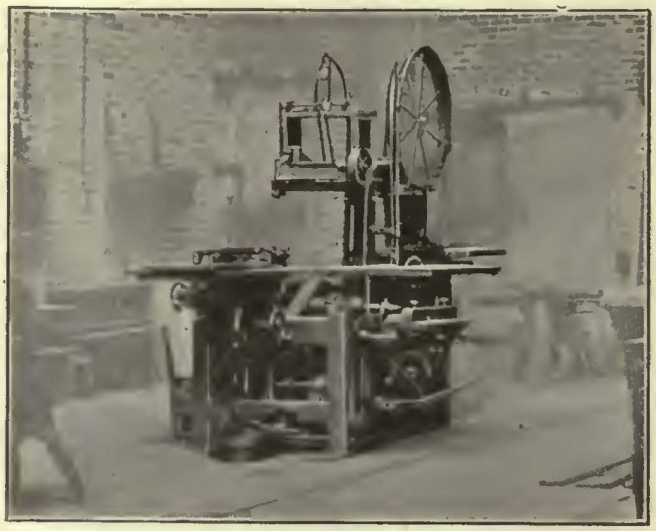
A recent visit to the shops by a representative of is paper disclosed a portable pinion puller, operated the hydraulic process. The increase of power in this



FRAME ON WHICH CIRCUIT BREAKERS ARE TESTED. IT CAN BE SET AT ANY ANGLE

vice is such that a force of 50 lb. on the handle of puller will develop 40,000 lb. on the ram. A section a photographic view are given.

In the operation of this puller oil or other liquid pumped from the reservoir shown at the right in the tion through the small duct and valve into the ram amber, which is set to push against the end of the nature shaft. An extension of the frame of the ram

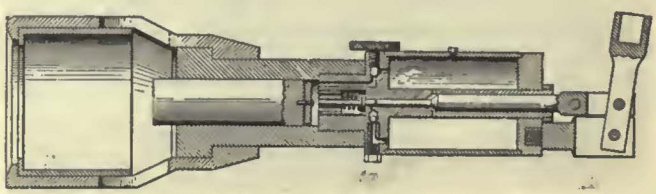


CORNER OF WOODWORKING MILL—VARIETY MACHINE AT LEFT

carries two collars with clamps to join them together, the outer collar having jaws to fit around the pinion to be removed. When the pressure is to be released, the liquid is allowed to flow back into the reservoir by the turn of a setscrew. The puller is the invention of C. W. Wood and E. C. Kelly, both connected with the railway company. It has been patented and has been placed on the market by the Electric Service Supplies Company. It has been in use in Hampton for about three years.

In operation this pinion puller clamps over the pinion, pulls in a straight line and therefore can be applied to the armature without removing the latter from the motor. It has ample power to remove pinions of any size used in electric railway service and a few strokes on the operating lever are sufficient to start the most obstinate pinion. The jaws consist of two heavy steel castings held together by quick-acting clamps with the inside face machined to take hold of new or badly worn pinions. These jaws are furnished in two sizes, which together take in the range of pinions in ordinary use. The pinion puller weighs approximately 50 lb. and is provided with a handle for convenience in carrying. As the puller is portable it can be readily carried to the pinion to be removed.

In the rear of the repair shop there is rigged up a small dipping tank for cleaning housings, bearings, brake hangers and other truck parts. The dipping tank is an old metal oil barrel heated with gas and resting on the carriage of a small chain hoist by which the parts are lowered into the tank in a wire basket. The company is using with success a cleaning mixture called "Oakite Platers' Cleaner," which has been found to clean metal parts three or four times as rapidly as



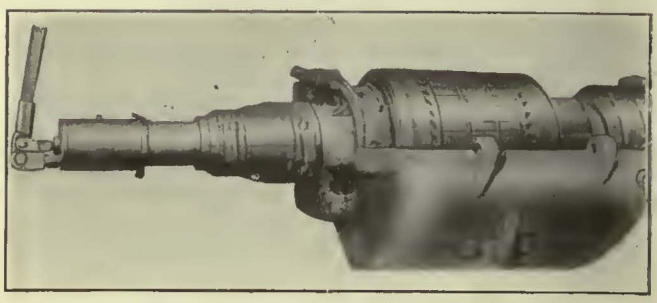
SECTION OF HYDRAULIC PINION PULLER

lye and to last almost indefinitely if about 10 per cent a week of the cleaner is added to the solution.

In the woodworking shop the company has recently installed a machine, illustrated in the accompanying

photograph, which performs a great many functions. It is a band saw, a trip saw, horizontal borer (used as a hollow chisel mortiser), a shaper and a joiner and has a planer attachment. It was made by the Sidney Machine Tool Company of Sidney, Ohio.

In its electrical department the company has a rig for testing circuit breakers by which it is possible to



REMOVING A PINION WITH HYDRAULIC PULLER

duplicate the conditions, so far as position is concerned, of those in which the circuit breaker is placed on the car. It consists of a frame which can be set at any angle by means of a pawl and ratchet. After the circuit breaker to be tested is bolted to the frame, the latter may be set vertically or horizontally, at 45 deg. or at any other angle in which the circuit breaker is attached to the car. In this way the calibration of the breaker can be made more accurate than if the test was conducted only in the one position.

During 1921 the company got a mileage from its brake shoes of 15,500 and from its trolley wheels of 7,000. The mileage per failure last year was 5,800, or 1.11 per cent of the cars operated.

Window Wiper Speeds Up Operation

SO MUCH trouble has been experienced by motormen when the glass window pane in front of them becomes obscured in bad weather that some sort of mechanical window wiper is a necessity. The type shown in the

MECHANICAL WINDOW WIPER IN MILWAUKEE

accompanying illustration was developed in the Cold Springs shops of the Milwaukee Electric Railway & Light Company. This device permits the motorman to clean the outside glass surface without having to move from his customary place. He operates the device b turning slightly the handle that is located on the insi window framing. The wiper, which is formed of rubber strip in a metal holder, moves radially in a ve tical plane across the glass surface. This holder attached to the outer end of an arm of roundbar ste which passes through the window framing. The devi is inexpensive, simple in construction and has bee installed on more than 1,000 cars of the Milwauk system.

What's New from the Manufacturers

Cost of Thermit Welds Reduced

AS A result of an investigation by the researc department of the Metal & Thermit Corporatio New York, to reduce the cost of Thermit welding, it ha been found that economies amounting to 10 per cent more can be made in regard to the amount of Therm required to make a weld. These result from reducin

THERMIT REQUIRED FOR WELDING VARIOUS SECTIONS

Width of Section, In.	Depth of Section, In.	Width of Gap, In.	Width of Thermit Steel Collar, In.	Thickness of Thermit Steel Collar Center, In.	Heat, Gate, In.	*Pour Gate, In.	Riser Dia., In.	Recommended Amount, Lb.
3	2	¼	2½	¼	1	1	1½	10
3	2½	¼	2½	¼	1	1	1½	12
3	3	¼	3	¼	1	1	1½	16
3	3½	¼	3½	¼	1	1	1½	20
3	4	¼	3½	¼	1	1	1½	25
4	4	¼	4	¼	1¼	1¼	2	40
4	4½	¼	4	¼	1¼	1¼	2	45
4	5	¼	4	¼	1¼	1¼	2	50
4	5½	½	4½	½	1¼	1¼	2	60
4	6	½	4½	½	1¼	1¼	2	65
4½	4½	½	4½	½	1¼	1¼	2½	60
4½	5	½	4½	½	1¼	1¼	2½	65
4½	5½	⅛	5	⅛	1¼	1¼	2½	70
4½	6	⅛	5	⅛	1¼	1¼	2½	75
5	5	⅛	5	⅛	1¼	1¼	2½	75
5	5½	⅛	5	⅛	1¼	1¼	2½	80
5	6	⅛	5½	⅛	1¼	1¼	2½	85
5	7	⅛	5½	⅛	1¼	1¼	2½	90
5½	5½	⅛	5½	⅛	1¼	1¼	2½	85
5½	6	⅛	5½	⅛	1¼	1¼	2½	90
5½	7	⅛	6	⅛	1¼	1¼	2½	105
6	6	⅛	6	⅛	1¼	1¼	3	100
6	6½	⅛	6	⅛	1¼	1¼	3	115
6	7	⅛	6½	⅛	1¼	1¼	3	125
6½	6½	⅛	6½	⅛	1¼	1¼	3½	130
6½	7	⅛	6½	⅛	1¼	1¼	3½	140
6½	8	⅛	7	⅛	1¼	1¼	3½	150
7	7	⅛	7	⅛	1¼	1¼	3½	150

*Diameters shown above for pouring gates are mean diameters. In practi these pouring gates should be tapered, bottom diameter being approximatel ¼ in. less and top diameter approximately ¼ in. greater than dimensions given.

the size of the collars or reinforcements of Therm steel, also from narrowing the gap and changing th proportions of gates and risers. For instance, a weld o a 2-in. x 3-in. section, for which 40 lb. of railroa Thermit used to be recommended, now can be made wit only 10 lb. of Thermit. On a 3-in. x 4-in. section, wher 55 lb. was formerly recommended, 25 lb. only is neede providing the size of collar, width of gap and size c the various gates are proportioned in accordance wit the dimensions now found best.

The accompanying table gives the width of gap, widt and thickness of collar, size of gates and quantity o Thermit which are now recommended in welding a sections from 3 in. x 2 in. in size up to 7 in. x 7 in.

New Syphon Sprayer Gun

HE accompanying illustration shows a form of syphon sprayer for cleaning and applying liquids various kinds by means of compressed air. This is ing introduced under the trade name of "Perfection ngine and Machine Washer," by M. W. Bailey, New ork, N. Y. The complete equipment includes 6 ft. of oil-proof flexible metal hose, an air hose pple, steel nozzle, d 12-in. extension zzle. The gun is sed for applying od preservatives, secticides, creosote, n paint, whitewash, etc., or wherever a syphon rayer can be used to advantage. Several electric ilways are using the gun for cleaning gear cases d truck parts.

SYPHON SPRAYER GUN

The gun is operated by pressing the valve button and direct spray follows. The air pressure has a tendency break the oil or solvent into a fine spray which is ective for cleaning.

Lead Alloy Bearing Metal Developed

HE United Lead Company has brought out an electrolytically produced calcium-barium-lead alloy that is claimed possesses all the requisites of a good aring metal. Frary metal, as it is called, is said to e good anti-frictional properties, since it retains gely the characteristics of lead in respect to plas- ty. It is claimed that the property of this alloy of intaining its hardness and strength at high tempera- e makes it a successful bearing metal. Its high lting point also partly accounts for this. The manu- turers say that it has the greatest hardness com- ible with the necessary plasticity, but this hardness much less than that of an axle or shaft so that in e of a dry bearing the axle is not scored, but the aring metal itself suffers. Under working conditions metal gradually develops fibrous structure and will e a very high polish under the revolving action of shaft and lubricant.

he pouring and molding practice with Frary metal ot different from that of any other bearing material. principal physical characteristics are as follows: sile strength, 13,000 lb. per square inch; hardness, to 30 Brinell; specific gravity, 11; melting point, deg. F.; pouring temperature, 800 deg. F.; resistiv- 188 ohms per circ.mil-ft. The tensile strength of inary babbitt metal is about 10,600 lb. per square n.

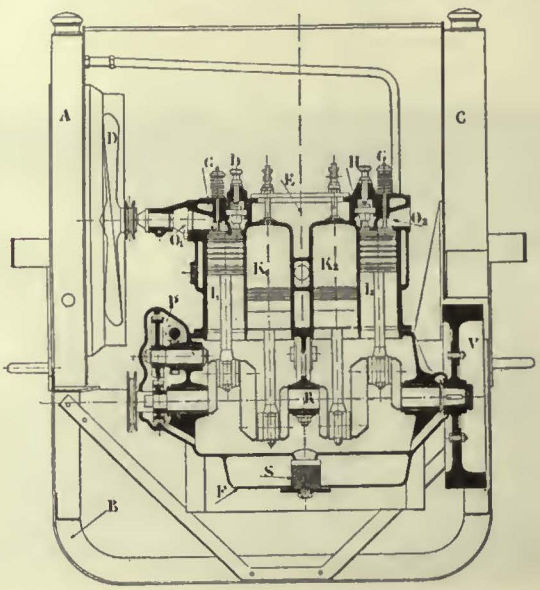
number of electric railways are already using this bearing metal on some of their cars. The accompanying table gives some results of bearings that were removed from service for inspection. All of these presented a smooth, shiny surface and none had worn down to the point requiring recasting. The remaining bearings of the various sets are still in use.

Light, Self-Contained Gasoline-Motor Air Compressor

For War Work in Drilling with Air, Etc., an Italian Automobile Manufacturer Developed a Novel Type of Compressor Which Has Now Been Made Available for General Use

DURING the war the Diatto Automobile Company of Italy was called upon to produce a light, portable air compressor with automobile gasoline-engine drive. The experience thus gained has been utilized in a peace-time machine of this type which is now being manufactured in more than one country of Europe.

The machine consists essentially of four cylinders in one block, two being engine cylinders and two compressor cylinders. Their pistons are connected to the same crankshaft, which carries a flywheel and a starting crank, and the engine valves are controlled by means of a camshaft. The engine as a whole is cooled by means of an automobile radiator and fan, and a pump is provided to circulate water around the compressor cylinders.



CROSS-SECTION OF DIATTO GASOLINE-MOTOR COMPRESSOR

A—Radiator. B—Angle-iron frame. C—Gasoline tank. D—Fan. E—Compressed-air chamber. F—Oil case. G, G—Cam-operated air inlet valves. H, H—Automatic air outlet valves. I_1, I_2—Compressor cylinders. K_1, K_2—Motor cylinders. O_1, O_2—Air inlets to compressors. P—Water circulating pump. R—Crankshaft. S—Oil strainer. V—Flywheel.

In the wartime and present designs portability has been a prime consideration, both as regards lightness and convenience of taking apart and assembling. The compact construction and the high engine speed (nor-

	Number of Bearings	Total Weight of Car	Maximum Speed M.P.H.	Mileage	Time in Use, Months	Loss in Weight, Ounces	Type of Bearings
napolis & Cincinnati Traction Company	8	102,000	80	77,635	11	7	solid
lo & Lake Erie Traction Company	8	63,200	35	37,296	8	..	solid
York, Westchester & Boston	8	120,000	42	68,017	13	..	lined
hectady Railway	8	69,620	50	19,922	5	16	solid
ern Ohio Railway	8	66,000	..	40,000	5½	..	solid
nnati Traction Company	4*	34,400	..	9,126	2½	10	solid
York, New Haven & Hartford Railroad	8	234,640	40	102,947	26	..	lined

oes not include two pony trucks.

mally 1,500 r.p.m.) make lightness possible, and the general mechanical design favors the other advantages mentioned.

In the standard size described in the Jan. 28 issue of the *Génie Civil*, Paris, the motor-compressor unit weighs 794 lb., and is 4 ft. 1 in. long and high. When taken apart it consists of the motor compressor proper, weighing 254 lb., and three other pieces weighing from 175 lb. to 200 lb. each. It produces a pressure of 120 lb. per square inch, and can deliver over 50 cu.ft. of air per minute against this head. The unit can be mounted either on skids (a construction covered by the weights mentioned above) or on a wheel truck.

New Crane Truck for Shop Use

THE Elwell-Parker Electric Company, Cleveland, Ohio, has recently developed a new electric truck equipped with a revolving counterbalanced crane of unusual length. It is particularly adaptable for handling supplies in storerooms and in storage yards, as well as for serving various machine tools in railway machine shops.

The heavy vertical steel column has a long bearing in a pedestal which is bolted to the steel platform on the truck and supports a 12-ft. boom which may be racked

CRANE TRUCK SERVING SHOP MACHINE

in or out by the operator without leaving the driving position. The hoist is operated by a separate motor direct connected to an inclosed hoist mechanism. The controller is located on the dash in front of the crane operator. The hoist is mounted on a steel frame which houses the batteries, hoist and motors, all acting as a counterbalance. A special trip switch mounted on the front battery box stops the inward motion of the boom as set.

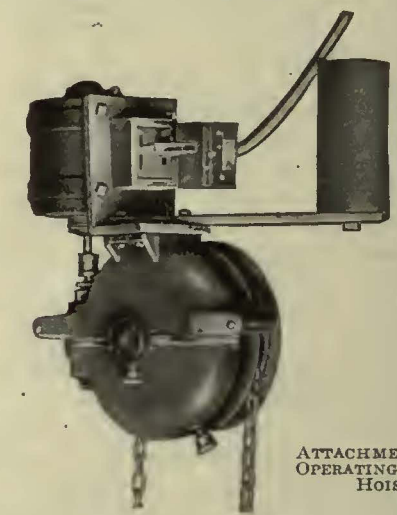
The crane is designed to pick up 1,000 lb. at an 8-ft. outreach, or with outriggers in position it will handle 3,000 lb. at 6-ft. outreach. The truck is equipped with 21½-in. x 3½-in. drive wheels and 15-in. x 3½-in. trailing wheels, all four of which steer. A coupler is furnished on the rear to permit using the unit for intermittent tractor service if occasion demands. Motors, differential worms, wheels and crane-pillar columns are all fitted with ball bearings. A single battery furnishes power to propel the truck as well as to operate the crane. The truck has a carrying capacity of 3,000 lb. One of the smaller though important details is the attachment or charging plug. Each battery is equipped with the receptacle end of this plug.

Weighting Lanterns to Keep Them in Position

THE accompan ing illustrati shows a lantern a tached to a Dr Sentry lante holder. This hold is built of iron a weighs 6 lb. A te sion spring is pr vided in the base that it will fit a size lantern. socket is also pr vided for the ins tion of the standa for a red flag if d sired. The use this holder preve lanterns from bei overturned by wi or storm and a prevents breaki Wherever railw construction or repair work requires a guarding lig such a holder will be found of value.

New Electric Chain Hoist Attachment

THE accompanying illustration shows a new el trically driven attachment designed so that it c be suspended in the bight of the operating chain of hand hoist. It has a capacity to overhaul 138 ft. of ha chain per minute and a chain pull of 130 lb. This gi



ATTACHMENT FOR OPERATING CHAIN HOIST

a load-lifting speed of approximately four times t obtainable by hand power. The machine weighs 160 It is being placed on the market by the New Jer Foundry & Machine Company, New York, N. Y.

Improved Concrete Mixing Machine

THE Foote Company, Inc., Nunda, N. Y., is bring out a new model paving mixer, 21-E. This n model is similar to the old type 21-E, except that i 6 in. longer in tread and frame construction and ha larger capacity drum. The new machine is rated at same capacity as the previous type, but will have a plus capacity.

American Association News

Recent Engineering Association Committee Gatherings

THESE days are busy ones for the Engineering Association committees. The committee on way matters met March 29 and 30, as reported in the April 8 issue, page 605. Last week's meetings are covered below:

BUILDINGS AND STRUCTURES

The committee on buildings and structures met at the offices of the Cincinnati (Ohio) Traction Company April 3. In attendance were: Frank Miller, Louisville Railway, chairman; E. H. Berry, Cincinnati Traction Company; J. R. McKay, Indiana Service Corporation, and L. C. Mayer, York Railways.

On the subject of shop layouts, blue prints and data furnished by N. E. Frexler were examined and referred to the appropriate sub-committee for digest. Similarly, other assignments were referred to sub-committee chairmen, all of whom will forward their reports to Chairman Miller by May 1. The committee was also apprised of the offer of the railways bureau of the Portland Cement Association to furnish accurate information on cement and concrete. The next meeting was appointed to be held in Pitsburgh during the first week of June.

POWER DISTRIBUTION

A two-day meeting of the committee on power distribution was held in New York City April 3 and 4. Chairman M. B. Rosevear, Public Service Railway, presided and present also were the following: J. R. C. Armstrong, Brooklyn City Railroad; C. C. Beck, Ohio Brass Company; H. S. Burd, National Conduit & Cable Company; C. A. Bicher, Westinghouse Electric & Manufacturing Company; R. W. Eaton, public service engineer, Providence, R. I.; L. F. Griffith, Little Rock (Ark.) Railway & Electric Company; H. D. Hawks, Anaconda Copper Mining Company; Adrian Hughes, Jr., United Railways & Electric Company, Baltimore; F. McVittie, New York State Railways, Rochester; H. S. Murphy, Philadelphia Rapid Transit Company; G. Hall Roosevelt, General Electric Company; F. J. White, the Okonite Company.

Mr. Rosevear reported regarding the conference on overhead crossings held under the auspices of the American Engineering Standards Committee. (See ELECTRIC RAILWAY JOURNAL, March 11, 1922, pages 393 and 414.) He said that the steering committee appointed at the conference, on which the American Association has but two representatives, is considering the inclusion of Part 4 of the National Electric Safety Code. An effort will be made to increase the representation of the association.

