MAINTENANCE AND CONSTRUCTION ISSUE

ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc. MARCH 16, 1929 Twenty Cents Per Copy

Electric Railway Journal

CHARLES GORDON, *Editor*

JOHN A. MILLER, JR.
Acting Managing Editor
HENRY W. BLAKE
Senior Editor
MORRIS BOCK
Engineering Editor
CLARENCE W. SQUIER
GEORGE J. MACMURRAY
CLIFFORD A. FAUST
L. H. CHURCH, Chicago
PAUL WOOTON, Washington
ALEX MCCALLUM
London, England

LOUIS F. STOLL
Publishing Director

McGRAW-HILL PUBLISHING COMPANY, INC.,
Tenth Ave. at 39th St.,
New York, N. Y.
Cable Address "Machinist, N. Y."
JAMES H. MCGRAW, Chairman of the Board
MALCOLM MUIR, President
JAMES H. MCGRAW, JR.,
Vice-President and Treasurer
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
HAROLD W. MCGRAW, Vice-President
C. H. THOMPSON, Secretary
NEW YORK District Office, 285 Madison Ave.
WASHINGTON, National Press Building
CHICAGO, 7 South Dearborn St.
PHILADELPHIA, 1600 Arch St.
CLEVELAND, Guardian Building
ST. LOUIS, Bell Telephone Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie Street, London E. C. 4.

Publishers of
Aviation
Electrical World
American Machinist
Electrical Merchandising
Engineering and Mining Journal
Chemical and Metallurgical Engineering
Bus Transportation
Power
Coal Age
Radio Retailing
Engineering News-Record
Ingeniería Internacional
Construction Methods
Food Industries
Electrical West
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

SUBSCRIPTION PRICES: United States and its Possessions, Canada, Mexico and other countries taking domestic postage rates, $4 a year. All other foreign countries, $7 a year. Single copy, 20 cents. Published weekly. Entered as second class matter, June 23, 1908, at the Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A.

CHANGE OF ADDRESS
Subscribers are requested to send both the old address and the new address when they move to a new address.
ELECTRIC RAILWAY JOURNAL is official correspondent in the United States for Union Internationale de Tramways, de Chemins de fer d'Intérêt local et de Transports Publics Automobiles.
Member A. B. P. Member A. B. C.
Number of Copies Printed, 9,000

1929

Vol. 73, No. 11 *Pages 419-460*

March 16, 1929

In This Issue

This NEW Molded Material Withstands All

Introducing a New Molded Substance to Strengthen Line Material - -

Moldarta

Something you have been looking for.

It will not soften under intense heat
It will not absorb moisture
It will not change color
It is not fragile
It is very tough
It has high dielectric strength