The chairman also called attention to the importance of co-operation with other associations regarding inductive interference and the committee referred his suggestion to the executive committee.

In the same general field the following motion was passed:

> We recommend to the executive committee that by means of letters to company members, publicity in *Aera*, or any other available methods, member companies be requested to co-operate in keeping the association advised of pending or contemplated action by public authorities in establishing laws or regulations in engineering matters affecting construction or operation; also that association headquarters should be similarly advised regarding pending or contemplated establishment of recommended practices or standards by associations or others.

In regard to the activities of sub-committees which are studying subjects already referred to the A. E. S. C. it was voted that they co-operate actively with representatives of the Engineering Association on A. E. S. C. committees.

The wear and the composition of trolley wire were extensively discussed by the committee and arrangements were made to secure experimental data. The A. S. T. M. will be approached, also, with a view to agreement on a joint specification.

The 1921 report of the American Committee on Electrolysis was next discussed, and arrangements were made to co-ordinate, through Mr. Hughes, the comments of the way, power generation and power distribution committees.

Finally Mr. Roosevelt reported on the plan for a thesis on the automatic substation, to include average data secured by canvass as applied to a special case of urban transportation.

EQUIPMENT COMMITTEE

A two-day session of the equipment committee of the Engineering Association was held in New York April 5 and 6. Those present were R. H. Dalgleish, Capital Traction Company, Washington, D. C., chairman; Daniel Durie, sponsor, West Penn Railways, Pittsburgh, Pa.; W. S. Adams, the J. G. Brill Company; H. A. Benedict, Public Service Railway of New Jersey; L. J. Davis, Brooklyn City Railroad; J. L. Gould, Wilmington & Philadelphia Traction Company; Stuart Hazelwood, Midvale Steel & Ordnance Company; J. M. Hipple, Westinghouse Electric & Manufacturing Company; A. J. Miller, Association of Manufacturers of Chilled Car Wheels; M. O'Brien, United Railways of St. Louis; E. D. Priest, General Electric Company; P. V. C. See, Northern Ohio Traction & Light Company; C. W. Squier, ELECTRIC RAILWAY JOURNAL; R. W. Steigerwalt (representing C. F. W. Rys), Carnegie Steel Company; A. Scheer, Jr., Public Service Railway, and N. B. Trist, Carnegie Steel Company. The last-named two were present by invitation.

The first day was taken up with meetings of sub-committees, in formulating reports for consideration by the committee as a whole on Thursday.

The subject of wheel contours was first discussed by the full committee. R. C. Cram and V. Angerer, representing the committee on way matters, took part in this discussion. The equipment committee concluded that standard contours for chilled iron wheels should be prepared for presentation in the annual report and that certain additions and modifications should be made to the flange contours for steel wheels. As to the recommendation of the way committee for a curved contour of wheels, the equipment committee felt that it would be impracticable to turn wheels to the contour recommended and, further, that wheels as actually turned to contours now recommended differ very slightly from the new contour proposed.

The sub-committee on helical gears presented a compilation of answers received to a questionnaire on this subject. The information received by the questionnaire method was considered to be of insufficient value to warrant its continuance. To arrange for more definite and accurate information, it was suggested that the representatives of the General Electric and Westinghouse Companies submit a list of questions which will aid in bringing about a clear understanding of conditions, for consideration at the next meeting.

The subject of trolley contact devices was discussed and some replies to a questionnaire which had been sent out were examined. The replies received so far are insufficient for definite conclusions. The chairman of this committee will tabulate answers as they are received and submit recommendations with his report at the next meeting.

A very complete report was given by the chairman of the sub-committee on possible revisions of existing standards and specifications. The recommendations included allowance for press fit for solid gears, a flange of the gear seat on axles, additional wheel contours and fillets for standard axles and journal bearings. The recommendations decided on will be incorporated in the final report to be submitted at the next meeting, which will be held the latter part of May.

PURCHASES AND STORES

A meeting of the committee on purchases and stores of the Engineering Association, held in New York City, on April 7, was attended by W. H. Staub, United Railways & Electric Company, Baltimore, Md., chairman; William C. Bell, Virginia Railway & Power Company; J. F. Fleming. Capital Traction Company; C. A. Harris, Pittsburgh Railways, and W. S. Stackpole, Public Service Railway of New Jersey. The subject of proper methods of taking periodical inventories with a view to adopting standard forms was discussed in considerable detail. The

committee concluded that the inventory problem is closely associated with the work of the accounting department and that general procedure is difficult to formulate. To provide information as to various details in taking inventories, it was decided that each member of the committee should prepare a statement, accompanied by various forms used, showing in detail the methods used by his company. In addition each member will undertake to obtain similar statements from several companies in his immediate vicinity. In this way a large amount of information will be obtained for study and decision.

News of Other Associations

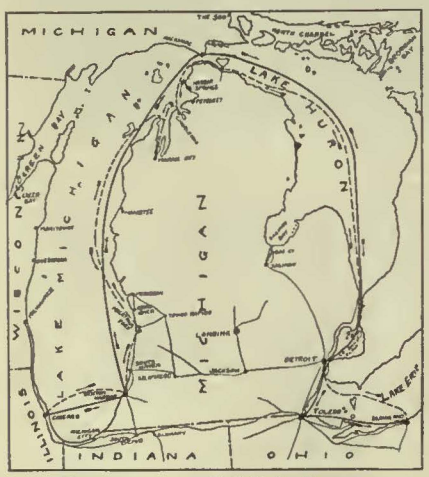
Schedule of the C.E.R.A. Cruise

SUPPLEMENTING the announcement of the six-day summer cruise of the Central Electric Railway Association, given in the issue of this paper for March 4, page 375, is the following detailed schedule, which has just been announced:

SCHEDULE FOR C.E.R.A. CRUISE—STANDARD CENTRAL TIME

	East Bound	
Lve. Chicago	Sunday	10:00 a.m. June 25
Arr. Benton Harbor	Sunday	2:00 p.m. June 25
Lve. Benton Harbor	Sunday	3:00 p.m. June 25
Arr. Mackinac	Monday	11:00 a.m. June 26
Lve. Mackinac	Monday	1:00 p.m. June 26
Arr. Detroit	Tuesday	8:00 a.m. June 27
Lve. Detroit	Tuesday	8:15 a.m. June 27
Arr. Toledo	Tuesday	1:15 p.m. June 27
Lve. Toledo	Tuesday	1:30 p.m. June 27
Arr. Cleveland	Tuesday	8:15 p.m. June 27
	West Bound	
Lve. Cleveland	Tuesday	8:30 p.m. June 27
Pass Detroit	Wednesday	6:00 a.m. June 28
Pass Port Huron	Wednesday	12:00 noon June 28
Arr. Charlevoix	Thursday	7:00 a.m. June 29
Lve. Charlevoix	Thursday	9:00 a.m. June 29
Arr. Traverse City	Thursday	12:00 am. June 29
Lve. Traverse City	Thursday	2:00 p.m. June 30
Arr. Macatawa	Friday	6:00 a.m. June 30
Lve. Macatawa	Friday	6:30 a.m. June 30
Arr. Benton Harbor	Friday	10:00 a.m. June 30
Lve. Benton Harbor	Friday	11:30 a.m. June 30
Arr. Chicago	Friday	3:30 p.m. June 30

For the accommodation of members of the party who desire to board the



ROUTE OF THE C.E.R.A. CRUISE

steamer at Chicago on Saturday evening, June 24, arrangements have been made for them to do so after 6 o'clock and have breakfast on the boat Sunday morning at a nominal price. The cost of the complete trip will be $65, and parts of the trip may be taken at appropriate rates. Members of the association may invite friends to accompany them on the trip, but these must be specially invited and tickets for them secured through the member extending the invitation.

The committee on arrangements for the cruise comprises S. D. Hutchins, chairman; John Benham, secretary; James H. Drew, Carlos Dorticos and Harry L. Brown.

Iowa Association to Meet June 23

THE annual meeting of the Iowa Electric Railway Association will be held at the Inn Hotel, Lake Okoboji, on Friday, June 23. The morning will be taken up with technical discussions and the afternoon with entertainment.

The meeting will be held immediately after the annual meeting of the Iowa Section, National Electric Light Association, and at the same place.

A. S. M. E. Addresses Are Broadcast

ON APRIL 4 messages to engineers of America, by President Dexter S. Kimball and Secretary Calvin W. Rice, of the American Society of Mechanical Engineers, were broadcast from the General Electric Station, Schenectady. The messages were heard at points as widely distant as San Francisco, Havana and the City of Mexico.

Conference on Association Waste

AT THE last meeting of the executive committee of the Society for Electrical Development a committee was appointed, consisting of C. L. Edgar of the Edison Electric Illuminating Company of Boston and E. W. Rockafellow of the Western Electric Company, to be known as its conservation committee. The purpose of this committee is to act with similar committees from other national associations in the electrical industry and avoid duplication of effort in their activities. An invitation has been extended by the society to these other organizations to appoint a similar representation to serve on a joint committee to discuss and define the most constructive and logical fields of effort for each association and effect an agreement which will eliminate overlapping and waste of resources.

It is hoped by the society that the other associations will appreciate the importance to the industry of the fulfillment of this plan and will respond to its invitation promptly and enthusiastically. It believes there is a steadily increasing tendency to criticise existing conditions, and any conservation of effort in association work will be reflected in an appreciable direct saving to the industry as a whole and increased efficiency and productivity of all co-operative effort.

Standardization of Paving Brick

THE National Paving Brick Manufacturers' Association has sent out a report of progress in the elimination of unnecessary types and sizes of paving brick. The movement is a result of the effort of Secretary Herbert Hoover to eliminate waste in industry.

On March 27 there was held in Washington the first meeting of a permanent committee, representing producers and buyers, which was appointed at a preliminary meeting held Nov. 11, 1921.

The permanent committee organized by electing E. J. Mehren, editor of *Engineering News-Record*, as chairman and H. R. Colwell of the Department of Commerce as secretary. Organizations were represented as follows: A. Hull, Bureau of Standards; Will Blair, American Society for Testing Materials; Col. R. Keith Compton, Federated American Engineering Societies; M. B. Greenough, National Paving Brick Manufacturers' Association; C. Herrick, American Association State Highway Officials; E. W. McCullough, Chamber of Commerce of the United States; V. M. Pierce, United States Bureau of Public Roads, and A. Durgin, chief division of simplified practice, Department of Commerce. The American Society for Municipal Improvements was represented by Colonel Compton in the absence of G. Fiske, the society's regular delegate.

The committee was informed that the following organizations already had formally approved the first elimination, reducing the number of brick sizes and types from sixty-six to eleven: National Paving Brick Manufacturers' Association, American Association State Highway Officials, American Institute of Architects, American Ceramic Society, Engineers' Club of Columbus, American Society of Civil Engineers, and the Departments of Agriculture, Commerce, the Interior, the Navy and War.

After considering new data as to total shipments of vitrified brick in 1921 the committee voted unanimously to eliminate the following sizes: Vertical fiber lug, 3 x 4 x 8½ in.; vertical fiber lug, 3½ x 4 x 8½ in.; wire-cut Hillside, 3½ x 4 x 8½ in.; repressed 3½ x 3½ x 8½.

The following remain as the sizes recognized types and sizes: Plain wire-cut, 3 x 4 x 8½ in.; plain wire-cut, 3½ x 4 x 8½ in.; repressed lug, 3½ x 4 x 8½ in.; wire-cut lug, 3½ x 4 x 8½ in.; wire-cut lug, 3½ x 3½ x 8½ in.; wire-cut 3½ x 3 x 8½ in.; repressed Hillside 3½ x 4 x 8½ in.

The committee decided that with the eliminations it had proceeded as far as was desirable until there are further reactions from producers and consumers. It was therefore concluded that further eliminations would be considered until March 23, 1923, when data on 1922 shipments will be available.

News of the Electric Railways

FINANCIAL AND CORPORATE :: TRAFFIC AND TRANSPORTATION
PERSONAL MENTION

Compromise in New Orleans

Valuation of $44,700,000 and Rate of Return at Seven and One-half per Cent Sustained

The Commission Council of the City of New Orleans, La., and the representatives of the security holders of the New Orleans Railway & Light Company compromised their differences on April , and the Commission Council by a vote of 4 to 1 (Mayor McShane dissenting) approved the settlement reached by the conferees. Under the rules of procedure in the City Council, the compromise ordinance will have to lie over for another week before it is finally formally ratified. Every provision in the agreement reached last fall, when the conference was interrupted by court order, was sustained by the Commission Council, except that provision placing a rate return upon new money to be added for improvements and extensions of the service.

The valuation is placed at $44,700,000 and the rate of return on both old and new money is fixed at 7½ per cent. Fare for school children over which the conferees had some dispute was left unchanged unless conditions in the future will warrant a lower rate of fare.

S. Hecht, president of the Hibernia National Trust & Savings Bank, chairman of the 4½ per cent bondholders, through whose efforts the compromise was very largely brought about, with the aid of G. M. Dahl, vice-president of the Chase National Bank of New York City and C. C. Chappelle, was greatly elated over the agreement reached, declaring that the settlement was fair both to the city and to the security holders.

Advantage of Agreement Cited

Commissioner Paul Maloney, of the Department of Public Utilities, summarizing some of the advantages which will accrue to New Orleans as the result of the compromise, said that under the agreement the president of the New Orleans Railway & Light Company must live in New Orleans, and two-thirds of the board of directors must be Orleanians; securities cannot be issued without the approval of the Commission Council; the transfer system is to continue; the Council is to have access to the books and supervise the operations of the company; real estate owned by the company and not needed is to be sold and the proceeds put into equipment; the city to have a perpetual option to purchase the properties; one-half of a reserve fund of $300,000, set aside yearly, to be reinvested in the property and the other half in liquidating the bonds; all dividends in common stock at the time of reorganization to be reinvested in the property; no stock dividends to be declared and the rate of cash dividends to be limited. The return to be limited.

A great deal of time will have to be expended before reorganization may be effected, according to H. Generes Dufour, counsel for the New Orleans Railway & Light Company. The first thing to be done will be to bring foreclosure proceedings by the holders of the 4½ per cent bonds for default on interest. This action will have to be taken by the New York Trust Company, trustee for the bondholders. After the filing of the bill of foreclosure, Special Master in Chancery D. B. H. Chaffe will have to call a hearing to take testimony on which he will base his formal report. Twenty days must then intervene before a decree of foreclosure is entered. The court will then order the property to be advertised and sold, when the bondholders will step in. With the filing of the master's deed, which will be the title to the property, transfer will be made to the purchaser's nominee, which will be the new company.

The receiver will then step out. The new company will then elect its officers, issue its securities and reduce the rates of fare and gas. The bill of foreclosure will probably be filed by the end of the present month.

Wage Dispute Hearings Begin

Presentation of arguments by both parties to the wage dispute between the Indiana, Columbus & Eastern Traction Company and its trainmen was expected to consume three days in the hearings which began before the board of arbitration at the company's offices in Springfield, Ohio, April 13. At the conclusion of the arguments, the board of arbitration will endeavor to arrive at a decision, by which both sides have agreed to abide.

Employees of the company are being represented by James Largay, an official of their union, while the company is being represented by Receiver J. H. McClure and Attorney Paul C. Martin. Pending the adjustment of the controversy, the company is paying 45 cents an hour to the trainmen, a reduction of 4 cents from the former scale, and the rate which the company seeks to continue. Up to last August the trainmen were receiving 60 cents an hour.

The three members of the arbitration board are S. D. Hutchins of Columbus, representing the traction company; George Rightmier, professor of law at Ohio State University, Columbus, umpire, and C. W. Rich of Springfield, representing the men.

Plans Wage Cut

Wage Reductions of Detroit United Railway May Approximate Ten per Cent If Men Reject Arbitration

An effort is being made by the Detroit United Railway to reduce the wages of its motormen and conductors, and although difficulties are anticipated where the company and city are operating cars on the joint agreement, city officials believe the difficulties will be settled as they are confident that the electors will vote to take over the Detroit United Railway when the matter comes up next Monday, April 17. No reduction in wages of municipal street car employees is planned by the city. A conference has been arranged and the question will probably be settled by arbitration. The wage agreement entered into last May between the Detroit United Railway and its employees provides for arbitration of wage disputes and both the company and the employees have signified their willingness to arbitrate at the present time.

Cut Not Expected

Although the present agreement holds only to May 1, 1922, the employees did not expect a further reduction of wages at this time as a cut was accepted last year. According to W. D. Mahon, president of the Amalgamated Association of Street and Electric Railway Employees of America, either party has the privilege of demanding a readjustment of wages once a year by serving notice of its desire on April 1, and holding hearings by May 1.

It is understood that two questions will be considered, the wage scale and the question of overtime work. Although information was not given out as to the extent of the reduction that the company would ask, it was intimated that if the men rejected the arbitration a scale of 43, 46 and 49 cents an hour would be enforced. The present scale is 55, 58 and 60 cents an hour. These rates are paid to men after service of six months, nine months and one year respectfully. It is believed that the company will insist on a cut of about 10 per cent.

With the carrying out of the purchase plan, the city will hold complete control of the transportation situation in Detroit after May 15. Any differences can then be settled and wages for all municipal owned employees fixed. The Detroit United Railway will have its interurban employees to deal with.

According to Ross Schram, assistant general manager of the Detroit Municipal Railway, municipal employees are now averaging about $32 weekly. Mr. Mahon stated that about 1,000 interurban employees of the De-

troit United Railway do not receive that much and the company's reduced operation has reduced the amount of work for the men.

It has been announced that the property of the Detroit Municipal System has been put on the assessors' books as valued at $10,000,000 as compared with the valuation of $1,000,000 one year ago. The Detroit United Railway property is assessed at $21,000,000 and if the system is taken over by the voters, this valuation will be revised by the board of review.

Wage Agreement Reached

Old Rates of Pay Likely to Continue for Year in Rochester, Syracuse and Utica

Representatives of the employees of Rochester, Syracuse and Utica and representatives of the New York State Railways, operating the properties in each of these cities, reached an agreement on April 12 for the year that will begin May 1. The agreement is subject to ratification by the members of each of the three divisions, and James F. Hamilton, president of the New York State Railways, must be notified of the action of the men by April 20.

WAGE SCALE UNCHANGED

The agreement reached on April 12 leaves the wage scale the same as fixed in the existing contract. It provides for a separate contract for each of the three cities, and there are slight modifications in the working conditions for each city.

The contracts will be somewhat simplified, but will mean virtually the same to the men as does the one existing contract that affects all three cities.

The present wage scale varies from 49 cents to 53 cents an hour, according to length of service. The agreement reached on April 12 provides for a seven-day week of from nine to nine and one-half hours a day, according to the schedule of the various lines. It was pointed out that there is a large "extra" list at each carhouse and that an employee can take any day off he desires. Some of the men work only five or six days a week, while others work seven days.

In Schenectady the trolley employees held a meeting recently to discuss the action of the Schenectady Railway in notifying the union that the company did not intend to enter into a new agreement with the association May first. The company maintains the position that it had decided upon such program because of the financial losses suffered by the company due to situations brought about by the association because of unwise leadership. This criticism is directed against the union officials Walter Walter, president and Michael Ward, business agent.

MEN INDORSE THEIR LEADERS

It would appear that in Schenectady the attitude of the traction company will be to make a personal issue of the leaders of the union, the same as was the policy of the United Traction Company last year in Albany. In spite of the criticism by the company the union passed a vote of confidence in its leaders. Mr. Ward stated he expected to hear from James F. Hamilton of Rochester at an early date in relation to a date for a conference between the men and the company officials.

Hearings Concluded

The New York Transit Commission on April 12 completed its hearings on the service given by the Interborough Rapid Transit Company, New York, N. Y., which were begun several weeks ago when the overcrowding in the rush hours in the subway became a cause of general alarm. New orders will be prepared by experts of the commission which Interborough officials claim will be accepted unless they are considered too drastic.

Franchise End Provided in Ordinance

An ordinance terminating the franchise of the Kentucky Traction & Terminal Company, Lexington, Ky., in Winchester is now before the Board of Commissioners. The terms of the contract under which the franchise is to be terminated provide that the railway company is to pay to the city of Winchester the sum of $4,000.

The company is to remove certain of its tracks and to bear the expense of paving these streets for the space between rails of the track and a distance of 18 in. on either side of the track. The track on Main Street is assigned to the city of Winchester.

The franchise was granted to the traction company on Aug. 21, 1906, and would have terminated on Aug. 26, 1926.