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA 1929

Westinghouse Electric & Manufacturing Co.
East Pittsburgh Pennsylvania

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

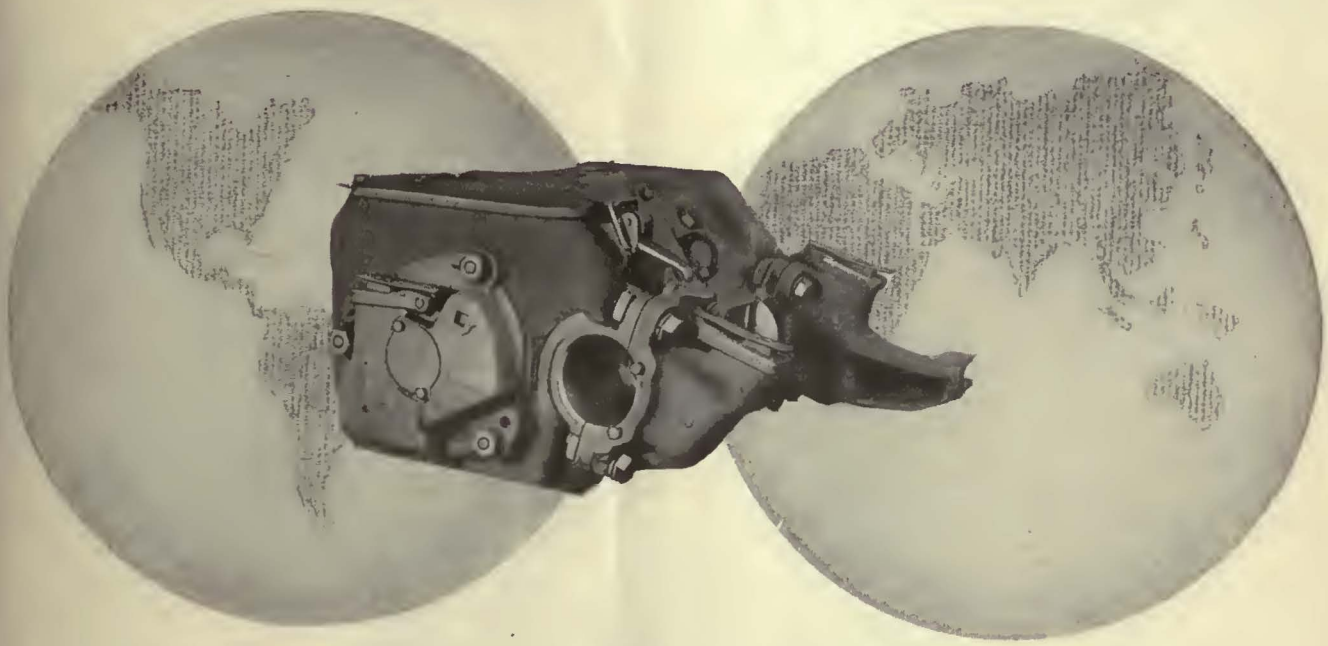
T-30381

Westinghouse

Moldarta Suspension

7500 Type 510 Motors—

(35 Horsepower)



—are useful transportation servants the world over

THERE are 7500 Westinghouse Type 510, 35 horsepower motors powering more than 1900 modern electric street cars at the present time. Most of these cars are in congested city service where frequent stops and high accelerating rates are necessary.

Geographically, the operation of cars equipped with this dependable motor is distributed over numerous transportation arteries in cities throughout 23 states and in 6 countries abroad. Many of its users repeatedly have ordered this motor for their new cars.

The large number in service attests to the ability of the Type 510 motor to withstand the grind of difficult city service with reliable operation, high quality of performance and the minimum cost of upkeep.

The nearest Westinghouse representative will furnish reference to railway properties using the Type 510 motor in your territory, and detailed information about its construction and performance.

Where Type 510 Motors are used

United States

Alabama
Florida
Hawaii
Iowa
Illinois
Indiana
Kansas
Louisiana
Maryland
Massachusetts
Michigan
Missouri
Nebraska
New Jersey
New York
Ohio
Pennsylvania
South Carolina
Texas
Virginia
Washington
West Virginia
Wisconsin

Abroad

Canada
Costa Rica
Japan
Mexico
Newfoundland
Spain

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania

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

Westinghouse

30442

Type B Armature Stand

The Peerless Armature Buggy

Type A Armature Winding Stand

Do you realize the economies of these methods of handling armatures?

Armature handling by primitive, back-breaking methods isn't economy—it takes its toll in energy, damage to armatures and injuries to employees.

From our long experience in the field, we have evolved the simplest, fastest and most efficient methods of handling armatures. Here are three that will pay for themselves in short time:

1. The Peerless Type B Armature stand —two rugged steel adjustable supports with heavy circular bases. Adjustable for height while armature is in position. A table is attached which is convenient for tools when winding and as a seat when putting the leads in the commutator.
2. Peerless Type A armature winding stands consist of two cast iron standards mounted on angle steel sills, one standard permanently attached to the sill, the other being adjustable to various lengths of armatures. Substantial construction hinged shelves at each end for tools or as seat for operator, easy guiding rollers make the Peerless Type A a labor-saver around the shop.
3. The Peerless Armature Buggy—a strong, compact metal truck on easy-guiding pivoted castors, designed for quick, easy handling of armatures around the shops and in the hauls to the bake oven. Two 1¼-inch bronze rollers protect the armature shaft against damage.

All the details on this money-saving equipment on request.

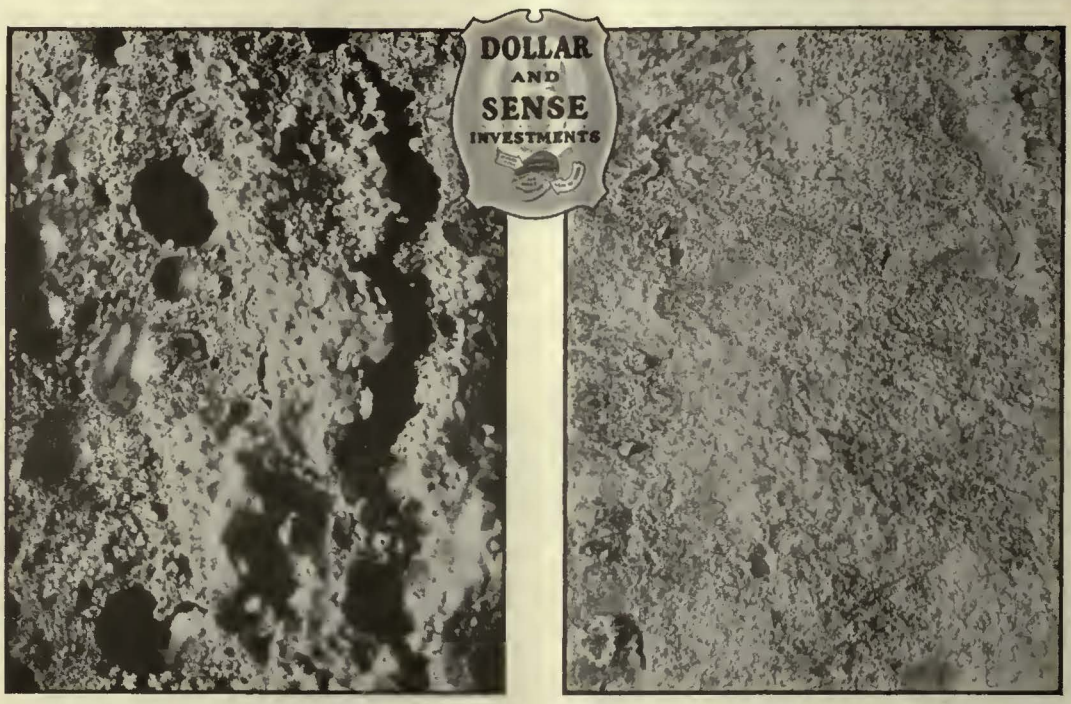
ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.

Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

Factors that Improve



ONE important factor in long service life of rail bonds is proper bonding to the rail. A weld should make a compact, homogenous union with the rail. When it does this low resistance and permanence are assured. To make this possible O-B manufactures Duron Welding Rod—a silicon copper rod for electric arc welding of proved welding qualities.

To illustrate its distinct advantages over ordinary scrap copper wire for welding, two bonds, one welded with Duron Welding Rod and one with copper wire, were sheared from a rail and the sheared surface photomicrographed.

The appearance of the two welds, enlarged four diameters, is shown above. Obviously, the weld made with Duron Welding Rod, (shown at the right) with its fine texture and even union with the rail, will out-live the copper wire weld indefinitely.

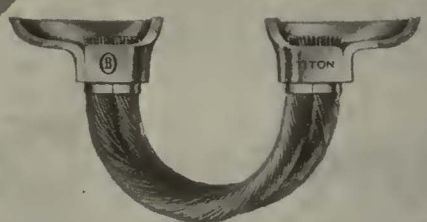
This is a most important factor in bond performance. It indicates the important consideration you should give to Duron Welding Rod.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1011B

Ohio Brass Co.

NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND BOSTON SAN FRANCISCO LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