Officials of the company already had announced their intention to cease operating the local railway system with the termination of the franchise. By terminating the contract now, the company will not have to lay tracks on streets which the city is paving only to tear them up at the end of four years.

Gary Motormen Given Vacation Bonus

Five days vacation with pay has been awarded to each of forty-six trainmen of the Gary (Ind.) Street Railway for having carried passengers during the entire year 1921 without a single accident. This plan of rewarding trainmen for careful operation was put into effect in 1919, but in that first year only three trainmen came up to the "no-accident" standard. In 1920 there were eighteen who received vacations with pay and the number increased again to forty-six last year. The vacations of the men on the roll of honor are allotted from May 1 to Oct. 31 and arrangements are made to grant absences on the dates desired, seniority prevailing in making selections.

As to whether the vacation bonus experiment has really brought results in reducing the number of accidents, the following figures are enlightening. During 1919 one personal injury occurred for every 47,857 passengers carried in 1920, one injury for every 62,613 passengers, and in 1921, one injury for every 94,053 passengers. In 1919 there was one vehicular accident for every 7,752 car-miles operated; in 1920, one vehicular accident for every 9,653 car-miles, and in 1921, one for every 12,133 car-miles.

On the showing made, Charles W. Chase, president, comments: "While we do not claim that the gratifying decrease in accidents is entirely due to the 'no-accident' bonus plan, yet we do believe that its operation has produced a material decrease in accidents and a great saving to the company as well as urging on the part of the men a greater instinctive regard for safe operation."

Traction Company Seeks to Recover Amount of Judgment

The Pennsylvania Railroad has been made defendant in a suit in which the Wheeling (W. Va.) Traction Company sues for sums of money aggregating $56,000, with interest of various portions of this sum from dates specified in the petition. The suit is an aftermath of the fatal collision at Mertz crossing, between Bridgeport and Bellaire, on the evening of Feb. 8, 1916, in which a Pennsylvania locomotive demolished a Bellaire division car of the Wheeling Traction Company, resulting fatally to W. C. Stewart, prominent enamel ware manufacturer, and Motorman James H. King, and the severe injury of several passengers on the street car. The traction company is trying to recover from the railroad the amount of judgments rendered against it because of these fatalities and injuries.

Courtesy Importance Emphasized

Officials of the Indianapolis (Ind.) Street Railway have caused to be posted in prominent places in the cars of the company the following notice:

> It is the desire of the employees and officials of the Indianapolis Street Railway Company that the patrons of this company be treated with courtesy at all times. Passengers will confer a favor by reporting to the superintendent, Room 814, Traction Terminal building, any case of discourteous treatment.

An official of the company said the notice was supplementary to the book of instructions issued to employees and also in addition to lectures on courtesy delivered at the different car stations. It was said the company demands courtesy on the part of the employees and the notices are being posted as announcement to the public that such courtesy is required. Officials express confidence the public will accord the courtesy to the company's employees.

Rejects Lease Plan

Mitten Disapproves New "L" Draft—Claims Rental Was the Only Issue Not Formerly Agreed On

President Thomas E. Mitten of the Philadelphia (Pa.) Rapid Transit Company has rejected the new lease plan formulated by Mayor Moore and recently submitted to the Council and the company. In a letter to the Mayor he said that he was not willing to discard the agreement reached after months of discussion. He said that at the Councilmanic meeting held on Jan. 9, 1922, all matters with respect to the lease were settled except the rental. Inclosed with the letter was a copy of the former lease tentatively agreed on.

It seems to be the general belief that Mr. Mitten will stand by the proposal assuming all operating losses during the first year of operation and then a graduated scale of return to the city amounting to 5 per cent in the sixth year of operation and thereafter. It is reported that Mr. Mitten's letter was entirely unsatisfactory to the Mayor.

The latest proposal by Mayor Moore on the operation of the Frankford Elevated line by the Philadelphia (Pa.) Rapid Transit Company was forwarded to the City Council on April 6, thus renewing the interrupted negotiations for an agreement on the management of this line. As was commented on editorially in the *Public Ledger* there is encouragement in this communication in that the Mayor does not stress the independent operation of the line but rather the importance of an "agreement with the Philadelphia Rapid Transit Company and the unification of the service under one management."

The outstanding feature of the new draft is the change in the rental clause. The original proposal contained a clause for a 5 per cent rental from the beginning of operation. The Mayor now recommends a sliding scale of rental commencing at 2 per cent on Jan. 1 next and increasing by increments of 1 per cent per annum until the maximum of 6 per cent is reached in 1927. A 1 per cent payment plan had been suggested by T. E. Mitten, president of the Philadelphia property. The proposed agreement is to be permanent or until 1957, when the 1907 agreement also will expire.

Change in Rental Suggested

An important feature of the Mayor's letter is the fact that the city should share in the company's profits above the 6 per cent mark, remarking that the same treatment that is promised to stockholders should also be extended to the city. The new arrangement includes the establishment of a depreciation fund to take care of replacements necessitated by the wear on the city-owned cars to be used on the northeast line. The Mayor likens his draft to the one of March 31, 1921, in that no attempt is made to stipulate the rate of fare. In conclusion the letter said:

> If this matter can be closed at an early date it is proposed immediately to bring to the attention of your body the question of extension now agitating certain sections of the city where car riders are asking for increased service. These extensions include an arm of the Frankford L to provide high-speed service for the northern district of the city; also the Roosevelt Boulevard and cross-town lines, all of which are contingent upon the operation of the Frankford L.

In the proposal submitted by the Mayor to the Philadelphia Rapid Transit Company Oct. 1 has been set as the date when the Philadelphia Rapid Transit Company will begin operation of the Frankford line. The line will be given rent free until Jan. 1, 1923, when the new provisions of the lease will go into effect.

Railway Opposes Council's Request

The International Railway, Buffalo, N. Y., through its general counsel, C. J. Joyce of Philadelphia, attorney for the Mitten Management, Inc., has refused to allow the municipal authorities of Buffalo to make an examination of its books in connection with the pending rate case before the Public Service Commission. The City Council had asked Herbert G. Tulley, president of the International, to allow Milo R. Maltbie, the city's expert, to examine certain records for data not contained in the report to the state utilities board.

During a conference with the municipal authorities over the fare question, Mr. Joyce said the railroad had nothing to hide from its stockholders or the people of Buffalo, but he opposed the principle of opening the company's records to outside interests. The city contends that the report to the Public Service Commission does not give enough detail and the Council believes it has the right to examine the books of any public utility.

Relief Offered Injured Railway Employees

A new type of public service is being rendered by the Reconstruction Hospital, New York, N. Y., a hospital dedicated to the reconstruction of men and women injured anywhere in America in the industries. As a direct result of the worldwide experiments in rehabilitation of men injured in war, America has now a hospital the sole aim of which is to care for industrial diseases and accidents and the restoration of industrial casualties to active useful life. This hospital, with the breaking ground on April 2 for its new eleven story addition at 100th Street and Central Park West, now enters upon a national career, prepared to offer a unique service to industry. The specific purpose is to provide treatment which will not only restore the health of the injured workman but will give him back his full earning capacity as well. Electric railway employees injured in the performance of their duties may secure the necessary treatment at this hospital.

"Truth," a New A. E. R. A. Publication

A copy of *Truth* was sent under date of April 12 to members of the American Electric Railway Association. *Truth* is a clip sheet full of constructive facts about the electric railway industry, which the Committee on Co-operation of Manufacturers has had prepared for members of the association. A copy of *Truth* will be mailed to members each month, from the Advertising Section of the American Electric Railway Association.

The hope of the committee is that the member companies will get over to their employees the facts contained in this sheet. Companies that have a company publication are urged to reprint the material in *Truth*. Companies that put stuffers in pay envelopes are urged to use some of the material in them. Companies that have no printed medium are urged to use the material in talks with the men, and are being asked to put some of the facts in sales letters, or use the material in any other of the many ways which suggest themselves. The first issue of *Truth* appears as a single sheet, 8½ in. wide by 14 in. high. The foreword says:

> Issued by the committee on publicity of the American Electric Railway Association, 8 West Fortieth Street, New York, for the use of persons and organizations co-operating in giving currency to facts about electric railway conditions. Material contained herein may be used as original matter—no credit being required—in house organs, company leaflets, newspaper interviews or releases, speeches, advertisements or in any other way desired. The association, however, vouches for the accuracy of all original statements contained, and it may be given as the source of information whenever preferable to do so.

Efforts Made to Place Franchise Rights with Commission

It has been announced that the California Real Estate Association plans to place in circulation a petition for the purpose of an initiative measure to amend the State Constitution to give the State Railroad Commission the power to grant franchises to public utilities operating within or without municipalities. A tentative draft of the proposed amendment was prepared at the request of Chris R. Jones, regional director of the Real Estate Association, at the State Capitol.

In this connection, W. V. Hill, manager of the California Electric Railways Association, has issued a statement claiming that the present franchise obligations of electric railways in California are burdensome to the extent of being the cause of financial distress for the carriers. Further franchises will be assumed only under much different conditions than those assumed by the railways in the past. He said that in the larger cities of the State, with the exception of Oakland, franchises were limited to from twenty to twenty-five years and little business sagacity was required to see the difficulty of financing a property with bonds whose life extended beyond the franchise period.

Reduces Wages Five Cents an Hour

The Manchester Traction, Light & Power Company, Manchester, N. H., has announced a wage reduction of 5 cents an hour affecting employees of the Manchester Street Railway, the Manchester & Derry Street Railway and the Manchester & Nashua Street Railway. The new rates, effective April 1, 1922, to April 1, 1923, in cents per hour are as follows:

Conductors and motormen	
First three months	45
Next nine months	50
Thereafter	55
The rate established for overtime is one-fifth of the regular rate, and the morning reporting time rate is reduced 60 per cent.	
Snow plow work	
Motormen	70
Sixteen trackmen	60
Outside men	company to make price.
Carhouse men	
Day foreman	$46.15 per week
Night foreman	67½
Night repair man	52
Bolt man	56
Air brake and miscellaneous men	66
Painter—foreman	70
Blacksmiths, pitmen and painters	59
Armature winders	73
Head inspector of equipment	62
Other inspectors of equipment	59
Helpers, car sweepers and cleaners	51
Trackmen	
Track foreman	$45.56 per week
Seven permanent trackmen	53¾
Nine permanent trackmen	50
Linemen	
Foreman	74½
Lineman	66
Lineman	60

The rates of wages for motormen and conductors in effect from April 1, 1920, to April 1, 1921, were 50, 55 and 60 cents per hour. From April 1, 1921, to July 15, 1921, this agreement was modified so that a reduction of 5 cents per hour was in effect during that period. After July 15, 1921, the schedule April 1, 1920, to April 1, 1921, was in force.

Service to Be Resumed in Augusta

Service will probably be resumed in Augusta by the Augusta-Aiken Railway & Electric Company on Saturday, April 15. News to this effect was contained in a telegram received from Augusta on April 14 in which the information was conveyed that the City Council on the night of April 12 had passed resolutions regulating the jitneys. As Friday was a holiday in financial circles in New York it was impossible to secure any further details from the J. G. White Management Corporation before going to press. That the situation in Augusta was fast heading toward an adjustment is indicated in the following account of some of the recent moves made there in connection with the controversy.

Mayor Julian M. Smith was requested by members of the Council of Augusta, Ga., to call a special meeting of that body for April 12 to discuss and act on the jitney and electric railway controversy.

Charles S. Banghart, vice-president and general manager of the company, had previously indicated to the Council that the executive committee of the company had declined to authorize him to put cars in operation again on the terms which had been suggested by the committee of the Council. The attitude of the executive committee was that it had been demonstrated by experiment that the company could not make actual operating expenses on the terms suggested by the committee.

Mr. Banghart indicated that if the city could see its way clear to remove the jitneys two blocks from car lines, instead of one, and prevent them from taking on and discharging passengers within two blocks of any trolley line, his company would re-start the cars, adopting the schedules mentioned in the committees' proposal and put on a 7-cent, instead of an 8-cent token fare for the general public, a 5-cent fare for school children and teachers. There would, however, have to be a 10-cent fare for the casual rider who refuses to buy 7-cent tokens. Mr. Banghart said:

> If the city should not find itself able to remove the jitneys two blocks as above set forth, but only one block as stated in the committee's proposal then the company in its excessive desire to meet the wishes of the public for restoring car service in the city will consent to this modification on condition that jitneys are not to cross Broad Street and that if after thirty days' trial the jitney competition still materially cuts into the railway's legitimate revenue, the city will then consent to remove them two blocks and in default the company is to be free to exercise its legal right again to stop the cars.

Millions for Improvements

Anticipating formal ratification at its next meeting by the Commission Council of New Orleans, La., of the agreement reached by the Council and the representatives of the security holders of the New Orleans Railway & Light Company, Commissioner Maloney on April 11, addressed himself to Receiver J. D. O'Keefe, on the subject of the immediate purchase of 100 new cars. The estimated expense of the equipment is said to be $1,000,000. The cars may now be purchased as under the agreement now reached several million dollars will be provided for improvements, which will include rehabilitation of the electric department by providing more power. The company's equipment at present consists of 550 cars, of which number only 475 cars are in operation.

Service-at-Cost Measure Signed

Governor Miller of New York has signed the Dick bill amending the public service commission law. The new measure defines service-at-cost contracts and authorizes municipal corporations with less than 1,000,000 population and street surface railroad corporations to enter into these contracts after public service commission approval.

A service-at-cost contract is defined to be an agreement between a municipal corporation and a street surface railroad corporation, providing generally for operation of a street surface railroad, wholly or partly in the limits of the municipal corporation, with a rate of fare directly or indirectly dependent on the excess of revenues after deduction of expenses and charges. All municipal corporations having less than 1,000,000 population and street railroad corporations now existing or which shall hereafter exist, may enter into such a contract. A ten days' notice to the Public Service Commission is required for its approval, which may be given to any such contract entered into after July 1, 1920.

No provision of any law, general or special, unless the contrary is specifically stated in such a law subsequently in effect, shall be deemed to interfere with the service-at-cost contract authorized by the new law.

Car Shops Burn in Oshkosh

The Eastern Wisconsin Electric Company, Oshkosh, Wis., suffered the loss by fire of the principal part of its shop and storehouse on April 9. One of the new safety cars, one interurban car and one older double-track city car, all shop records and much valuable equipment and supplies were destroyed. The disaster came on the heels of one of the worst sleet storms in the history of Wisconsin, and was quite a blow to the company.

Despite the handicap which the fire imposed on the company the local city service and all interurban lines operated 100 per cent during the blaze and service has been maintained at that standard since then by the unceasing efforts of the manager and his staff.

The damage to the equipment is estimated at $40,000. The stock room contained approximately $40,000 worth of stock. It was believed at first that this stock had been entirely destroyed and that the loss would total $100,000. Investigation made the morning after the fire indicated that this loss was not nearly so great as had appeared at first. The damage to the building is estimated at $25,000 to $30,000.

G-E to Equip Fifteen Trolley Buses

The General Electric Company has received an order for the electrical equipment for 15 new trackless trolley buses, eight of which will be operated by the City of New York on an extension to its system in Staten Island between Richmond and Tottenville. The remaining seven will be put on a new line that is to be built on City Island. The order was placed through the Trackless Transportation Corporation, New York, N. Y.

Decision of the city to increase its fleet of trolley buses is the result of the thorough commercial success attending the operation of the first buses which have been operating out of Meiers Corner, Staten Island, since Oct. 8, 1921. When these 15 buses are added to the system, New York City will have a total of 22 trolley buses in operation, all of which are equipped with General Electric motors and control and current collectors.

The automatic substation equipment will be furnished by the Westinghouse Electric & Manufacturing Company according to report.

Financial and Corporate

Toledo Property Reports

Deficit Under Service at Cost—Lower Fares Depend Upon Action to Regulate Buses

Operations of the Community Traction Company, Toledo, Ohio, for the eleven months of 1921 under the service-at-cost ordinance put into effect on Feb. 1, showed a deficit of $325,036 as reflected in the stabilizing fund. The annual report has been published by the Toledo *City Journal*, the official city publication. The passenger revenue amounted to $2,960,966. The total gross income was $3,148,889. Operating expenses totalled $2,021,870.

Commissioner Wilfred E. Cann, however, points out in his report that the car riders have been saved $327,325 by reason of the lower fares which the new plan of operation put into effect. For the first six months the fares were cut 1 cent and transfers have been cut from 2 cents to 1 cent ever since the ordinance has been in force.

From the gross revenues of the operations for 1921 there was placed in the city purchase fund $194,792, of which $49,000 was used on Feb. 1, 1922, to purchase 6 per cent bonds of the Community Traction Company. These, together with what may be purchased in July, will make the city's income from bonds alone about $12,000 a month. The city fund at the present time amounts to nearly a quarter of a million dollars. During 1921 there was spent on maintenance of tracks, equipment and trolley wire the sum of $560,-078.

At the end of the year there were cash balances in the depreciation fund of $5,789, in the reserve for injuries and damages of $11,291, and in the reserve for taxes of $109,913, or a total of $126,993.

The revenue per car-mile increased from 38.045 cents in July to 46.354 in December. The high point in cost of operation per car-mile was in February with 42.863 cents, which consistently declined to 30.498 cents in December.

During February there was carried an average of 8.81 revenue passengers per car-mile. This ratio declined till the low point was reached in August with 7.1 passengers per car-mile. The December loading was at the rate of 7.95 passengers per car-mile. With a yearly average of 8.5 passengers a car-mile, Commissioner Cann declares the lines would be on a good financial basis.

An increase of less than 600,000 passengers a month will make for successful operation. Last March had 700,000 more riders than there were in December, so the possibility of wiping out the deficit appears very good.

In the report the commissioner tells Council that it must take more drastic action to regulate the buses if the concerted effort of all to bring lower fares is to be successful.

A comprehensive grade separation program is urged as a means of working out further economies in street railway operation. The commissioner also tells the Council that there are forty locations in Toledo where the street railways cross steam railroad tracks and 112 crossing diamonds to maintain. He says further rerouting plans will be developed during the year.

The record of the claims department was notable during 1921. For the eleven months 2.573 per cent of the gross revenue was set aside in the reserve for injuries and damages. This amounted to $79,905. Actual settlements and operation of the department took only $68,614, equivalent to only 2.214 per cent of the gross revenue. Better results may be attained by more careful regulation of traffic on the streets, according to the commissioner.

Of the 2,295 accidents reported by crews operating street cars, 1,323 covered collisions with automobiles, and of the 425 cases settled 143 representing collisions between cars and autos were disposed of by payment to claimants of $9,189.

"The year 1921 ushered in a new era in local transportation in Toledo," said Mr. Cann. "Control of street railway service is now vested in the city, where it properly belongs, and your local transportation system is today, to all practical intents and purposes, solely that of the people of Toledo."

Salt Lake City Property Reports

A net revenue of $84,815 was earned by the Bamberger Electric Railroad, Salt Lake City, Utah, during 1921, according to figures presented by the company in its annual report, which has just been filed with the State Public Utilities Commission. The operating income of the road was $33,654, with a gross income amounting to $48,558. From this figure the railroad claims deductions for interest, taxes, rents, etc., of $82,213, making a deficit of $33,655 transferred to profit and loss during the year. The principal source of revenue for the railroad was the passenger service, which yielded $471,719, yet this was $79,067 lower than the 1920 passenger revenue.

The railroad claims investments to a total of $3,910,442, this being an increase over the preceding year of $102,448. Par value of the capital stock Dec. 31, 1921, aggregated $1,500,000. The average investment per mile of road was $102,676, the total investment in road and equipment being $3,690,188. The book value of investment in the Lagoon resort and the Salt Lake Terminal Company is given by the company at $147,652.

To Take New York Depositions

Minneapolis Valuation Hinges on City's Access to Books—Hearing Set for April 25

Neil M. Cronin, city attorney of Minneapolis, Minn., is in New York to take depositions of four witnesses in the mandamus action against the Twin City Rapid Transit Company and allied corporations to get access to minute books and other records. Depositions were begun on April 11 before William Bradford, notary public. The city desires to ascertain the true valuation of the company's property.