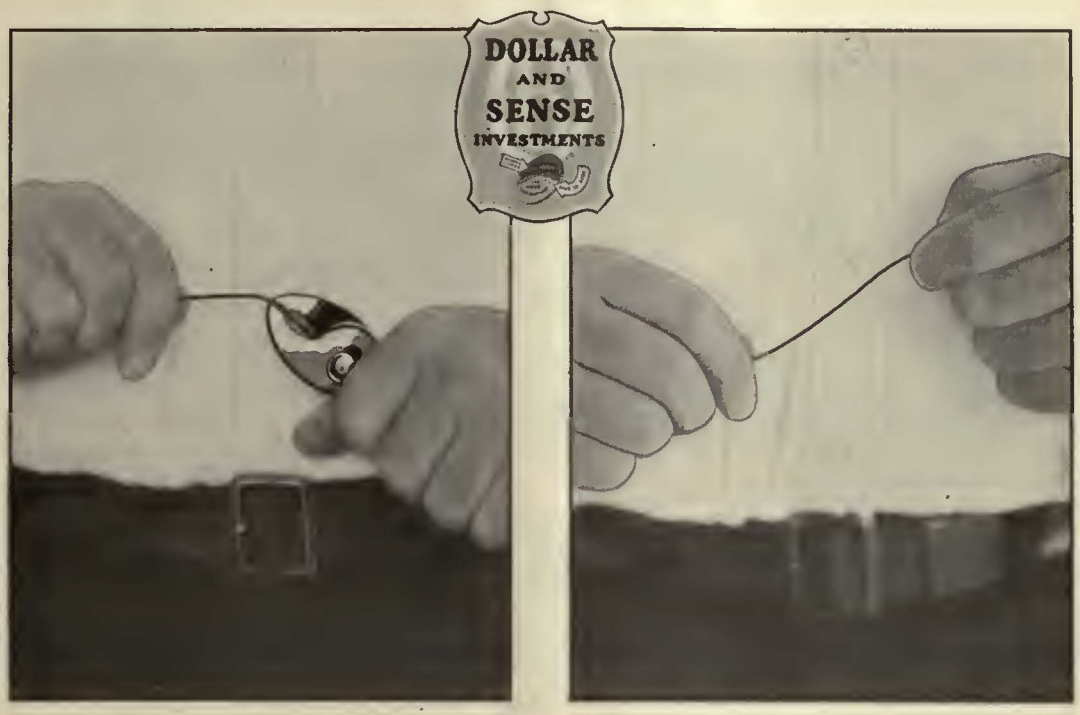


O-B TITON Rail Bond for application to head of rail by copper-alloy Arc-welding process. Page 667, O-B Catalog No. 20.

Terminal of O-B Type AW-12 Rail Bond for application to base of rail by copper-alloy arc-welding process. Standard lengths up to 36 in. Page 670, O-B Catalog No. 20.

O-B Type AW-15 Rail Bond for application to base of rail by copper alloy-arc-welding process. Page 48, Supp. No. 2 to O-B Catalog No. 20.

Bond Performance



EQUALLY important to the long service life of O-B rail bonds is the *Internal Copper Sleeve*—used on all O-B rail bonds. This construction is directly responsible for the small percentage of strand breakage in O-B Bonds.

The illustrations above show why this is true. Hold a piece of wire in a pair of pliers. Bend it back and forth until it breaks. Then hold the wire between the thumb and finger and repeat the experiment. The latter method requires from three to four times as many bends, because of the cushioning effect of the thumb and finger.

The internal copper sleeves act in exactly the same manner, by forming a cushion about the cable and preventing direct contact with the rigid metal of the bond terminal; absorbing the friction and destructive action set up by the vibration of trains passing over the joint.

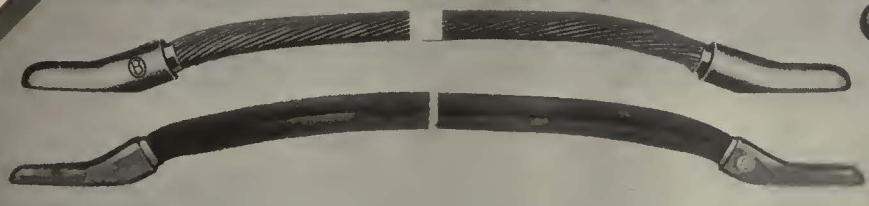
If you are not now obtaining the performance made possible by the Internal Copper Sleeve, you should investigate at once.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
10118

Ohio Brass Co.

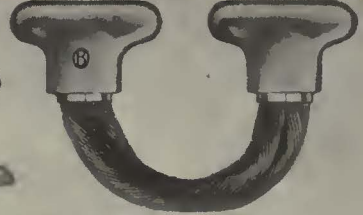
NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA BOSTON SAN FRANCISCO CLEVELAND LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



Above: O-B Type AW-7 Rail Bond for application to base of rail by steel arc-welding process. Standard lengths up to 36 in. Page 664, O-B Catalog No. 20.

Below: O-B Type AW-11 Rail Bond for application to base of rail, under splice plates, by steel arc-welding process. Standard lengths up to 36 inches. Page 669, O-B Catalog No. 20.



O-B Type AW-8 Rail Bond for application to head of rail by steel arc-welding process. Page 666, O-B Catalog No. 20.

Rough riding . . . . .

Some people don't mind it . . . A few actually seem to like it!

But the majority of us prefer a more comfortable conveyance. When it comes to local transportation we like it faster and smoother. And we're willing to patronize and pay the system that gives us what we want.

Rough riding railway track is distinctly out of date. The rubber-tired auto put it out. Regardless of the economic merits of new cars, the public won't ride on them if they're slow and rough riding.

Speed, with smooth-riding comfort, is obtainable only on perfectly straight, even-surfaced track. Only perfect joints will do—or better still, no joints at all.

And this means Thermit-welded, of course. Thermit-welded rail is the answer to the present day problem of suitable track for the modern car.

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

the latest Recommendation from Cincinnati for Revenue Paying Transportation

a smaller Versare Uni
place in city

SEATING 33 or 35 passengers, having extremely fast acceleration (3 miles per hour per second up to 12 miles per hour), this four-wheel gas-electric coach fills a place long vacant in city transportation needs.

For outlying metropolitan service having a fluctuating load requiring maximum capacity in a small unit, or for maximum load requirements of smaller city properties, where traffic movement is always at a faster schedule speed than is possible in more heavily congested districts, this Versare Transportation unit *fits in!* Its quick pick-up insures extremely fast smooth starts, eliminating in the passenger's mind that impression of slowness, present in most coaches as other vehicles pass him. This one feature alone will be a means of retaining and increasing revenue riders.

All construction details are identical with other Versare Units, assuring the same absence of body and other maintenance costs

...which has a definite ...ransportation Systems –

POINTS

1 —*Fastest and smoothest acceleration of any coach on the road, facilitating increased schedule speeds.*

2 —*Unusual hill climbing ability: 15 miles per hour on 12% grade, fully loaded.*

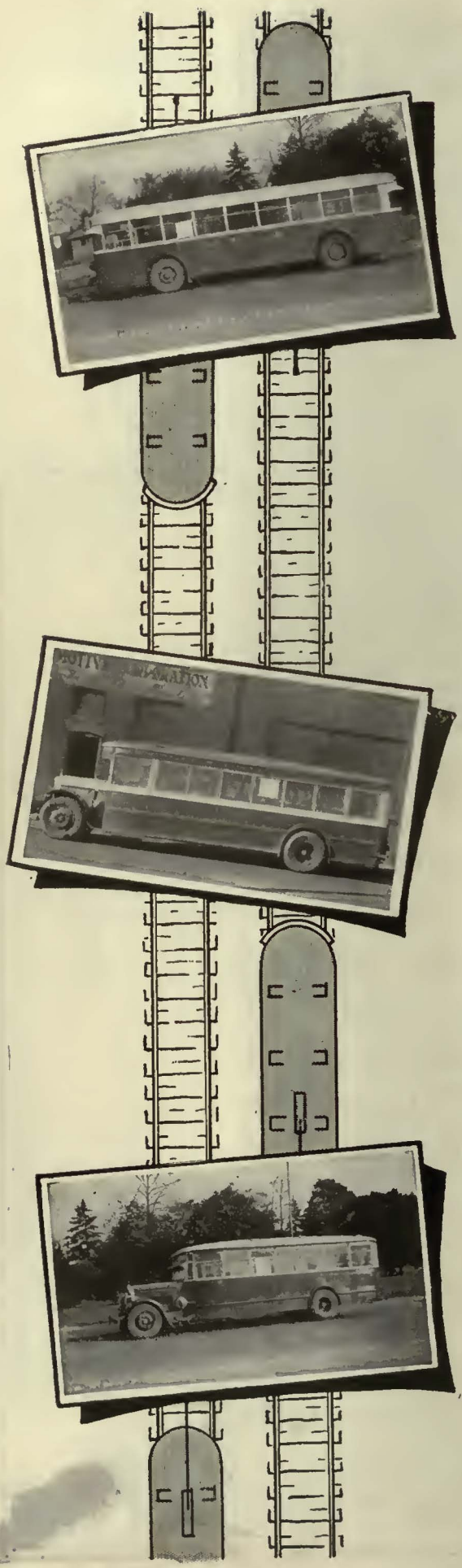
3 —*Unusual accessibility of power unit from all sides.*