The writ was signed on Feb. 9 by Judge W. W. Bardwell of the District Court, the city seeking to compel the traction officials to produce the books to aid in the appraisal being made by Delos F. Wilcox for the city in its rate litigation. The City Council had directed the company to give Dr. Wilcox access to the books, which the company is alleged to have refused to do, with the exception of the minute books of the Minneapolis Street Railway and other associated companies. Delay of twenty days to March 2 was granted on motion of the company, its plea being it would be necessary to go to New Jersey to get the books. Secretary A. M. Robertson said the Twin City Rapid Transit Company is merely a holding company and that its books have no records of the business activities of the Minneapolis company. The writ was dismissed on March 13 on motion of the city attorney and a new action begun before Judge H. D. Dickinson, who granted a writ directed against the Twin City Rapid Transit Company and the St. Paul City Railway, omitted in the first order. The New Jersey company's answer stated that that company has not been the fiscal agent of either Twin City company since 1907 and that the Transit Supply Company is the fiscal agent and its books are open. In reply to an allegation of the city that the Twin City Rapid Transit Company had arbitrarily caused substantial amounts to be paid the St. Paul City Railway on which the railway is not required to pay interest to the Minneapolis Street Railway, from which the amounts are taken, it denies that the St. Paul and Minneapolis companies are caused to assume a joint fund obligation. The two local companies executed a joint mortgage securing $10,000,000 of bonds guaranteed by the Twin City Rapid Transit Company.

Upon filing of this answer of the company on April 2 the hearing was set for April 25. This being the date set for the valuation hearing of the St. Paul City Railway before the Railroad and Warehouse Commission, St. Paul considers advancing the date so as to have a joint hearing with Minneapolis, giving the latter city no advantage over St. Paul in its proceedings to determine the basis for a true fare decision by the state commission.

Surplus of $990,099

Virginia Property Cuts Operating Expenses—Cash Conserved for Improvements—Traffic Decreases

After deducting all charges the Virginia Railway & Power Company, Richmond, Va., realized a surplus of $990,099 for the year ended Dec. 31, 1921. Adding the surplus at the end of 1920 the total surplus as of Dec. 31, 1921, is $2,291,175. From this amount a deduction of $507,738 was made for dividends on preferred stock and an accumulated surplus remains on Dec. 31, 1921 of $1,783,437.

Gross earnings for the year amounted to $10,173,335, an increase of $179,759 over the year 1920. Operating expenses decreased from $7,080,070 to $7,067,662.

The annual report of the company shows that the property of all departments is in good physical condition. Improvement in operation is also seen from the fact that expenditures for maintenance and way and equipment amounted to $1,060,593, against $1,179,781 in 1920. In addition to the regular charges for maintenance of way and equipment an amount of $610,400, equal to 6 per cent of the gross earnings for the fiscal year, was included in the operating expenses and credited to reserve for depreciation, thus continuing the policy followed by the company during the last ten years. The balance to the credit of reserve for depreciation on Dec. 31, 1921, was $1,625,811.

The total number of passengers carried during 1921 was 105,192,532, against 113,615,675 in 1920.

In his report President Wheelwright said that on account of the necessity of making extensions and improvements in both railway and light and power departments the board of directors considered it necessary to continue the conservation of cash resources of the company so far as possible and for that reason no cash dividends were declared on the stock of the company during the year. He said further that the board of directors in its desire to deal fairly with the holders of its non-cumulative preferred stock declared a dividend of 6 per cent on preferred stock, payable in preferred stock for the year 1920, and a similar dividend for the year 1921.

Greater Volume of Business Under Negotiation

The annual report of J. G. White Companies, New York, N. Y. for the year ended Dec. 31, 1921, shows a deficit of $126,484, against a surplus in 1920 of $313,016. The total assets and liabilities as of Dec. 31, 1921, are $6,698,527.

The report states that as predicted in the previous annual report the business of the Engineering Corporation was adversely affected by the general business depression. It goes on to say further that since the first of the year a substantial amount of satisfactory business has been secured. Further improvement in this respect is anticipated as more new business is under negotiation than at any previous time for several years.

Will Vote on $300,000 Bond Issue

St. Petersburg (Fla.), will vote May 13 on a $300,000 bond issue to provide an electric plant to run its municipal electric railway and furnish power for waterworks, gas plant and street lighting.

The city attorney has been ordered to draw the ordinance and the commission will pass it and immediately call the election.

C. T. Baker, a consulting engineer, has submitted a comprehensive report covering the cost of installing and operating an electric power plant in St. Petersburg, using Diesel type engines. He suggests that the plant be located on Second Avenue south about Eighteenth Street, on the Seaboard Airline Railway. He estimates that the plant complete will cost $301,000 and that the cost of the first year's operation, including fixed charges, will be approximately $61,350, while Director of Utilities R. E. Ludwig estimates that under the latest proposed contract with the St. Petersburg Lighting Company the cost for power the first year would be $65,000 and the city would be obligated to pay for certain improvements at the privately owned plant. The estimated cost of the city plant the second year is $68,470, while Mr. Ludwig estimates the cost to the city for that same year, under a contract with the lighting company, at $112,340.

Meeting Held—Will Absorb West End Property

The Boston (Mass.) Elevated Railway's stockholders held their annual meeting on April 3 and re-elected the old board of directors. They did not fill the vacancy on the board caused by the recent death of General William A. Bancroft.

On June 10 the Boston Elevated will absorb the West End Street Railway, which it has been holding under a lease, and the West End company will pass out of existence. The West End preferred stock will be exchanged for Elevated first preferred; the West End common will become Elevated second preferred stock and the Elevated preferred stock will become Elevated third preferred rates of dividend to remain as they are today on the respective stocks.

The West End Street Railway is the owner of the surface lines in the Elevated system. When it passes out of existence some of its directors and officers may be taken into the Boston Elevated directorate, as under the law the seven directors who were elected by the elevated stockholders on April 3 have a right to increase their number to fourteen.

Protective Committee Makes Favorable Report

In the letter sent to the noteholder by the protective committee it wa said that the net earnings of the Brook lyn Rapid Transit Company subwa and elevated lines for the eight month ended Feb. 28, 1922, were $2,378,68 This sum is in excess of operatin expenses and taxes, interest on th $22,967,000 of underlying bonds restin on the elevated lines and on the re ceiver's certificates and other prio charges. The showing thus made i at the rate of about 5.9 per cent pe annum upon the outstanding notes an bonds of these issues, and if allowanc be made for $298,606 of interest on re ceiver's certificates reported to b chargeable to construction this rat would be increased to about 6.7 per cent

The letter states further that th receiver of the subway and elevate lines has been able to pay off $2,000,00 of the $18,000,000 of receiver's certifi cates that were originally issued, an an additional $2,500,000 have been pur chased by the receiver of the Brookly Rapid Transit Company out of funds i his hands. In part the letter says:

> Your committee will continue to press fo the necessary adjudication and to keep i touch with the further proceedings of th Transit Commission and with the opera tion and earnings of the properties, to th end that unless the Transit Commissio should offer some basis for participatio in a comprehensive plan of reorganizatio which the security holders can afford t accept, the committee may be in a positio to proceed with the formulation of a pla of reorganization as soon as the necessar legal questions have been finally adjud cated and conditions are opportune for th raising of the money necessary to provid for the payment of the receiver's certif cates and other cash requirements.

It is said that meetings have bee held for some time with the object i view of effecting a reorganization c the property. Officials of the compan stated that within a few months a application to lift the receivershi might be made.

Judge Julius M. Mayer in the Feder District Court has signed an orde directing the receiver, Lindley M. Ga rison, to pay on April 15 the sem annual coupon interest due since July 1919, on the first consolidated mortgag 4 per cent gold bonds of the Con Island & Brooklyn Railroad Compar and on the 5 per cent consolidated fir mortgage bonds of the Brooklyn Cit & Newton Railroad. The interest to be paid at 6 per cent from the tin that payment was originally due.

Seeks Bond Extension.—The Wo cester Consolidated Street Railwa Worcester, Mass., has filed a petitio with the Department of Public Utiliti asking approval of an extension $500,000 of 4½ per cent gold coup bonds for five years from Sept. 1, 192 These bonds are part of an issue of $1 000,000, $500,000 of which are dat Sept. 1, 1902, and the remainder dat Sept. 1, 1905. The new bonds, if a proved by the commission, will be interest at 7 per cent.

Application May Be Withdrawn

Threatened Abandonment of the Springfield and Washington Line May Result in Complete Reorganization

Although application has been filed with the Ohio Public Utilities Commission for abandonment of service on the Springfield & Washington Railway, operating between Springfield and South Charleston, Ohio, with hearing set for April 14, developments indicate that the application will be withdrawn and service continued under a complete reorganization program. G. D. Baker of Springfield, son of G. W. Baker, the original owner of the line, has purchased the interests of the other heirs and announces that service will continue with a number of changes to be inaugurated. Under the reorganization now being arranged, Mr. Baker becomes president and treasurer; W. W. Keifer, Springfield, vice-president; E. W. Gangwish, Washington Courthouse, secretary; James McDaniel, Washington Courthouse, general manager, and C. J. Baugh, South Charleston, assistant general manager.

One of the first efforts of the reorganized company will be to regain the extensive freight business lost when shippers began delivering their products by motor truck. Mr. Baker declares that under a plan he has in mind he can deliver these shipments quicker and cheaper than the manufacturers can with their own trucks where they have less than a full truck load for transportation both ways. He is at present engaged in perfecting this plan and says he will make a public announcement of it within the near future.

Since the sale of the road an arrangement has been made with the Flag motor-bus line of Washington Courthouse, which has been operating buses between Springfield and Washington Courthouse and other points, whereby the bus line will operate between South Charleston, discontinuning service to Springfield. Transfers between the bus line and the traction line will be issued for persons desiring to make the through trip. Package freight between the two points will be handled in this manner also.

Mr. Baker has received the assurances of the Springfield and South Charleston Chambers of Commerce that these bodies will offer co-operation in every way possible, and already a campaign has been started for the members to make their freight shipments via the traction line. Passenger service will stop at 9 p.m. daily and freight only will be handled between that hour and 5 a.m. It is planned to make a special rate for all night freight shipments.

One of the problems which has faced the road was that of taking care of its paving assessments. In this respect, however, the Springfield Chamber of Commerce has offered its aid and an effort will be made to have the traction line exempted from any paving assessments now due or which may be levied in the future. Should this move be found impossible, the business men may propose an extra levy which it is believed will carry, inasmuch as all persons living along the line are anxious to make some sacrifice in order to keep the road in operation.

Power for the road is now being obtained from Dayton, but it is understood that the Springfield Light, Heat & Power Company will provide a contract at a much lower figure than is now being given. Attempts will also be made to operate "feeder" bus lines along the way, running from cities or towns not connected with the traction line, to a point where contact can be made with the line and transfers made. A test bus will be operated at various points to determine how practical this proposal will be.

Other traction lines in the vicinity are watching the Springfield & Washington Railway developments with keen interest inasmuch as this was one of the first roads to feel the real effect of motor bus and truck competition. It is felt that should a practical solution of the road's problems be reached so as to make it a financial success, the ideas will be worth application to other lines.

Financial News Notes

Carhouse Sale Postponed.—The sale of the carhouse property of the New York Railways at Thirty-second Street and Lexington Avenue has been adjourned until April 20. It was originally scheduled for March 30 on the steps of the New York County Court House.

Applies for Stock Sale Permission.—The Chicago, Aurora & Elgin Railroad has applied to the Illinois Commerce Commission for permission to issue $11,000,000 common stock for the purpose of acquiring the properties of the Aurora, Elgin & Chicago Railroad, Aurora, Ill.

Year's Surplus Is $113,550.—The Michigan Gas & Electric Company, Ishpeming, Mich., reports for the year ended Dec. 31, 1921, gross earnings of $553,957; net earnings of $119.055; surplus after interest and other charges of $19,758, leaving a total surplus on Dec. 31 last. of $113.550, as compared with $118.863 on Dec. 31, 1920.

Will Offer Securities.—The Wisconsin Railroad Commission has granted permission to the Wisconsin Gas & Electric Company, Milwaukee, Wis., to issue $750,000 in securities to pay for additions to power house equipment and for extensions to its lines. This company sells gas and electricity in southern and eastern Wisconsin.

Surplus of $487,521.—For the nine months period ended Dec. 31 1921, the Market Street Railway, San Francisco, Cal., realized a surplus after interest charges, etc., of $487,521. The total revenues were $7,089,944 and the gross income was $1,439,466. Total assets and liabilities as of Dec. 31 amounted to $48,696,411.

New Issue Announced.—Harris, Forbes & Company, New York, N. Y., are offering $3,000,000 of the New York State Railways first consolidated mortgage gold bonds. The bonds are dated Nov. 1, 1912, and are due Nov. 1, 1962. They are 4½ per cent securities with 2 per cent extra coupons, thus bearing 6½ per cent interest. The offering price was 95 and interest, to yield about 6⅞ per cent.

Receiver Will Purchase Coupons.—The Nassau Electric Railroad of the Brooklyn (N. Y.) Rapid Transit Company, through its receiver, has announced that it will purchase all matured coupons from the general consolidated mortgage bonds of the Atlantic Avenue Railroad. The Metropolitan Trust Company will handle the coupons. The amount of bonds outstanding of this issue is $2,241,000 on which the Oct. 1, 1919, and subsequent coupons were in default. The Oct. 1, 1919, coupons down to the April 1, 1922, inclusive are being purchased by the trust company.

Denies $325,000 Debt to Doherty Company.—Bondholders of the Toledo & Western Railroad, represented by Samuel Dority, Toledo, have filed a motion in Federal Court asking leave to file an intervening petition in the suit of Henry L. Doherty and Frank W. Frueauff, of Henry L. Doherty & Company, against the Toledo & Western Railroad. Dority denies that the defendant company is indebted to the Doherty interests in the amount of $325,000 as claimed or to the Toledo Railways & Light Company in the amount of $175,675, and asserts that Doherty and a number of other individuals interested in the company are really indebted to the company through their liability as stockholders of the company.

Abandons Part of Line.—The Lafayette (Ind.) Street Railway, Inc., has announced the discontinuance of service on the Lafayette-Battle Ground line beyond the Tecumseh Trail and the Soldiers' Home. The track beyond Tecumseh Trail belongs to the Indiana Service Corporation, and according to Allison E. Stuart, counsel for the Lafayette Street Railway, is not sound enough to be used. The Lafayette Service Company, which the Lafayette Street Railway succeeds, operated over the track, agreeing to care for the track and roadbed. The former company has not the money to make the repairs and the new company does not feel that it can make the necessary changes. The agreement between the two companies was verbal.

Traffic and Transportation

Agreement in Spokane

After Many Months of Controversy Railway Wins Over Jitney— People Will Decide Issue

A final agreement has been reached between the Mayor and City Council of Spokane and the street railway officials of the city which terminates the warfare between the two bodies, waged bitterly for the last year, over the advent of jitneys in competition last June. Conferences looking to this settlement have been held during the past several weeks with each day's outcome not infrequently contradicting that of the day preceding. Several times it appeared that there was no hope of getting together.

City and Railway Officials Agree

As the situation stands, the city officials and those of the two street railway systems, the Spokane & Eastern Railway & Power Company and the Washington Water Power Company, which are to be consolidated under one head, are in accord. It remains now for the people of Spokane to set their seal of approval upon the agreement by voting certain city charter amendments at a special election to be held on May 2. The entire article in the charter relating to franchise is to be placed on the ballot in its proposed revised form for the convenience of the voters so that there will not be the confusion which might result from the voting on the change by sections.

The jitneys, of which there are more than sixty in operation, are not to be relicensed Jan. 1 of next year. In return the railways concede a 6-cent fare by ticket and a 7-cent cash fare to the casual passenger, with universal transfer, and a 4-cent fare for school children. This agreement effective July 1 is for three years.

In the charter amendments that have to be voted upon, it is agreed that the companies may discontinue service upon a year's notice if jitney competition is renewed at any time. It is prohibited from discontinuing service upon any one part of its system in advance of the termination of the franchise for the entire system. The sprinkling of tracks on graded streets by the company is to be continued, although this was one of the burdens which the street car men asked that they be freed from.

Free rides for mail carriers are to be dispensed with, though this does not amount to anything as the section relative to this in the present franchise has been a dead letter and the government has paid for the carriers. Provision is made that all lines must have owl car service and it is probable that metal tokens will be used for the regular patrons rather than selling tickets to them. There is little question but that the people of the city are well pleased to have the controversy settled on so favorable a basis and that they will voice this at the election.

The prevailing rate of fare has been 8 cents on the street cars, with jitneys running with a 5-cent fare. Early last year the State Public Service Commission, after having had the question under consideration for some months and having held a public hearing at which the city officials bitterly opposed such increase, granted the Washington Water Power Company and the Spokane & Eastern Railway & Power Company the right to increase their fares from 6 cents to 8 cents. Mayor Fleming at the time of the hearing announced that the putting into effect of an 8-cent fare would mean the letting loose of jitney competition. He reiterated this upon the announcement of the decision by the commission, which in such decision took occasion to state that it hoped he had not made such statement in earnest and to point out the disastrous effect of such action upon the transportation situation. A committee of influential citizens sought to act as intermediaries among the companies and the Mayor and Council.

Mayor Carries Out Threat

A compromise offer of a 7-cent fare was secured by the committee and laid before the Council, which rejected it for the reason, so the members explained, that it was not authoritative and that the 7-cent fare was for tickets, while the legal fare remained at 8 cents. The net result was that the 8-cent fare was put in operation early in June last year and the Mayor immediately took steps to carry out his threats. Shortly nondescript vehicles began to make their appearance on the street. These were succeeded as the weeks passed by better and more commodious vehicles and more of them.

The competition began to be felt more and more by the companies, with the result apparent in a gradual lessening of the frequency of service on practically all lines, the discontinuance of several and the laying off of considerable numbers of railway employees. Reports by jitneys to the city hall indicate that they carried in the peak months approximately 30,000 daily fares. The average street car business previously ran 70,000 fares, so the jitney competition cut the street car patronage almost in half. It is estimated that the fight has cost the traction people about a half million dollars, while the taxpayers of the city have also been called upon to pay costs in maintaining streets for jitney service, some additional paving authorized for them and much more on the wear and tear on paved streets, the latter an item that cannot be determined.

Submits Rate Exhibit

Railroad Commission States Electric Fares in California Are Lowest in United States

In connection with the rehearing of the Hollywood rate case regarding increase of fares on Pacific Electric lines, the California State Railroad Commission has, after the close of the rehearing, submitted to the various communities opposing the fare increases a comparative rate exhibit. The details of the rehearing were given in the ELECTRIC RAILWAY JOURNAL, issue of April 8.

The commission says that the fares in California cities are virtually, without exception, the lowest in the United States. The exhibit was compiled by the engineering department of the commission from information received in response to a questionnaire sent to 100 of the principal electric railways in America and constitutes the latest official compilation on the subject. The report is compiled as of Jan. 1, 1922. The questionnaire requested information as to the present rates of fare, reduced-rate tickets, transfer privileges, length of ride possible and other more technical information.

Referring to the California fares the report says that with few exceptions, railway fares in California cities were either 5 or 6 cents. It was to be noted that in the cities of Pomona, Redlands, Riverside and Santa Cruz, with a 10-cent cash fare, and Santa Barbara with an 8-cent cash fare, an endeavor has been made to enable the continued operation of street railway service by increasing fares approximately to their economic maximum. These communities were faced with the possibility of abandonment of service on account of operating losses due to automobile competition and other causes and the present fares may be considered somewhat in the nature of an experiment. In all cases in California where a 10-cent cash fare obtained it was a question either of discontinuing service entirely or collecting the maximum fare, and the cities chose the latter alternative.

Data were collected for the compilation from seventy-nine cities. From this number twelve cities have a 10-cent fare, one a 9-cent fare, fifteen an 8-cent fare, thirty a 7-cent fare, twelve a 6-cent fare and nine a 5-cent fare. Most of the cities reporting, especially those having the higher cash fares, allow a discount on the purchase of tickets or tokens in quantity. In a number of cases an additional charge is made for transfers.

The report also gave consideration to the maximum length of ride and said that on a unit fare it varied according to the different cities from approximately 2 miles in smaller towns to a maximum of 34 miles in Chicago.

In Los Angeles the average length of ride on the Pacific Electric lines performing local service is found to be 5 miles.

Six-Cent Fare Ordered in Chicago

New Surface Lines' Rate to Go Into Effect May 1—Rate Justified by Eliminating Several Obligations Specified in 1907 Franchise Ordinances

BEGINNING May 1 the rate of fare on the Chicago Surface Lines will be 6 cents if the order of the Illinois Commerce Commission entered April 8 is carried out. The new order is "tentative, temporary and experimental" and is to be effective until Jan. 1 unless changed in the meantime. The commission expresses the belief that the 5-cent fare order which was enjoined by the federal court last November could have been made effective if there had been co-operation between the companies, their employees and the city. The companies have been collecting an 8-cent fare since July, 1920. The new order rescinds and annuls the 5-cent fare order of Nov. 23, 1921, and it is expected that steps will be taken to dismiss the proceedings in the United States court where a master in chancery was about to begin taking evidence for the purpose of deciding whether the injunction should be made permanent.

Will Likely Ask for Rehearing

By this latest order the companies' return is limited to 5 per cent. Under the order of the previous commission the rate of return was fixed at 7½ per cent, although the companies last year earned only 6½ per cent on the allowed valuation. It is understood that the companies regard the 6-cent order as confiscatory. No announcement was made as to what steps they would take, but it is likely they will ask for a rehearing and the commission will be allowed twenty days under the law to decide this question. That could be settled before the date on which the order is supposed to become effective.

Last year the gross income of the surface lines was $60,343,733 and the expense, including taxes, was $46,965,-651. The commission figures that the reduced fare will attract about 50,000,000 additional revenue passengers, so that the gross earnings will be $67,916,228. Last year the companies used 12.78 per cent of the gross for maintenance and 8 per cent for renewals. It is proposed to combine these two accounts and allow a total of 16 per cent, which would save $1,759,187. This is practicable, it is claimed, because there is no deferred maintenance and the property is in a condition of good operating efficiency.

The companies last year carried to the injuries and damages fund $2,301,-[illegible], and actually spent $1,762,778 from this amount. The damage reserve fund is now $2,490,359. The commission does not believe that a fund of this character should be accumulated and proposes to cut the allowance to the extent of $1,001,224 during this year. It is also proposed to save $700,000 on the allowance for materials on the theory that prices have gone down 20 per cent below the average last year. An interesting feature of the decision is the disallowance of any appropriation for sweeping, cleaning and sprinkling streets, thereby saving $607,000 per year. On this point the commission says:

> Whatever may be the relations between respondent companies and the city of Chicago, any obligation which may be in the license contracts of said city requiring respondent companies to pay certain portions of the cost of sweeping, cleaning and sprinkling the streets is not binding upon this commission in the exercise of the police power of the State in the fixing of rates of fare to be charged and collected in the city of Chicago, and is not a proper charge to operating expenses of said companies.

Proposed Savings Total Millions

Summarizing the savings proposed by the commission, it is found that these total $7,079,411 from operation and $2,403,131 from the allowed rate of return. By inference the city will also lose its share of receipts because there would be no surplus to divide. This would save another $2,944,963. These savings would total $12,427,505, and on this basis the commission figures that the total expense will be $39,885,000. Deducting this from the estimated gross of $47,916,000, the net return of approximately $8,000,000, or 5 per cent on the former commission's value of $160,000,000, is arrived at.

The commission agreed with the companies' estimate that taxes would again increase this year in spite of a 46 per cent increase last year and it allowed $407,000 additional for this item. It announced that further attention will be given to the valuation of the properties and for the present it would not disturb the previously allowed figure of $160,609,761. On the question of return, it said the evidence showed that interest rates have decreased 1½ per cent from peak costs and, therefore, 5 per cent would be a reasonable allowance.

On the question of high wages the order reads:

> This commission has been criticised for not ordering an immediate reduction in operating expenses of respondent companies, especially in regard to salaries and wages. Under the Illinois commerce act, this commission has no authority to make such a direct order. Where, however, it is perfectly apparent, as it is in this case, that the operating costs of a company are excessive in proper relation to the cost of labor and industries requiring similar skill, to the prices paid for the same service by similar utilities in other cities of the United States, this commission believes that not all of this excess cost should be reflected in the rates of fare charged and collected, but that a certain portion thereof should be borne by the company itself.

The maximum wage for trainmen in Chicago is 80 cents an hour and the commission points out that when this rate was fixed in 1920 the cost of living in Chicago was about 114 per cent over that of December, 1914. In December, 1921, the order says, this had receded to a point where it was 72.3 per cent over the 1914 level, when the men were receiving 32 cents an hour. Exhibits in the case showed further that the maximum wage for trainmen in a number of large cities had dropped from an average of 61.1 cents in 1920 to an average of 54.9 cents, a decrease of 10.1 per cent from the peak. Evidence showed also that from 1914 to 1918 the Chicago wage was 4.6 cents an hour higher than other properties and on this basis it would now be 60.3 in Chicago. To get to this level, it is pointed out, there would have to be a reduction of 24.6 per cent. It was stated during the hearings that the companies were negotiating with the men for a reduction in wages at the time the fare fight was renewed. The contract since that time has been continued on a month to month basis.

Big Issue Before New Council

The fare proposition in Madison, Wis., looms up as a big issue before the newly-elected City Council. The Madison Railways Company has submitted a schedule of fares which has the indorsement of the City Attorney and Mayor. It includes a 10-cent cash fare, 3-cent fare for children, seven tokens for 50 cents and books containing thirty tickets for $1.50. The company agrees to this rate if the city relieves the company from all obligations to surface the railway zones in certain streets. This work has been held up pending an agreement with the company. Just what action will be taken if the city fails to approve of this action street railway officials decline to say. It is expected, however, that the new Council will take favorable, or at least some definite action within six weeks.

Recommends Increased Railway Service

Glendale's proposal to operate a municipal bus line in Los Angeles, Cal., was rejected recently by the Los Angeles Board of Public Utilities. In rejecting the request, the board considered the reports of its chief engineer, H. Z. Osborne, Jr., and also briefs submitted by the Pacific Electric lines and the city of Glendale. Recommendation that the Pacific Electric increase its service on its Glendale line during the morning and evening rush hours was also voiced by the board. D. W. Pontius, vice-president and general manager of the company, stated that the railway would gladly comply with the recommendations. Commissioner Leeds of the board, in explaining his negative vote, said he believed that the paralleling of the Pacific Electric Railway line with a bus line for the entire distance was unfair competition. Commissioner Kennedy stated among other things that he did not think that this was any time to cripple any public utility, whether privately or publicly operated. Details of this municipal bus project will be given in BUS TRANSPORTATION for May.

One Dollar Weekly Pass for Terre Haute, Too

The Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., has made application this week to the Public Service Commission of Indiana for permission to install on the 5-cent city cars of Terre Haute the unlimited-ride transferable weekly pass to be sold at $1. This will make the sixth property in the United States and the second in Indiana to use this form of transportation, the first five properties being Racine, Kenosha, Youngstown, Beaver Valley and Fort Wayne.

To prepare the carmen and the public for this innovation, E. M. Walker, general manager, invited Walter Jackson, originator of the pass, to aid in the publicity campaign. Mr. Jackson called on both the leading merchants and theater managers of the city to secure their help in pushing the pass as a producer of the off-peak travel that means so much to them. He also addressed the night and day carmen, explaining the meaning of the pass from both the fare-handling and business-building standpoints.

Mr. Walker's suggestion that they be placed on a commission basis met such a cordial response that a number of operators said they would do more than sell passes on the card—they would offer them to their neighbors in their off hours.

The local papers which were represented at these meetings have published good accounts of the pass, so that the pass is already a matter of general knowledge, even in advance of the advertising campaign prepared for newspaper and car window use. The company hopes to put on pass No. 1 for the week beginning May 1.

Boise Revenue Gains in Second Week

The second week of the 7-cent cash fare on the Boise (Idaho) Street Car Company and the Boise Valley Traction Company shows an increase in passengers and revenue over the first week of the new rates. The first week showed a falling off in traffic and receipts as compared with the last week of the lower fares. During the second week the Boise Street Car Company carried 698 more passengers than during the first week, and collected $30 more in fares. As compared with the corresponding weeks in February, the first week of the new rates showed a decrease of $106 on the Tenth and Eighteenth Street belt lines of the Boise Valley Traction Company in revenue and of 3,705 in passenger traffic, while the second week showed a revenue decrease of $61.79 and passenger decrease of 2,668. The South Boise line during the first week of the new fares reported a decrease, as compared with the last week of the old schedule, of $27 in revenue and 686 in passengers. For the second week it reported an increase of thirty-eight in passenger traffic and $9.08 in revenue over the corresponding week in February. The announcement of new rates was given in the ELECTRIC RAILWAY JOURNAL, issue of April 8.

Fare Increase Sought in Mobile

The Alabama Public Service Commission has under advisement a petition of the Mobile Light & Railroad Company for an increase in fares. The company has requested the right to charge an 8-cent cash fare instead of the present 7-cent one and an increase in the ticket rate from 6 to 7 cents. At present four tickets are sold for 24 cents.

Opposition to the proposed increase was registered with the commission by the city of Mobile. A request was made that the old contract rate of 5 cents be re-established. This contract was suspended as an emergency measure about two years ago to permit the company to charge the present rates, to meet the increased costs to which it was then subjected. The Mobile Light & Railroad Company now contends that not only have costs failed to be reduced, but that losses in traffic and the suspension of shipbuilding activity at the Chickasaw plant have created losses in revenue which if continued throughout the present year will cause a deficit of $162,700.

The commission has determined to have a valuation of the property made before rendering a final decision on rates. The commission's own engineers will value the property. The company has already had a valuation made on its own account. According to report, this valuation showed that the property had cost a minimum of $4,050,000, and that it would now cost $6,506,000 to reproduce.

One of the appraisals of the properties of the Mobile Light & Railroad Company is being made by the firm of Harry Barker & Robert C. Wheeler of New York City and Albany, N. Y., working in connection with Capt. Charles T. Long, the company valuation engineer. The field work is being done by a force of about fifteen under the direction of Capt. Harry Barker, who will present the results before the Alabama Public Service Commission. The commission engineer, L. M. McDonnell, is making a concurrent check and appraisal.

Railway Loses Fare Suit

In an opinion by Justice Brandeis the United States Supreme Court recently decided against the Galveston (Tex.) Electric Company in its suit to enjoin the city of Galveston from putting into effect a 5-cent car fare. The company contended that this rate was confiscatory. The District Court for the Southern District of Texas denied the injunction on the ground that it had no right to interfere with the fixing of rates, which was a legislative function, unless it appeared beyond doubt that the rates would deny just compensation, which it was not convinced was shown in this case.

Transportation News Notes

Children's Fares to Be Reduced.—Officials of the Pine Bluff (Ark.) Company have announced that they are working on a plan for reduction of the fares charged school children. A reduction to 3 cents has been asked, and the officials state that it is probable that a reduction to less than 3 cents will be made.

Freight Rates Reduced 16 and 20 per cent.—Freight reductions of 16 and 20 per cent, effective April 10, have been announced for the electric lines of the Cleveland, Southwestern & Columbus Railway, Columbus, Ohio. This will make the rates equal to those prevailing on steam roads. E. L. Hukill also announced a similar reduction for the Columbus, Deleware & Marion Electric Company, effective April 20.

Reduced Rates Announced.—The Western Light & Power Company, Boulder, Col., through its general manager recently announced a reduction in railway fares approximating 20 per cent. This step was voluntary on the part of the company to induce more people to ride. Single rides will be 10 cents, the present rate; strips of seven tickets can be bought for 50 cents and books of twenty rides will be sold for $1.25 instead of $1.50.

Seek Lower Rates.—Six separate petitions have been presented to the City Council of Fort Smith, Ark., by 37 citizens of that city asking that the Council order the Fort Smith Light & Traction Company to reduce its trolley fares from 7 to 5 cents. The petition call for transfers and half fares for children. The Council has set April 1 as the date for a hearing. It is said that the petitions were circulated shortly after the platform men employed by the traction company accepted a cut in wages of 6 cents a hour. The negotiations lasted for five weeks, ending with the men signing the only contract offered by the company.

Fares Reduced on Grays Harbor Lines.—A fare reduction from three tickets to four tickets for 25 cents has been ordered by the Department of Public Works of Washington, on all lines of the Grays Harbor Railway & Light & Power Company. This railway serves Hoquiam, Aberdeen and Cosmopolis. The reduction is for an indeterminate trial period. Cash fares continue at 10 cents. The reduced rate is effective April 30. Trial of 10-cent cash fare and three tokens for 25 cents resulted in a loss to the company, but with the lower fare the company hopes that increased patronage, particularly in intercity traffic, will more than make up for the reduction. One-man cars and other operating economies have been instituted by the company. This matter has been referred to previously.

New Publications

Fire Tests of Building Columns

By the Associated Factory Mutual Fire surance Companies, the National Board Fire Underwriters and the Bureau of andards. 389 pages, illustrated.

This bulletin reports the results of experimental investigation of the re- stance of building materials and ded columns when exposed to fire to fire and water, with the record characteristic effects.

bliography of Petroleum and Allied Substances (1918)

By E. H. Burroughs. Bulletin No. 189. ited States Bureau of Mines, Washing- n, D. C.

This bulletin contains a complete list all material appearing in periodicals ring 1918 on the subject of petro- m. The references are classified ac- rding to the Dewey system and a ort résumé of each article is given.

Motor Truck Transportation

By F. Van Z. Lane. Published by D. Van strand Company, 8 Warren Street, New rk.

This book is a summary of the prin- ples governing the success of motor ck transportation, practically all the ace being devoted to freight carry- g vehicles. Operating costs, motor ck vs. other modes of transportation, dies and other load carrying equip- nt, are all discussed in a general way. e author is the lecturer on motor ck transportation at New York iversity.

gnaling on the Berlin Elevated and Underground Railways

Published by Julius Springer, Berlin, rmany. 188 pages; illustrated.

This gives a very complete descrip- n of the types of signals and signal uipment together with methods of stallation with circuit diagrams for e Berlin (Germany) Elevated & Un- rground Railways; also similar in- rmation for the London Underground d New York subways. It puts in rmanent form information not avail- le elsewhere.

Railway Statistics of the United States for 1920

By Slason Thompson, Bureau of Railway ws and Statistics, Chicago, Ill.

This is the eighteenth year that Mr. ompson has published his little book statistics of the railroads in this ntry and abroad. The data relate t only to rolling stock, mileage and ances for both American and foreign ds but to many allied topics. The k contains 147 pages and will be nd very useful for any one looking group statistics of the steam rail- ds. Many of these are in compara- e form. Editorial comments accom- ny many of the figures given.

American Electricians' Handbook

By Terrell Croft, consulting engineer. Second Edition, Published by McGraw-Hill Book Company, Inc., New York. Cloth 7 x 4¾ in. 789 pages. 900 illustrations.

A second edition of American Electricians' Handbook, by Terrell Croft, has been published by the McGraw-Hill Book Company, Inc. This popular handbook has been found very useful by practical electricians, and is particularly noted for its clear explanations and good illustrations.

Effect of Moisture Content on Concrete

A Study of the Effect of Moisture Content Upon the Expansion and Contraction of Plain and Reinforced Concrete. By Torata Matsumoto. Bulletin No. 126 of the Engineering Experiment Station, University of Illinois, Urbana. Sent upon request.

This study contains some of the results of experiments made by the author, who did graduate work in Theoretical and Applied Mechanics at the University of Illinois in 1918. He was for many years an engineer on harbor work in Formosa and wished to determine the lasting qualities of concrete in a damp and tropical climate.

Sistema de Alimentazione Della Linee a Trazione Elettrica a Corrente Continua

By Enrico Sorelli, Brescia. 46 pages, paper.

This pamphlet describes the transmission system for direct current electric railways devised by Mr. Sorelli, an Italian engineer. The purpose of this system is to reduce the number of converting substations and centralize the distribution of energy by the use of a system of double feeders at different voltages. He states that by the use of his system the tension is equalized throughout the line and that the drop is reduced to very small fraction.

The most interesting feature of the booklet is a technical description of conditions on the Gardone-Travernole electric railway where his system is in use.

Federal Power Commission Report

Government Printing Office, Washington, D. C., 1921

The first annual report of the Federal Power Commission, which covers the fiscal year ended June 30, 1921, has been published. The report states that the commission's jurisdiction is limited to the consideration of projects designed to produce water power; further, that the body has the authority to grant permits or licenses for constructing, maintaining and operating which have previously been approved by the International Joint Commission. On Nov. 1 the commission had received 260 applications which aggregated 11,060,000 primary horsepower and 16,826,000 hp. of estimated installation. The applications affected thirty-three states, the District of Columbia and the territory of Alaska. This estimated installation is approximately twice the horsepower so far developed in the United States.

The Federal Power Commission consists of the Secretaries of War, the Interior and Agriculture, and O. C. Merrill, who is executive secretary.

Legal Notes

CALIFORNIA—*Ejectment not Proximate Cause of Injuries Sustained More than ¾ Mile from Place of Ejectment.*

A railroad was not liable for injuires to person on the track on the theory that it had negligently ejected him for failure to produce a ticket or fare, though he was in a helpless condition as a result of intoxication or other causes, where injuries were sustained three-fourths of a mile from the place of the ejectment, the ejectment in such case is not the proximate cause of the injuries. [Lammers vs. Pacific Electric Ry., 199 Pacific Rep. 523.]

FEDERAL COURTS—*Payment of Interest into Special Fund Held to be a Contract Requirement.*

Where a city, in an ordinance authorizing the issuance of bonds, irrevocably obligated itself to pay into a special fund from the gross revenues of its street railway system before each installment of interest falls due a sum equal thereto, and requiring the city treasurer one month prior to this interest date to set aside the amount thereof, the provision for setting the interest aside is part of the contract obligation binding on the city and not merely a directory provision. [Puget Sound Power & Light Co. vs. City of Seattle et al., 271 Federal Rep. 958.]

GEORGIA—*Company May Reassign Seats in Carrying Out Jim Crow Law.*

Where a State law requires the separation of white and colored passengers in street cars, a conductor has the right not only to assign a seat at the time a passenger enters the car, but to make such necessary reassignments as the exigencies of the traffic may require. [Savannah Electric Co. vs. Lowe, 108 Southeast Rep. 313.]

MASSACHUSETTS—*Conditions Precedent to Becoming Passenger.*

Any one in proper condition, who takes hold of the grabhandle, places his foot on the step and begins to enter a car is a passenger, if the car is at a regular stopping place in the street for the purpose of receiving passengers and persons were invited to enter and become passengers. [Franz vs. Holyoke Street Railway, 132 Northeast. Rep. 270.]

MICHIGAN—*City Has Power to Oust Railway on Expiration of Franchise.*

The Common Council of Detroit under the charter of the city has power to exercise control over the use of its streets and to direct the institution of a suit to oust a street railway company from the streets as to which its franchises from the city have expired. [City of Detroit vs. Detroit United Ry., 184 Northwest Rep. 516.]

MISSOURI—*Excessive Speed Not Necessarily Cause of Accident.*

Negligence not being actionable unless it produces an injury, an instruction authorizing recovery must require a finding that the negligence complained of was the proximate cause of the injury. Hence, in an action for the death of a pedestrian struck by a street car, an instruction that if the car was being run at a speed greater than 15 m.p.h. and the deceased was exercising ordinary care for his own safety, the company would be liable, was erroneous as not requiring a finding of specific and definite facts, from which it necessarily followed that the negligence was the cause of the injury. [Lackey vs. United Railways 231 Southwest. Rep. 956.]

MISSOURI—*Street Railway Held Not Negligent in Maintaining Defective Grabhandle.*

A street railway could not be held negligent for maintaining a grabhandle on a street car which contained a defect not discoverable except by breaking the brass casting holding the rail, where the grabhandle was inspected from time to time by stepping on the step and jerking on it, as far as injuries to one not a passenger was concerned. [Galloway vs. Kansas City Rys., 223 Southwest. Rep. 385.]

MISSOURI—*Denial by Commission of Railway Company's Right to Issue Bonds Held Impairment of Contract Right.*

Under the terms of a railway company's mortgage it has the right to issue bonds to cover additions and extensions upon showing net earnings double its interest charges; when, however, it proposed to issue bonds on additions it was found that part of the expenditures were made more than five years prior to its application to the Public Service Commission for authority to issue such bonds, the delay in making such application being due to the fact that the company could not show the requisite net earnings prior to its application. By the Public Service Act of the State, the commission is prohibited from authorizing the issuance of bonds for additions made more than five years prior to the application. Nevertheless the court held that the application should be granted in spite of the law, because otherwise the law would be unconstitutional, as impairing the company's contract right to issue such bonds, contrary to Const. U. S. Art. 1, Sec. 10. [State ex rel. Joplin & Pittsburgh Ry. vs. Public Service Commission, 223 Southwest. Rep. 388.]

SOUTH CAROLINA—*Place in Street Where Street Car Passenger Alights Is Not a Station.*

A public street in a city, at a point where a street car stops for passengers to alight, is not to be regarded as a passenger station, in determining the duty of the company toward its passengers, and a passenger who stepped on a banana peel and fell cannot recover. [Thompson et al. vs. Greenville Traction Co., 107 Southeast. Rep., 911.]

Personal Mention

J. A. Crilly Has Long Service

"I hope John A. Crilly will be with the Connecticut Company many more years," declared Nathaniel J. Scott, manager of the Hartford Division, in commenting upon the fifty-seventh anniversary of Mr. Crilly's service, which was celebrated April 7. Mr. Crilly entered the company's ranks in 1865, when it was known as the Hartford & Wethersfield Horse Railway, and for many years was chief claim adjuster. Since 1916, when he retired from this position, he has been doing special work for the company.