ONE of the Versare Coaches of this type started on route shown below. Another will start very shortly on a Western Tour. Special stops along the route may be arranged by a wire to the company.

Cincinnati Car Corporation

WINTON PLACE

CINCINNATI, OHIO



AIR BRAKED BUSES *Improve* Coordinated Service

The Community Traction Company at Toledo, Ohio, is among the many street railway properties that are making great strides toward better service for their patrons by coordination of rail and highway transportation.

In addition to making improvements in the equipment and routing of street cars, this company is operating a number of buses—as feeder lines to new territory—for cross town service—and to supplant rail service on some routes where bus operation fits the case better.

The same degree of prompt and safe transportation is being realized on motor coaches as on rail cars by virtue of their being equipped with air brakes.

The Community Traction Company now operates 66 buses that are equipped with the Westinghouse Air Brake.

Leading automotive manufacturers are now equipping their standard line of commercial vehicles with the Westinghouse Air Brake—thus incorporating a factor that is reflected in maximum safety and earning capacity.

Westinghouse Traction Brake Company
Automotive Brake Division Wilmerding, Pa.

WESTINGHOUSE
AUTOMOTIVE AIR BRAKES

◆◆ BEHIND THE PYRAMIDS—3 ◆◆

Purifying the pitch binder

General view of pitch plant

OUR modern stills for the purification of pitch binders are gas-fired, and are operated under close scientific control. During the distilling process the lighter hydrocarbons are boiled off, and condensed in great water-cooled condensers. The pitch is then distilled out under conditions that hold its characteristics within close limits. This leaves in the still a residue of ash and other materials unsuitable for brush manufacture. Laboratory tests check every step in the process, and prove the quality of the pitch before it is used.

This great care is necessary, even though the pitch is used solely as a binder, for were we to use an impure pitch the quality of our brushes would be affected. Ash, for instance, is most undesirable in a brush, and if our pitch contained ash, that ash would be found in the finished brush and interfere with the operation for which National Pyramid Brushes are famous. The pitch we use is so pure that it can be said to leave within the finished brush nothing but carbon. Our extra-extreme technical care in checking component parts in NCC Brushes insures exact performance. Because NCC Brushes are held to a close standard of manufacture they prove much more efficient in actual practice.