Mr. Crilly's first work with the company was taking care of horses at $8 a week. Even his next work was still somewhat distantly removed from modern electric railways, for he did the blacksmithing for the company. He became yard foreman, and when the company changed from horse cars to electric apparatus Mr. Crilly was in charge of selling the horses. He sold 750 and is proud of his record. Thereafter he was acting superintendent, by appointment of President E. S. Goodrich, until 1895, when he became chief adjuster. He was succeeded in that work by his son, John A. Crilly, Jr.

The service record of Mr. Crilly is excelled by few others in the country.

Los Angeles Railway Makes Changes

Changes in the auditing department of the Los Angeles (Cal.) Railway have been announced. O. J. Hastings becomes assistant auditor. He was formerly chief clerk. This position has been filled by G. W. McDonald. H. E. Gaskell has been appointed chief accountant and statistician, and S. J. Nock head bookkeeper and accountant.

George E. Falk, formerly safety director for Henry L. Doherty & Company, with headquarters at their New York office, has been assigned to the Community Traction Company and the Toledo Edison Company, at Toledo, as head of all the safety work. He plans a general all-year campaign on "safety" and has already secured the co-operation of the Toledo Automobile Club and the public schools in an effort to put over a safety course through the public schools. Mr. Falk has been with the Doherty interests for nine years. He started in the gas offices of subsidiaries in New York State.

George P. Good, who has served for many years in the transportation department of the Philadelphia (Pa.) Rapid Transit Company, has been appointed superintendent of transportation. Elbert G. Allen has been appointed chief engineer. Mr. Good started work with the company twenty-eight years ago, when cable cars were still used. Mr. Allen, a graduate of the Massachusetts Institute of Technology, was associated in an advisory capacity with Stone & Webster in the construction of Hog Island. His appointment has been referred to previously in the ELECTRIC RAILWAY JOURNAL.

Obituary

Howard E. Huntington

Howard Edward Huntington, vice-president of the Los Angeles (Cal.) Railway and only son of Henry E. Huntington, president of the company, died March 27 at the age of forty-six.

Private burial service was conducted on March 29 and as a mark of respect all trolley cars in Los Angeles stopped for one minute at 10 a.m., the time of the funeral. All machinery, except substation motors, was stopped for five minutes and the main offices closed for half a day.

Mr. Huntington began his railway career in 1894 with the late Epes Randolph, builder of the Southern Pacific Railway of Mexico. In 1903 he began his actual experience in Los Angeles traction activities as a worker in the electrical department of the shops.

Upon the death of J. A. Muir, then general manager, Mr. Huntington was appointed to the position.

He continued as active head of the railway until 1911 when he made a trip to Europe for his health. He retained the title of general manager until 1918, when George J. Kuhrts, the present general manager, was appointed. During the war he served as a dollar-a-year man with the shipping board and supervised important phases of shipbuilding work at Los Angeles Harbor and Oakland, Cal.

Knox Taylor, president of the Taylor-Wharton Iron & Steel Company, and vice-president of the American Railway Business Association, died April 4, at his home in High Bridge, N. J. During the war his company aided in supplying railway track material for use abroad, and he himself was the representative of the leading manufacturers of this product in dealings with the Government. Mr. Taylor worked through all the departments of the Taylor Iron & Steel Company, and finally became president. In 1912 this company purchased the William Wharton, Jr., & Company, Inc., and the Philadelphia Roll & Machine Company, and Mr. Taylor became president of the new Taylor-Wharton Iron & Steel Company. The Taylor and Wharton Companies had originated the use of manganese steel in trackwork.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES BUSINESS ANNOUNCEMENTS

New Electric Line Planned for Florida

Sanford, Fla., suburban trolley lines linking up Sanford (Fla.) and intermediate points south to Plant City, where it is confidently expected the Tampa Electric Company will meet it, is the plan being promoted by Frank J. Ryan, vice-president of the Orland Mortgage & Loan Company, and F. F. Ange, president of the Bank of Orange, Orlando, Fla. The proposed lines would provide a scenic route through Florida linking with the St. John's River north from Sanford so as to appeal to the tourists. Orlando would be headquarters and the route would include Winter Park, Orlando, Kissimmee, Loughman, Haines City, Lake Alfred, Auburndale, Lakeland and Plant City, with spurs out of Orlando to Daytona and Tavares. It would offer competition to high freight rail rates by a joint trolley and water rate to Jacksonville and an all-trolley rate to Tampa and Orlando, the three principal consuming centers of the region. One of the biggest lumber mills in the south is at Loughman and its owners are understood to be interested in the project. Mr. Ryan's estimates are that it will require $12,000,000 to lay the lines and equip the various companies which would operate over the tracks. Mr. Ryan states that negotiations have progressed with Northern financiers far enough to practically assure consummation of the project.

Ohio Road Will Buy Power

Indiana, Columbus & Eastern Traction Co., Springfield, Ohio, will operate cars with power furnished by the Dayton Light, Heat & Power Co. not later than June 1, according to a statement issued today by G. D. Nicoll, superintendent of power equipment for the road. At present the company is supplying its own power, but the contract with the Dayton company will furnish service cheaper than the traction line can produce it, company officials say. New rotary converters are being installed at the various substations and new substation buildings are being constructed at Medway on the Dayton-Springfield division and at Donovan's Mill on the Springfield-Lima division. Operation of the power plant at Medway will stop as soon as the Dayton service begins and it is regarded as probable that the plant will be entirely demolished, although some of the executives are said to favor the retention of the plant for emergency purposes. The Dayton service will be transmitted at 33,000 volts, the same as at present, but with alternations at 60 cycles instead of 25. It was this change which required the installation of new converters. The contract between the traction line and the Dayton company was recently approved by the State Public Utilities Commission.

Orders for 151 Safety Cars Placed

The Stone & Webster Company recently placed orders for 136 Birney safety cars. Of these eighty-nine were ordered from the St. Louis Car Company and forty-seven from the American Car Company. These cars will be used as follows: Houston, Tex., 35; Columbus, Ga., 3; Savannah, Ga., 30; Tampa, Fla., 24; Pensacola, Fla., 8, and Jacksonville, Fla., 36.

In addition to these the Chicago, South Bend & Northern Indiana Railway has placed an order for fifteen safety cars with the J. G. Brill Company.

Advice on Foreign Market Conditions

A feature of the ninth National Foreign Trade Convention in Philadelphia, to be held on May 10, 11 and 12, will be the furnishing of trade advisers to give information on foreign trade questions. These advisers have been selected from business men who have spent years in foreign trade and they will furnish information regarding market, shipping, finance, sales and advertising methods, and other items considered as obstacles to entering foreign markets.

Westinghouse Air Brake Report

The Westinghouse Air Brake Company earned $1,412,490 net during 1921. This was exclusive of loss due to shrinkage in inventory prices, amounting to $2,307,854, charged against reserves created for that purpose. With this adjustment the inventory stands at $10,802,328, as compared with $15,628,811 on Dec. 31, 1920. In commenting on the general situation the officers say:

"As outlined in our last annual report for the stockholders. we entered the year 1921 with a fair volume of unfilled orders on hand, and as a consequence our shipments for the first quarter were fairly satisfactory; but on account of the general business depression and particularly the curtailing of purchases by the railroads of the country, our orders received during the year under review amounted to less than 50 per cent of normal, which resulted in plant operation and shipment for the year of approximately this same percentage. Under existing conditions, it would be difficult and useless to endeavor to forecast the future."

San Francisco Car Contracts Awarded

Contracts were awarded on April 4 for twenty new cars for the San Francisco Municipal Railways. The contracts are for the construction and assembling of cars of the center entrance type, at a cost of almost $200,000. The bids accepted, according to City Engineer M. M. O'Shaughnessy, are approximately $1,200 cheaper per car than the estimate made several months ago. The contract for the body and trucks went to the American Car Company of St. Louis at $5,187 per car; trucks and wheels to the same company at $1,312.50 per car. The Westinghouse Traction Brake Company was awarded the contract for the air brakes, the total contract being for $11,363.73. The Westinghouse Electric & Manufacturing Company was given the contract for the electrical apparatus, motors, etc., the contract totaling $49,503.66.

General Electric Submits 1921 Report

The thirtieth annual report of the General Electric Company, Schenectady, N. Y., reports orders received in 1921 were $179,722,000, as compared with $318,470,438 for 1920. For the first quarter of 1922 orders received have been at an annual rate in excess of $200,000,000. Net sales billed were $221,007,992, compared with $275,758,488 for 1920. A surplus in excess of cash dividends for the year 1921 was $8,243 290. C. A. Coffin, chairman of the board of directors, in a statement to the stockholders, characterized 1921 as an exceptionally trying and difficult year "with its contraction in business and the unavoidable processes of readjustment."

The report states that inventories in factories and warehouses and on consignment have been taken with the usual care and valued in accordance with the custom of the company at cost or market, whichever is lower. Investment securities have been carefully revalued according to the statement and a reserve of $3,700,000 has been established to safeguard the company's interest in associated manufacturing and selling companies against inventory or other shrinkage. They are now carried at a net value of $75.326,382.

Metal, Coal and Material Prices

Metals—New York	April 11, 1922
Copper, electrolytic, cents per lb.	12.875
Copper wire base, cents per lb.	14.125
Lead, cents per lb.	5.05
Zinc, cents per lb.	5.25
Tin, Straits, cents per lb.	30.375
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4 60
Somerset mine run, Boston, net tons	2.10
Pittsburgh, mine run, Pittsburgh, net tons	.....
Franklin, Ill., screenings, Chicago, net tons	2 625
Central, Ill., screenings, Chicago, net tons	1.875
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y. cents per lb.	5.90
Weatherproof wire base, N. Y., cents per lb.	15.50
Cement, Chicago net prices, without bags	$1.97
Linseed oil, (5-bbl. lots), N. Y., cents per gal.	84.00
White lead, (100-lb. keg), N. Y., cents per lb.	12.25
Turpentine (bbl. lots), N.Y., cents per gal.	88.00

Rolling Stock

Columbus, Delaware & Marion Electric Company, Columbus, Ohio, contemplates the addition of one more freight car owing to increase in business.

Houston (Tex.) Traction Company plans to purchase immediately thirty-five new cars at a cost of $270,000, according to an outline of the company's proposed improvements submitted to the City Council by Luke C. Bradley, district representative of Stone & Webster. Mr. Bradley also told the City Council that the company will paint and overhaul thirty-six cars it now owns that have been in the carhouses unused for some time.

Chicago (Ill.) Surface Lines expect to be in the market very soon for 100 new cars. Of these, seven will be trailers to replace the trailers burned in the Devon carhouse fire which occurred in January. The others will probably be of the double-truck one-man safety type, like the sample recently built and described in the ELECTRIC RAILWAY JOURNAL for Jan. 14, 1922. The insurance money received for the cars destroyed in the Devon fire is sufficient to finance a large proportion of these new cars.

Track and Roadway

Houston (Tex.) Electric Company has begun to double track its line on Lorraine Street from Gano to Maury Streets.

Pennsylvania & New Jersey Railway, Trenton, N. J., is placing a new curve in the road at Hulmeville, Pa., and otherwise repairing the road in that section.

Municipal Railway of San Francisco received bids on March 29 for track construction on Liberty Street between Church and Sanchez. The cost of the work will be approximately $60,000.

Indiana Service Corporation, Fort Wayne, Ind., will soon start work on the double tracking of the West Main Street line, according to S. W. Greenland, vice-president and general manager. The franchise for this work was granted last year.

Michigan Railway, Kalamazoo, Mich., will start work on its $100,000 improvement program just as soon as warm weather comes. The principal item calls for the relaying of track on Portage Street from Washington Avenue to Lovell Street.

Public Service Railway, Newark, N. J., through Harry C. Stevenson, its representative, has informed the Haddonfield, N. J., city officials that the corporation will make repairs in King's Highway in the early spring. Mr. Stevenson made this announcement after an inspection of the road.

Murphysboro & Southern Illinois Railway, Murphysboro, Ill., has announced through its president that it will extend its interurban line from Carbondale to Herrin, work beginning about May 1. The citizens' subscriptions to the preferred stock justified the extension.

Harrisburg (Pa.) Railways will probably begin the work about April 1 of improving North Third Street in front of the Capitol and will include paving of the Walnut Street stretch on the south side of the Capitol. The trolley tracks now in Third Street will be shifted to allow for another track and the west side curbing will be moved for widening the sidewalk.

New Jersey & Pennsylvania Traction Company, Trenton, N. J., may be forced to provide additional rails on West Hanover Street. This action is urged so that cars from the Princeton and the Pennsylvania lines can travel on the right hand side of the street. There are two different gages of tracks compelling the cars to travel on the wrong side of the street. The traction company asked that the city cut down the width of the sidewalks instead of putting the corporation to so great an expense. It is said that the cost will amount to about $75,000.

International Railway, Buffalo, N. Y., in co-operation with the city in its plans for repaving city streets, rebuilt during 1921 more than 20 miles of track. The rehabilitation also represents the complete overhauling of 334 cars, renewal of 38 miles of trolley wire and many other improvements and betterments. The expenditure thus incurred, amounting to over $3,000,000, entirely consumed the appropriation made from 1921 earnings for maintenance and renewals and approximately $500,000 of working capital provided by the stockholders.

Memphis (Tenn.) Street Railway, with the Mayor's consent, has made final arrangements for the extension of the crosstown line from Agnes Place to McLemore and the connection of two links in the railway chain on McLemore Street, making a through crosstown route from Poplar and Cleveland Streets to Riverside Park. The company is also making rapid progress in laying its tracks across the Viaduct just erected at McLemore Street over the Yazoo & Mississippi Valley and the Illinois Central Railroad system tracks. The double tracks will first be laid, after which the concrete will be put in. The work is being done under the direction of A. E. Yarbrough of the car company construction department.

Power Houses, Shops and Buildings

Duquesne Light Company, Pittsburgh, Pa., which furnishes power for the Pittsburgh Railways, has authorized the Dwight P. Robinson Company to install two additional boilers of 22,914 sq.ft. of surface and to design and construct additions to the company's high-tension substation.

New Orleans Railway & Light Company, New Orleans, La., will probably erect a new office structure instead of repairing the old building recently damaged by fire. The new building if constructed will be five stories in height and will cost about $500,000. Receiver O'Keefe has had a conference with the security holders on the subject of constructing this new building upon the site of the former quarters of the company.

Philadelphia Electric Company, which supplies power to the Philadelphia Rapid Transit Company, has just placed an order for sixteen 3,750-kva. single-phase transformers for operation at 60 cycles, with a total capacity of 600,000 kva. The total cost of the transformers will be approximately $100,000. The contract for these transformers is awarded to the Westinghouse Electric & Manufacturing Company, and they are to be used in various substations. They are duplicates of approximately thirty similar Westinghouse units now in operation.

Trade Note

Canton Culvert & Silo Company, Canton, Ohio, manufacturers of "Acme" (Nestable) and "Imperial" riveted corrugated metal culverts, was awarded on March 10 the annual contract for supplying the Pennsylvania State Highway Department's requirements for corrugated metal culverts this season. The contract approximates 42,000 ft. of corrugated culverts.

New Advertising Literature

Ohio Brass Company, Mansfield, Ohio. has issued a folder which describes with pictures its Type A-Ear with its improved Under-run type of construction installed.

Sprague Electric Works, New York, N. Y., has issued a circular descriptive of narrow-unit panelboards of the safety type. This panel is an economy in wall space and price.

Stumpf Una-Flow Engine Company, Inc., Syracuse, N. Y., has issued a Lefax sheet describing and giving information regarding the performance of its una-flow steam engine.

General Electric Company Schenectady N. Y. has just issued descriptive leaflets of type LG-116 indoor disconnecting switches and type QC-3 quick-break lever switch.

Electric Power Club, 1017 Olive Street, St. Louis, Mo., has recently published a handbook on controllers for electric motors. This pamphlet contains simple descriptions of controllers and definitions of the terms used in that connection. Words which do not appear in most dictionaries are explained simply.

PEACOCK

"The Peacock Staffless"

A Capacity Brake for Loaded One-Man Cars

LIKE the extra safety valve on a boiler, the hand brake is installed in the one-man safety car not because the rest of the equipment is expected to fail, but because no man or machine is so perfect that the lives of the public can be placed unreservedly in its power.

Laws carefully worked out by trained engineers govern the selection of the proper type and size of boiler safety valves. The choice of hand brakes is left to the individual preference of the purchaser. All the more reason why you, responsible as you are for the safety of the traveling public, should choose an equipment which will positively perform its intended duty, when emergency requires it.

The Peacock Staffless Brake is designed and built on technically correct theory, and has established its adequacy in practice. It has ample power to stop the most heavily loaded safety car, and its almost unlimited chain-winding capacity makes certain that it will work under any conditions.

Specify Peacock Staffless.

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

How do *you* buy car Lubrication

IF YOU WISH to reduce your use of car "out of service" signs per day, we suggest that you buy lubricants only on a *performance basis*. By a *performance basis* we mean the securing of more car miles from every gallon of car oil, air compressor oil and gear lubricant that you use.

Your use of lubricants is only a trifle of your total maintenance costs—probably not more than 1/10 of 1%. But in terms of repairs and renewals, lubrication is a "tremendous trifle."

The day of haphazard lubrication is fast drawing to a close.

No Equipment Superintendent who is eager to make economy records for his com-

VACUUM OIL COMPANY

pany and for himself can afford to ignore or to be indifferent to scientifically correct lubrication.

The ability of the Vacuum Oil Company to deliver more car miles per gallon is being demonstrated every day throughout the world—wherever electric street cars run.

The great fund of Vacuum Oil Company experience in reducing maintenance and upkeep costs through Correct Lubrication—probably the widest experience in the world—is at your service.

We shall be glad to arrange for one of our Engineers to meet your Equipment Superintendent to discuss the lubricating needs of your system more in detail. In writing, kindly address our nearest branch office.

The best oils you can buy are the cheapest in the long run—no matter what the size of your system.

Lubricating Oils

A grade for each type of service

Domestic Branches:
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"P & H" Guaranteed Penetration Process

You can absolutely depend upon the *"P & H"* Guaranteed Penetration Process for longest pole life.

It guarantees a uniform half inch penetration of the preservative throughout the ground line area of the pole.

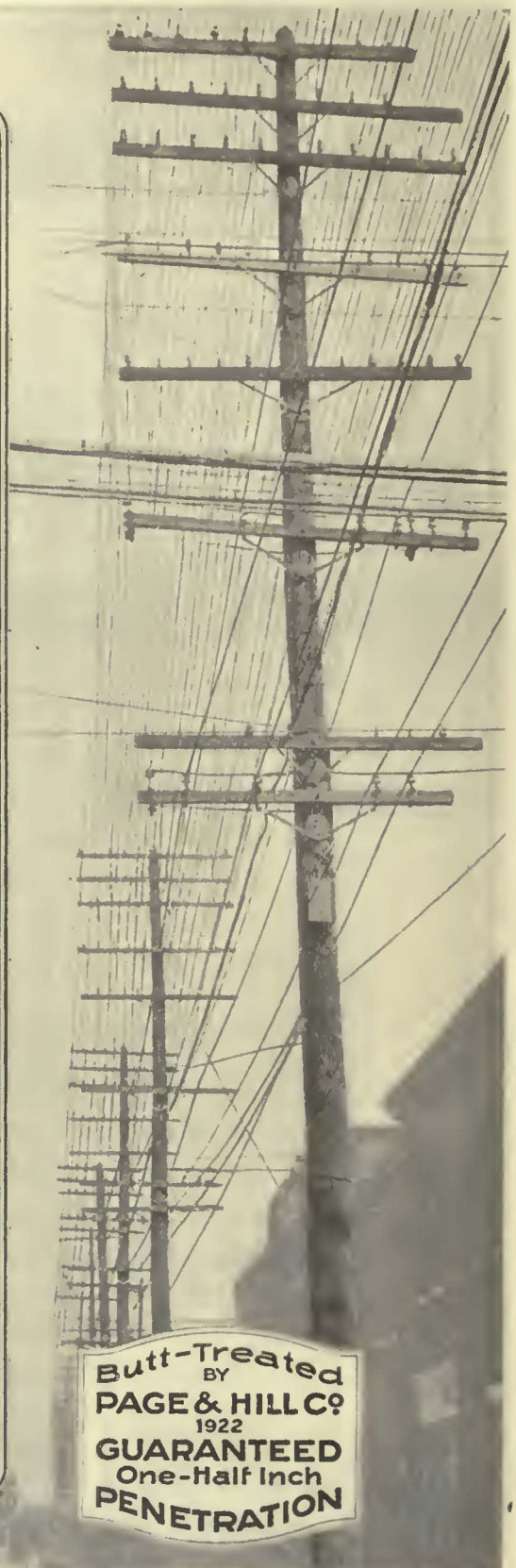
Furthermore, we agree by written guarantee to refund the Butt-Treating price on any pole that does not show the guaranteed half inch penetration.

TAKE NO CHANCES

Specify the *"P & H"* Guaranteed Penetration Process.

We can furnish, promptly, treated and untreated Northern White and Western Red Cedar Poles—any form of Butt-Treatment—and we are giving to pole-users the first Guaranteed Penetration Process ever offered in the pole industry—the *"P & H"*

Send for a copy of our interesting booklet.
"Butt-Treating Cedar Poles at the Page & Hill Plant"



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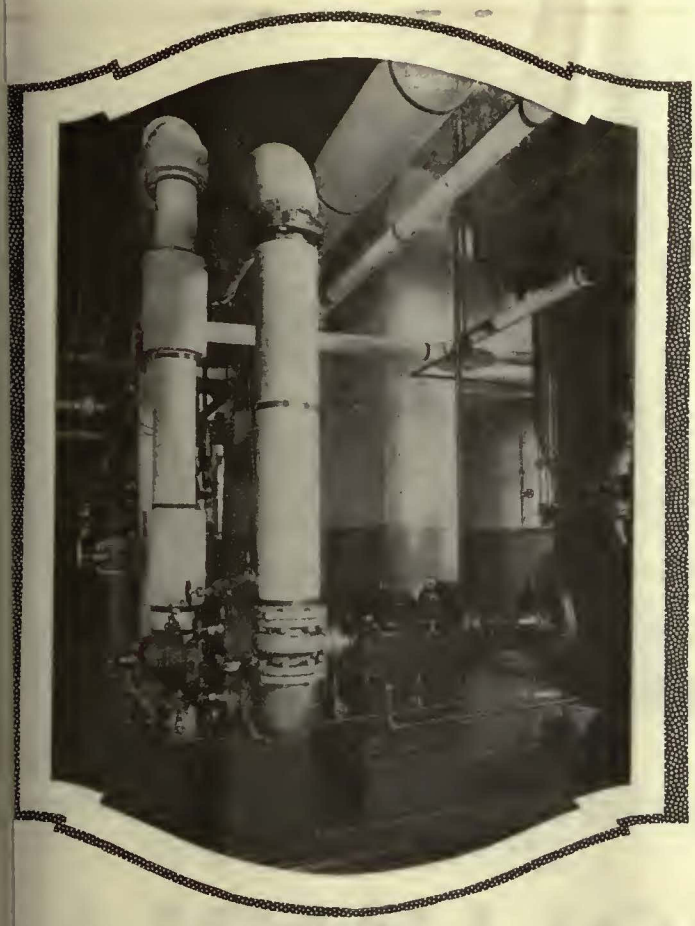

Eliminate Shut-Downs

Terry Turbines receive their energy directly from the boiler, avoiding the cycle of main unit, generator, fuses, switchboard and wiring required by motors.

Terry Turbine and Gears driving Condenser Removal Pump. If this unit should shut down, the main unit would have to be stopped long enough to permit the condenser shell to cool before condensing operation could again be resumed.

When selecting the drive for power plant auxiliaries, the significance of the above statement should be borne in mind. What more direct method of eliminating shutdowns could be devised than to eliminate the external sources of shutdown? Then dependability of service would rest only with the driving apparatus itself.

The single-stage steam turbine is the most simple prime mover. It cannot be injured from overload, making it unnecessary to provide an efficient over-size unit. Its fuel consumption per horsepower is less than one-quarter that of the most efficient condensing turbine. It is, in short, the ideal drive for auxiliaries.

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THE TERRY TURBINE

Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

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Springtime means more linework

Figure your line renewals now and start getting quotations on materials.

Columbia Ears are made according to well-tested designs. Only fresh metals, correctly alloyed for maximum durability, are used.

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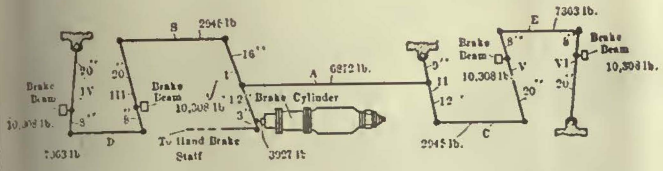

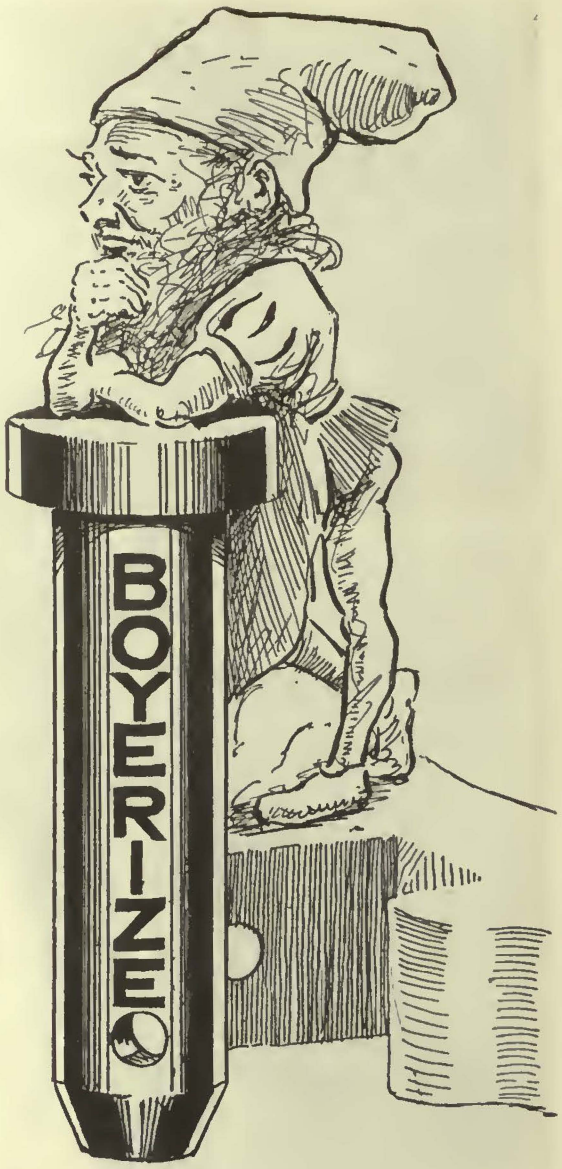

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Boyerizing Reduces Loss!

Every worn joint in the brake rigging means useless "play" and requires additional piston travel to take it up. Compressed air costs too much to be wasted unnecessarily.

Boyerized pins and bushings wear three or four times as long as ordinary untreated ones. They save their own cost many times over in longer life and reduced lost motion.

Brake Hangers
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Some people think that when they stay in a rut and continue to use out-of-date material as long as their maintainance cost is not more than for previous years, they have lost nothing

That's all wrong: if there's something better and you pass it up, you lose the difference between your present costs and what they might be. It's not a loss on the ledger but a loss against your efficiency.

Think this over in terms of "Tool Steel" guaranteed saving gears and pinions.

Imperial under electric railway.

IMPERIAL Riveted TONCAN METAL **Corrugated CULVERTS**

Under the more important stretches of track —where dependability is the chief requisite —there you will find IMPERIAL Riveted Corrugated Culverts. Made of anti-corrosive Toncan Metal, they can be depended upon to give perfect service for years and years. Those installed over fourteen years ago show no signs of rusting thru.

IMPERIALS are made in all of the standard diameters. Can ship within a few dsys after receiving order. Write for delivered prices.

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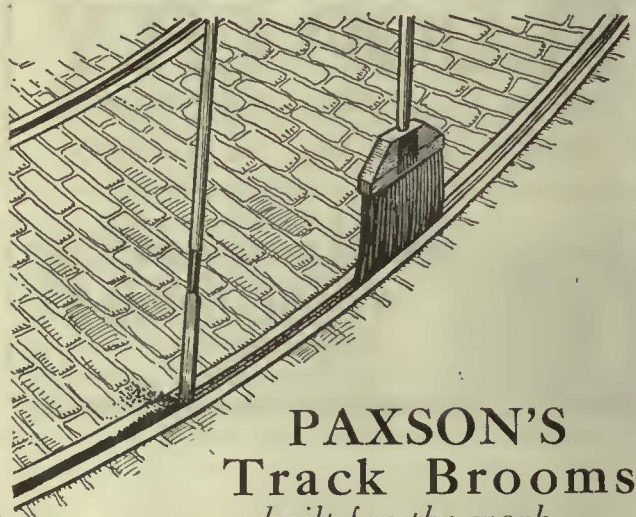
CHICAGO
NEW YORK



PAXSON'S Track Brooms
—built for the work

The broom part is flat spring-steel wire. The chisel on the other end of the handle will loosen any obstruction, and the broom will throw it.

Send for a sample.

J. W. PAXSON CO.
Philadelphia, Pa.
Nicetown Lane and D Street

FOUNDRY AND MACHINE SUPPLIES AND EQUIPMENT
J.W. PAXSON CO.
MOULDING SAND
PHILADELPHIA, PA.

DON'T FORGET

to consult the

SEARCHLIGHT SECTION

of this issue

It may hold the very opportunity for which you have been seeking

If you do not find what you want, perhaps a small ad will help you.

DISPLAYED ADS
$5 or less per inch

UNDISPLAYED ADS
***Positions Wanted*—4 cents a word**
***All Others*—8 cents a word**

0168

ELECTRIC RAILWAY JOURNAL

Think "SEARCHLIGHT" First

ADVERTISING RATES

POSITIONS VACANT—Business Opportunities and other undisplayed ads, 8 cents a word, minimum $2.00 an insertion.

POSITIONS WANTED—Evening work wanted, tutoring and other undisplayed ads of individuals looking for employment, 4 cents a word, minimum 75 cents, payable in advance.

ADD 5 WORDS for box number in undisplayed ads if replies are to any of our offices. There is no extra charge for forwarding replies.

DISCOUNT OF 10% if one payment is made in advance for 4 consecutive insertions of undisplayed ad.

ADS IN DISPLAY TYPE—Space is sold by the inch (30 in. to a page), the price depending upon total space used within a year, some space to be used each issue.

RATE PER INCH for ads in display space:

1 to 3 in., $4.50 an in.	15 to 29 in., $3.80 an in.
4 to 7 in., $4.30 an in.	30 to 49 in., $3.50 an in.
8 to 14 in., $4.10 an in.	50 to 99 in., $3.70 an in.

POSITIONS VACANT

ENGINEER of maintenance of way wanted by city property in Middle West; young graduate civil engineer with some practical experience preferred. P-412, Elec. Ry. Jour., Leader-News Bldg., Cleveland.

RAILWAY overhead line foreman wanted. Location, eastern Pennsylvania. Must be capable and able to handle entire overhead railway line work. Application will not be considered unless fully qualified. State salary and send references. P-411, Elec. Ry. Jour., Real Estate Trust Bldg., Phila.

POSITIONS WANTED

EDITOR or assistant; 16 years' experience electric railway, light and power; references. PW-409, Elec. Railway Jour.

WENTY years' experience all branches city and interurban railways, wish connection as master mechanic, large property, or manager small company; also had charge maintenance work, 225 motor trucks, 3 years. PW-414, Elec. Ry. Jour., Old Colony Bldg., Chicago.

AR painter wants position, all-around man, years of fine experience. Would take charge, and do lettering. PW-408, Elec. Ry. Journal.

ASTER MECHANIC or general foreman; 22 years' experience on all types of railway motors, also one-man cars and line work; A-1 reference. PW-407, Elec. Ry. Journal.

PERINTENDENT construction, catenary trolley, trolley, high tension transmission, either pole or tower, capable handling complete layout; start $300 per month. PW-406, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

PERINTENDENT of transportation, with a proven record of 17 years in electric railway field on large city and interurban properties, desires a change and will consider any good size property that requires a capable superintendent of transportation that has the ability to take over details and get results. Very successful in handling labor, capable of building up an organization that would add to value of any property. Best of references from men of highest integrity in railway field. Personal reasons for desiring change. PW-404, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

AGENTS AND SALESMEN

Salesman Wanted

lling on street railways to sell our products as a side line. AS-413, Elec. Ry. Jour., Leader-News Bldg., Cleveland.

700 tons new 9 in.

GIRDER RAIL

Penna. Steel Co. Section 228, 107 lb. to the yard. Attractive price upon application. Subject to R. W. Hunt & Company's Inspection. Prompt shipment.

H. M. FOSTER COMPANY
Continental Building, Baltimore, Md.

ROTARY CONVERTERS

1—500 kw. Westinghouse, 3 phase, 60 cycle, 260 volts A.C.; 600 volts D.C.; 400 r.p.m., with 2—200 kw. Westinghouse 2400/380 volt transformers, also switchboard.

2—300 kw. Stanley, 3 phase, 25 cycle, 380 volts A.C.; 600 volt D.C.; speed, 500 r.p.m.; complete, with suitable transformers, also panels.

1—300 kw. Westinghouse, 3 phase, 60 cycle, 370 volts A.C.; 575 volts D.C.; 600 r.p.m.

MOTOR GENERATOR SETS

2—1000 kw. General Electric Synchronous Motor Generator Sets, each consisting of 1—1000 kw., 600-volt type MPC, 514 r.p.m., D.C. generator, and 1—1400 kva., 3 phase, 60 cycle, 2300/4000 volt, 514 r.p.m. synch. motor.

DIRECT CONNECTED ENGINE UNIT

1—850 kw. Gen. Elec. 575-volt Compound Wound 100 r.p.m. Generator, direct connected to 22 and 54 x 48 Greene Wheelock cross compound heavy duty 4-valve engine, complete with surface condensing equipment and panel; price, f.o.b. cars, $7,500.

ARCHER & BALDWIN, Inc., 114 Liberty St., New York City
Telephone 4337-4338 Rector

STANDARD FLATCARS—$350.00 Each

50 cars, 60,000 lbs. capacity, 8 sill constr., 36 ft. long, Simplex trucks, passing all MCB and ICC requirements; immediate shipment.

S. W. LINDHEIMER, First National Bank Bldg., Chicago

FOR SALE

SECOND HAND CARS

trucks and motors

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Phila., Pa.

FOR SALE

22 New G. E. 203 P

MOTORS

TRANSIT EQUIPMENT CO.
501 Fifth Ave., New York

SOME ONE WANTS TO BUY

the equipment or machinery that you are not using.

This may be occupying valuable space, collecting dust, rust and hard knocks, in your shops and yards.

SELL IT BEFORE DEPRECIATION SCRAPS IT

THE SEARCHLIGHT SECTION
IS HELPING OTHERS

—LET IT HELP YOU ALSO

0128

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

Advertising, Street Car
Collier, Inc., Barron G
Air Receivers & Aftercoolers
Ingersoll-Rand Co.
Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Anti-Climbers
Railway Improvement Co.
Armature Shop Tools
Armature Coil Equip. Co.
Elec. Service Sup. Co.
Axles
Bemis Car Truck Co.
Cambria Steel Co.
Midvale Steel & Ord. Co.
St. Louis Car Co.
Axle Straighteners
Columbia M. W. & M. I. Co.
Axles, Car Wheels
Bemis Car Truck Co.
Brill Co., The J. G.
Westinghouse E. & M. Co.
Babbitt Metal
Ajax Metal Co.
More-Jones B. & M. Co.
Babbitting Devices
Columbia M. W. & M. I. Co.
Western Electric Co.
Badges and Buttons
Elec. Service Sup. Co.
Int. Register Co., The
Batteries, Dry
National Carbon Co.
Western Electric Co.
Batteries, Storage
Western Electric Co.
Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co
Columbia M. W. & M. I. Co.
General Electric Co.
More-Jones Br. & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.
Bearings, Center and Roller Side
Burry Railway Supply Co.
Stucki Co., A.
Bells and Gongs
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Consolidated Car Heating Col.
Elec. Service Sup. Co.
St. Louis Car Co.
Benders, Rail
Western Electric Co.
Boilers
Babcock & Wilcox Co.
Boiler Tubes
Cambria Steel Co.
Midvale Steel & Ord. Co.
Bond Testers
Amer. Steel & Wire Co.
Elec. Serv. Sup. Co.
Rail Welding & Bonding Co.
Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Rail Welding & Bonding Co.
Railway Track-work Co.
Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Rail Welding & Bonding Co
Westinghouse E. & M. Co.
Book Publishers
McGraw-Hill Book Co., Inc.
Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
Bates Exp. Steel Tr. Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
Hubbard & Co.
Ohio Brass Co.
Western Electric Co.
Brake Adjusters
Gould Coupler Co.
National Ry. Appliance Co.
Smith-Ward Brake Co.
Westinghouse Tr. Br. Co.
Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
St. Louis Car Co.
Weierbach Brake Shoe Co.
Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.
Brooms, Track, Steel or Rattan
Amer. Rattan & Reed Mfg. Co.
Paxson Co., J. W.
Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
National Carbon Co.
Western Electric Co.
Westinghouse E. & M. Co.
Brushes Graphite
National Carbon Co.
Brushes Wire Pneumatic
Ingersoll-Rand Co.
Brush Holders
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
Buses, Motor
Brill Co., The J. G.
Bushings
Nat'l Fibre & Insulation Co.
Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., J. G.
Cables. (See Wires and Cables)
Carbon Brushes (See Brushes, Carbon)
Car Panel Safety Switches
Consolidated Car Heating Co.
Westinghouse E. & M. Co.
Cars
Cambria Steel Co.
Midvale Steel & Ord. Co.
Cars, Dump
Differential Steel Car Co.
Car Lighting Fixtures
Elec. Service Sup. Co.
Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg Co.
Midvale Steel & Ord. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.
Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.
Cars, Self-Propelled
General Electric Co.
Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
Columbia M. W. & M. I. Co.
More-Jones Br. & Metal Co.
Castings, Gray Iron and Steel
Ajax Metal Co.
Amer. Steel Foundries
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Castings, Malleable and Brass
Amer. Br. Shoe & Fdy Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
St. Louis Car Co.
Catchers and Retrievers, Trolley
Earll, Chas. I.
Elec. Service Sup. Co.
Ohio Brass Co.
Wood Co., Chas. N.
Catenary Construction
Archbold-Brady Co.
Circuit-Breakers
Cutter Elec. Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Clamps and Connectors for Wires and Cables
Anderson Mfg. Co, A. & J. M.
Elec. Ry. Equipment Co
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Western Electric Co.
Westinghouse E. & M. Co.
Cleaners and Scrapers—Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
Western Electric Co.
Cinsters and Sockets
General Electric Co
Coal and Ash Handling (See Conveying and Hoisting Machinery)
Coasting Recorders
Railway Improvement Co.
Code Signal Systems
Western Electric Co.
Coil Banding and Winding Machines
Armature Coil Equip. Co.
Columbia M. W. & M. I. Co.
Elec. Service Sup. Co.
Coils, Armature and Field
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse Elec. & M Co.
Coils, Choke and Kicking
Elec. Service Sup. Co.
General Elec. Co.
Western Elec. Co.
Westinghouse Elec. & M. Co.
Coil Forming Machine
Armature Coil Equip. Co.
Coin Counting Machines
Intern'l Register Co., The
Johnson Fare Box Co.
Commutator Slotters
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.
Commutator Truing Devices
General Electric Co.
Commutators or Parts
Cameron Elec'l Mfg. Co.
Cleveland Armature Works
Columbia M. W. & M. I. Co.
General Electric Co.
Mica Insulator Co.
Western Electric Co.
Westinghouse E. & M. Co.
Compressors, Air
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.
Compressors, Air Portable
Ingersoll-Rand Co.
Concrete Products
Massey Concrete Prods. Co.
Concrete Reinforcing Bars
Cambria Steel Co.
Midvale Steel & Ord. Co.
Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.
Connectors, Soldierless
Westinghouse E. & M. Co.
Connectors, Trailer Car
Consolidated Car Heating Co.
Elec. Service Sup. Co.
Controllers or Parts
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.
Controller Regulators
Elec. Service Sup. Co.
Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.
Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Conveying and Hoisting Machinery
Columbia M. W. & M. I. Co.
Copper Wire
Anaconda Copper Mining Co.
Cord Adjusters
Nat'l Fibre & Insulation Co
Cord, Bell, Trolley, Register, etc.
Brill Co., The J. G.
Elec. Serv. Sup. Co.
Intern'l Register Co., The
Roebling's Sons Co., John A.
Samson Cordage Works
Cord Connectors and Couplers
Elec. Service Sup. Co.
Samson Cordage Works
Wood Co., Chas. N.
Couplers, Car
Amer. Steel Foundries
Brill Co., The J. G.
Gould Coupler Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co
Cranes
Allis-Chalmers Mfg. Co.
Cross Arms (See Brackets)
Crossing Foundations
International Steel Tie Co.
Crossing Signals (See Signals, Crossing).
Crossing, Frog & Switch
Wharton, Jr., & Co., Wm.
Crossings, Track (See Track, Special Work).
Culverts
Canton Culvert & Silo Co.
Culvert Pipe Concrete
Massey Concrete Prods. Co.
Curtains and Curtain Fixtures
Brill Co., The J. G.
Elec. Service Sup. Co.
Morton Mfg. Co.
St. Louis Car Co.
Dealer's Machinery
Archer & Baldwin
Cleveland Armature Works
Elec. Equipment Co.
Foster Co., H. M.
Derailing Devices (See also Track Work).
Wharton, Jr., & Co., Wm.
Destination Signs
Columbia M. W. & M. I. Co.
Elec. Service Sup. Co.
Detective Service
Wish-Service, P. Edward
Dogs, Lathe
Williams & Co., J. H.
Door Operating Devices
Con. Car Heating Co.
National Pneumatic Co., Inc.
Brill Co., The J. G.
General Electric Co.
Safety Car Devices Co.
Door & Door Fixtures
Hale & Kilburn Corp.
Doors, Folding Vestibule
National Pneumatic Co., Inc.
Draft Rigging (See Couplers)
Drills, Rock
Ingersoll-Rand Co.
Drills, Track
Amer. Steel & Wire Co.
Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.
Dryers, Sand
Elec. Service Sup. Co.
Electric Grinders
Seymour Rail Grinder Co., E. P.
Electrical Wires and Cables
Amer. Electrical Works
Roebling's Sons Co., J. A.
Engines, Gasoline
Climax Eng. Co.
Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beeler, John A.
Day & Zimmerman, Inc.
Drum & Co., A. L.
Engel & Hevenor, Inc.
Feuatel, Robert M.
Ford, Bacon & Davis
Gould, L. E.
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Richey, Albert S.
Sanderson & Porter
Smith & Co., C. E.
Stone & Webster
White Eng. Corp., The J. G.
Witt, Peter
Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.
Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.
Fence
Cambria Steel Co.
Midvale Steel & Ord. Co.
Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.
Fenders and Wheel Guards
Brill Co., The J. G.
Cleveland Fare Box Co.
Elec. Service Sup. Co.
Star Brass Works
Western Electric Co.
Fibre and Fibre Tubing
Continental Fibre Co.
Nat'l Fibre & Insulation Co
Westinghouse E. & M. Co.
Field Coils (See Coils).
Flaxlinum Insulation
Nat'l Ry. Appliance Co.
Floodlights
Elec. Service Sup Co.
Western Electric Co.
Flooring Composition
Amer. Mason Safety Tread Co.
Floor Plates
Amer. Abrasive Metals Co
Forgings
Cambria Steel Co.
Columbia M. W. & M. I. Co
Midvale Steel & Ord. Co.
Williams & Co., J. H.
Frogs, Track (See Track Work)
Funnel Castings
Wharton, Jr., Inc., & Co., Wm.
Fuses and Fuse Boxes
Columbia M. W. & M. I. Co.
Consolidated Car Heating Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Williams & Co., J. H.
Fuses, Refillable
Columbia M. W. & M. I. Co
General Electric Co.
Gaskets
Power Specialty Co.
Westinghouse Tr. Brake Co.
Gas-Electric Cars
General Electric Co.
Gas Producers
Westinghouse E. & M. Co
Gates, Car
Brill Co., The J. G.
Gear Blanks
Cambria Steel Co.
Midvale Steel & Ord. Co.
Gear Cases
Chillingworth Mfg. Co.
Columbia M. W. & M. I. Co.
Elec. Service Sup. Co.
Westinghouse E. & M. Co.
Gears and Pinions
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Elec. Service Sup. Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.
Generating Sets, Gas-Electric
General Electric Co.
Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.
Gong (See Bells and Gongs)
Greases (See Lubricants).
Grinders and Grind. Supplies
Railway Track-work Co.
Western Electric Co.
Grinding Blocks and Wheels
Railway Track-work Co.
Guards, Trolley
Elec. Service Sup. Co.
Ohio Brass Co.
Hammers Pneumatic
Ingersoll-Rand Co.
Harps, Trolley
Anderson Mfg. Co., A. & J. M.
Bayonet Trolley Harp Co.
Elec. Service Sup. Co.
More-Jones Br. & Metal Co.
Nuttall Co., R. D.
Star Brass Works
Western Electric Co.
Headlights
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.
Heaters, Car (Electric)
Consolidated Car Heating Co.
Gold Car Heat. & Light. Co.
Nat'l Ry. Appliance Co., P.
Smith Heater Co., Peter
Heaters, Car, Hot Air and Water
Smith Heater Co., Peter
Heaters, Car (Stove)
Elec. Service Sup. Co.
Smith Heater Co., Peter
Hoists and Lifts
Columbia M. W. & M. I. Co.
Ford Chain Block Co.
Hoists, Portable
Ingersoll Rand Co.
Houses, Station & Watchmen's Concrete
Massey Concrete Prod. Corp.
Hydraulic Machinery
Allis-Chalmers Mfg. Co
Instruments Measuring, Testing and Recording
Elec. Service Sup. Co.
General Electric Co.
Thompson-Levering Co.
Westinghouse E. & M. Co.
Insulating Cloth, Paper and Tape
General Electric Co.
Mica Insulator Co.
National Fibre & Insulation
Standard Underground Cable Co.
Western Electric Co.
Westinghouse E. & M. Co
Co.
Insulating Varnishes
Sterling Varnish Co., The

Around Frogs, Switches and Cross Overs

"IMPERIAL" Pneumatic Tie Tampers are just as effective in difficult places as on straight track. They do good work even in the most cramped quarters—where hand picks and bars are awkward and inefficient. They make good track all along the line.

Besides having this ability to thoroughly tamp all the track, "Imperials are great labor savers. Four men with these tools will do more and better work than twelve to fifteen men using hand picks and bars.

Ask for a list of the many users who have made "Imperial" Tampers part of their standard track equipment.

PRICE OIL ENGINES

INGERSOLL-RAND COMPANY
11 Broadway, New York
Offices in all large cities

Ask for Bulletin 9123

165-TT

Ingersoll-Rand

Insulation (See also Paints).
Anderson M. Co., A. & J. M.
Electric Ry. Equipmt. Co.
Electric Service Sup. Co.
General Electric Co
Sterling Varnish Co., The
Western Electric Co.
Westinghouse E. & M. Co.

Insulators (See also Line Material)
Anderson, M. Co., A. & J. M.
Electric Ry. Equipmt. Co.
Electric Service Sup. Co.
General Electric Co.
Hemingray Glass Co.
Ohio Brass Co.
Pittsburgh High-Voltage Insulator Co.
Western Electric Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Sup. Co.
Hubbard & Co.

Insurance, Fire
Marsh & McLennan

Jacks. (See also Cranes, Hoists and Lifts).
Buckeye Jack Mfg. Co.
Elec. Service Sup. Co.

Journal Boxes
Bemis Car Truck Co.
Brill Co, J. G.

Junction Boxes
Standard Underground Cable

Lamps, Guards and Fixtures
Anderson M. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc and Incandescent (See also Headlights).
Anderson, M. Co., A. & J. M.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.

Lanterns, Classification
Nichols-Lintern Co.

Lathe Attachments
Williams & Co., J. H.

Lightning Protection
Anderson M. Co., A. & J. M.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co
Western Electric Co.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
Anderson M. Co., A. & J. M.
Archbold-Brady Co.
Columbia M. W. & M. I. Co.
Electric Ry. Equipmt. Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
More-Jones Br. & Metal Co
Ohio Brass Co.
Western Electric Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Wharton Jr., & Co., Wm.

Locomotives, Electric
General Electric Co.
McGuire-Cummings Mfg. Co.
Westinghouse E. & M. Co

Lubricating Engineers
Galena Signal Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co.
Universal Lubricating Co.
Vacuum Oil Co.

Machine Tools
Columbia M. W. & M. I. Co.

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

Machinery, Insulating
Amer. Insulating Mach. Co.

Manganese Steel Castings
Wharton, Jr., & Co., Wm.

Manganese Steel Special Track Work
Wharton, Jr., & Co., Wm.

Meters (See Instruments)
Elec. Service Sup. Co.

Mica
Mica Insulator Co.

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses, See Buses, Motor

Motormen's Seats
Allis-Chalmers Mfg. Co.
Brill Co., J. G.
Elec. Service Sup. Co.
Wood Co., Chas. N.

Motors, Electric
Western Electric Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
General Electric Co.

Nails
Cambria Steel Co.
Midvale Steel & Ord. Co.

Nuts and Bolts
Barbour-Stockwell Co.
Bemis Car Truck Co.
Columbia M. W. & M. I. Co.
Hubbard & Co.

Oils (See Lubricants).

Omnibuses, See Buses, Motor

Oxy-Acetylene (See Cutting Apparatus Oxy).

Paints and Varnishes (Insulating)
Mica Insulator Co
Sterling Varnish Co., The

Paints and Varnishes for Woodwork
National Ry. Appliance Co.

Pavement Breakers
Ingersoll-Rand Co.

Paving Bricks, Filler and Stretcher
Nelsonville Brick Co.

Paving Material
Amer. Br. Shoe & Fdy Co.
Nelsonville Brick Co.

Pickups, Trolley Wire
Elec. Service Sup. Co.
Ohio Brass Co.

Pinion Pullers
Columbia M. W. & M. I. Co.
Elec. Service Sup. Co.
General Electric Co.
Wood Co., Chas. N.

Pinions (See Gears).

Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Power Specialty Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Pliers, Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Poles, Metal Street
Bates Exp. Steel Truss Co.
Electric Ry. Equipmt. Co.
Hubbard & Co.

Pole Protectors
Amer. Pole Protective Co.

Pole Reinforcing
Amer. Pole Protective Co.
Hubbard & Co.

Poles Post and Piling Concrete
Massey Concrete Prod. Corp.

Poles & Ties Treated
American Pole Protective Co.
International Creosoting & Construction Co.
Page & Hill Co.
Pole Protection Co.
Western Electric Co.

Poles, Ties, Posts Piling & Lumber
International Creosoting & Construction Co.
Page & Hill Co.
Southern Cypress Co.
Western Electric Co.

Poles, Trolley
Anderson Mfg. Co., A. & J. M.
Bayonet Trolley Harp Co.
Columbia M. W. & M. I. Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

Poles, Tubular Steel
Elec. Ry. Equipmt. Co.
Elec. Service Sup. Co.

Power Saving Devices
National Ry. Appliance Co.
Railway Improvement Co.

Pressure Regulators
General Electric Co.
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Grinders (See Grinders).

Rails
Cambria Steel Co.
Midvale Steel & Ord. Co.

Railway Safety Switches
Consolidated Car Heating Co.
Westinghouse E. & M. Co.

Rattan
Amer. Rattan & Reed Mfg. Co.
Brill Co., The J. G.
Elec. Service Sup. Co.
Hale & Kilburn Corp.
McGuire-Cummings Mfg Co.
St. Louis Car Co.

Reel Rack
Armature Coil Equip. Co.

Registers and Fittings
Brill Co., The J. G.
Elec. Service Sup. Co.
Intern'l Register Co., The
Rooke Automatic Rg. Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

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

Repair Work (See also Coils)
Cleveland Armature Works
Columbia M. W. & M. I. Co.
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Columbia M. W. & M. I. Co.
Elec. Service Sup Co.

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

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

Resistances
Consolidated Car Heating Co.

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

Rheostats
General Electric Co.
Mica Insulator Co.
Westinghouse E. & M. Co.

Rolled Steel Wheels
Cambria Steel Co.
Midvale Steel & Ord. Co.

Sanders, Track
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
Elec. Service Sup. Co.
Nichols-Linterns Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.

Sash, Metal, Car Window
Hale & Kilburn Corp.

Scrapers, Track (See Cleaners and Scrapers, Track)

Seats, Car (See also Rattan)
Amer. Rattan & Reed Mfg. Co.
Brill Co., The J. G.
Hale & Kilburn Corp.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.

Second-Hand Equipment
Archer & Baldwin

Shades, Vestibule
Brill Co., The J. G.

Shovels
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings, Center and Side)

Signals, Car Starting
Con. Car Heating Co.
Elec. Service Sup. Co.
Elec. Pneumatic Co., Inc.

Signal Indicating
Nichols-Lintern Co.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc.
U. S. Elec. Signal Co.
Western Electric Co.
Wood Co., Chas. N.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
U. S. Elec. Signal Co.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A. & J. M.
Bayonet Trolley Harp Co.
Columbia M. W. & M. I. Co.
Electric Ry. Equipmt. Co.
Elec. Service Sup. Co.
More-Jones Br. & Metal Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow-Plows, Sweepers and Brooms
Amer. Rattan & Reed Mfg. Co.
Brill Co., The J. G.
Columbia M. W. & M. I. Co.
McGuire-Cummings Mfg. Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel Foundries
Amer. Steel & Wire Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.

Steel Castings
Wharton, Jr., & Co., Wm.

Steel Freight Cars
Cambria Steel Co.
Midvale Steel & Ord. Co.

Steel and Steel Products
Cambria Steel Co.
Midvale Steel & Ord. Co.
Morton Mfg. Co.

Steps, Car
Amer. Abrasive Metals Co.
Amer. Mason Safety Tread Co.
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Storage Batteries (See Batteries, Storage).

Strand
Cutter Elec. & Mfg. Co.
Roebling's Sons Co., J. A

Straps, Car, Sanitary
Railway Improvement Co

Structural Steel
Cambria Steel Co.
Midvale Steel & Ord. Co.

Superheaters
Babcock & Wilcox Co.
Power Specialty Co.

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

Switches, Selector
Nichols-Lintern Co.
Ramapo Iron Works

Switches, Track (See Track Special Work)

Switches and Switchboards
Allis-Chalmers Mfg. Co.
Anderson Mfg. Co., A. J. & J. M.
Cutter Co.
Elec. Service Supplies Co.
General Electric Co.
Western Electric Co.
Westinghouse E. & M. Co

Tamper Tie
Ingersoll-Rand Co.

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

Telephones and Parts
Elec. Service Supplies Co.

Terminals, Cable
Standard Underground Cable Co.

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

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

Ticket Choppers and Destroyers
Elec. Service Supplies Co.

Tie Plate
Cambria Steel Co.
Midvale Steel & Ord. Co.

Ties and Tie Rods, Steel
Barbour-Stockwell Co.
Dayton Mechanical Tie Co.
International Steel Tie Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

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

Tongue Switches
Wharton, Jr., & Co., Wm.

Tool Holders
Williams & Co., J. H.

Tool Steels
Cambria Steel Co.
Midvale Steel & Ord. Co.

Tools
Western Electric Co.

Tools, Thread Cutting
Williams & Co., J. H.

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Columbia M. W. & M. I. Co
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Torches, Acetylene (See Cutting Apparatus)

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

Towers and Transmission Structures
Archbold-Brady Co.
Bates Exp. Steel Truss Co
Westinghouse E. & M. Co.

Track Expansion Joints
Wharton, Jr., & Co., Inc., Wm.

Track, Special Work
Barbour-Stockwell Co.
N. Y. Switch & Crossing Co
Ramapo Iron Works
Wharton, Jr., & Co., Inc., W

Transfers (See Tickets)

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse E & M. Co.

Treads, Safety, Stair, Car Step
Amer. Abrasive Metals Co.
Amer. Mason Safety Tread Co.
Morton Mfg. Co.

Trolley Bases
Anderson Mfg. Co., A. J. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Nuttall Co., R. D.
Ohio Brass Co.
Trolley Supply Co.

Trolley Bases
Brill Co., The J. G.
General Electric Co.
Westinghouse Elec. & Mfg Co.

Trolley Material
Ohio Brass Co.
Elec. Service Sup. Co.

Trolleys and Trolley Systems
Ford Chain Block Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Roebling's Sons Co., J. A.

Trucks, Car
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Terry Steam Turbine Co.
Westinghouse E. & M. Co.

Turnstiles
Damon-Chapman Co.
Elec. Service Sup. Co.
Perey Mfg. Co., Inc.

Upholstery Materials
Amer. Rattan & Reed Mfg Co.

Valves
Ohio Brass Co.
Westinghouse Tr. Br Co.

Ventilators, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.

Vises, Pipe
Williams & Co., J. H.

Welded Rail Joints
Indianapolis Switch & Frog Co.
Ohio Brass Co.
Rail Welding & Bonding Co

Welders, Portable Electric
Elec. Ry. Improvement Co.
Ohio Brass Co.
Rail Welding & Bonding Co.

Welding Processes and Apparatus
Elec. Ry. Improvement Co.
General Electric Co.
Ohio Brass Co.
Rail Welding & Bonding Co
Westinghouse E & M. Co.

Wheels, Car, Steel and Steel Tired
Amer. Steel Foundries

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.

Wheels, Trolley
Anderson Mfg. Co., A. J. & J. M.
Bayonet Trolley Harp Co.
Columbia M. W. & M. I. Co.
Electric Ry. Equip. Co.
Elec. Service Supplies Co.
Flood City Mfg. Co.
General Electric Co.
H. H. Trolley Supply Co.
More-Jones Br. & Metal Co.
Nuttall Co., R. D.

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Wire
Cambria Steel Co.
Midvale Steel & Ord. Co.

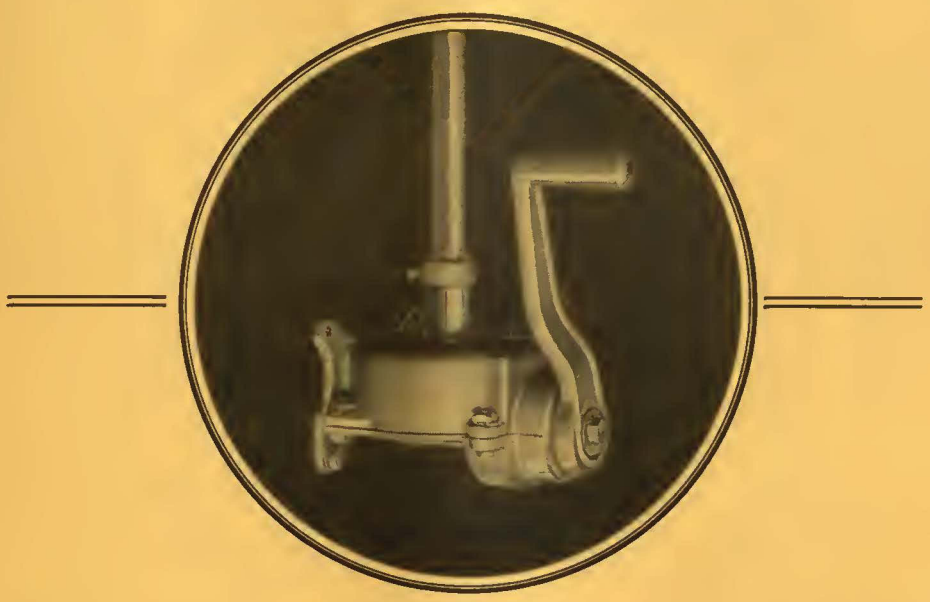
Wire Rope
Amer. Steel & Wire Co.
Roebling's Sons Co., J. A.

Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Roebling's Sons Co., J. A.
Standard Underground Cable Co.
Western Electric Co.
Westinghouse E. & M. Co.

Wrenches
Williams & Co., J. H.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Brill Vertical Handle Brake



An Emergency Brake Developed Particularly for Birney Safety Car Platforms

In presenting the Brill Vertical Handle Brake we are offering a type of brake which will meet every requirement as far as braking power is concerned and which will quickly bring the car to a stop when called upon to do so. By the use of its single handle considerable weight is eliminated, while at the same time it is applicable to Birney Safety Car platforms, allowing sufficient clearance for the operation of the air brake handle and folding platform seat.

The Brill Vertical Handle Brake is now standard equipment for light-weight Safety cars, and may be installed on cars of this type already in service equipped with staff brakes. It is furnished either with suitable stub for welding to brake staff or complete as desired.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.

AMERICAN CAR CO. ST. LOUIS MO. — G.C. KUHLMAN CAR CO. CLEVELAND, OHIO. — WASON MANF'G CO SPRINGFIELD, MASS.

CANADIAN BRILL COMPANY, LTD., PRESTON, ONT.