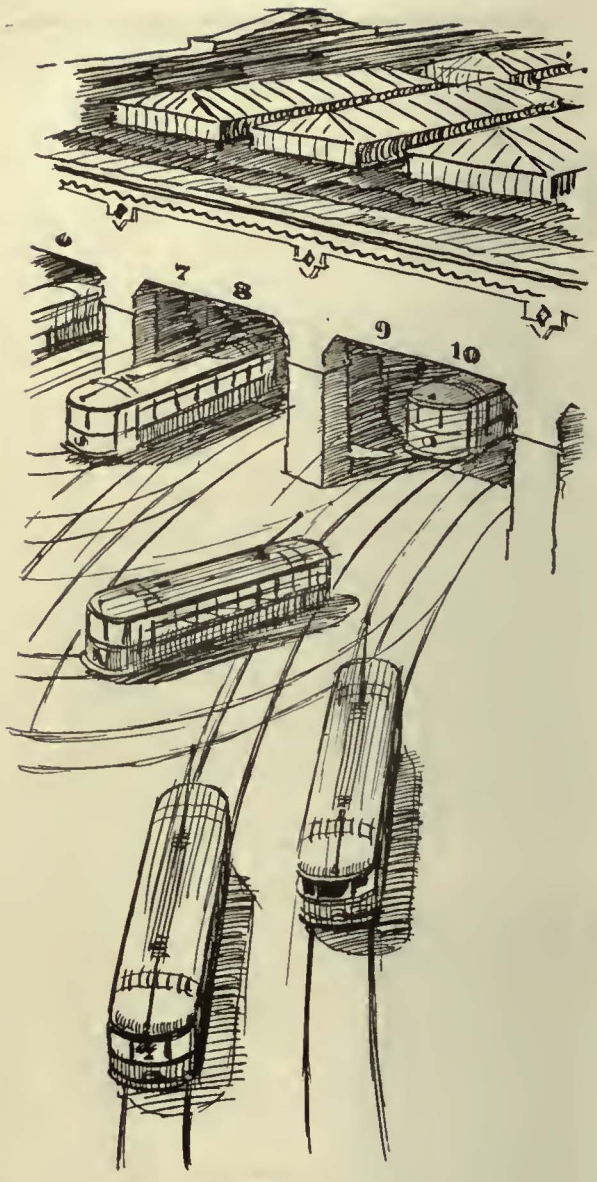
With VARIOUS

Used with brick paving, at Terre Haute, Ind.

Used with concrete paving, at Richmond, Ind.

CAREY Elastite System of Track Insulation is a preformed asphaltic compound, reenforced with asphalt-saturated fibres. A moisture-proof, resilient rail-pavement cushion. Made to fit any rail section; easily installed, regardless of weather conditions.

THE PHILIP CAREY COMPANY,



On the regular car inspections—

How about **your** *wheels?*

When cars are checked at the barns, does the report tell of badly worn wheels, inaccurate shafts and axles? Or does the report read—"Wheels, Axles and Springs O.K.?"

"Standard" Wheels, Axles, Shafts and Springs are made of the stuff which checks "O.K."

Rolled Steel Wheels | *Armature Shafts* | *Axles and Springs*

"FOR EVERY TYPE OF CAR

IN EVERY TYPE OF SERVICE"

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES:

CHICAGO NEW YORK PORTLAND PITTSBURGH
ST. LOUIS HOUSTON RICHMOND SAN FRANCISCO

WORKS: BURNHAM, PA.

A BOOK WITH A *DOUBLE* VALUE TO YOU

The new 150 page Timken Book shows how universal Timken Bearings have become in every kind of equipment—how they have revolutionized operating and maintenance costs wherever wheels and shafts turn throughout all Industry—how they can do the same in all of the equipment used in your plant.

It is of *double* value to you because it contains so much technical information on bearing mountings and installations. It deserves a permanent place in your library. A copy? For the asking!

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW, *Chairman of the Board*
MALCOLM MUIR, *President*
H. C. PARMELEE, *Editorial Director*

CHARLES GORDON, *Editor*

LOUIS F. STOLL, *Publishing Director*

Volume 73 New York, Saturday, March 16, 1929 *Number 11*

A New Kind of "Drive" Is Needed

DURING the last few years there has developed within the electric railway industry a recognition of the fact that the business of urban transportation is to a large extent a merchandising enterprise, that the sale of rides can be fairly compared with the sale of any other commodity, and that one of the principal problems confronting the industry has to do with salesmanship. Yet it must be admitted that one of the greatest essentials for sales success, namely, the training of the sales force, has not received the attention it deserves. However capable the average trainman may be in other respects, it cannot be disputed that, by and large he is none too efficient as a salesman. That is not because he is congenitally inept or incapable of learning, for he has learned to do other things with a commendable degree of efficiency. Indeed, it is in no small measure due to the men on the platform that the industry has been able to hold its ground during these last few difficult years of increasing costs.

Some time ago the call went out for power saving campaign as a means of cutting down expenses. The motorman willingly and ably responded to the appeal by improving his technique of feeding his controller and by taking advantage of every opportunity to coast. Starting as a special "drive," the saving of energy soon passed into regular routine and became a definite part of the duties of a good operator. Similarly, when the drive against accidents was initiated in a further effort to reduce expenses it was to the man on the platform that the appeal was made, and again the response was prompt and effective. The safety movement, starting as a drive, with safety weeks and safety months, has progressed to a point where it is no longer a sporadic effort but a day-to-day job, in which both the conductor and his motorman take a commendable pride. By means of energy saving and accident prevention, both brought about through the intelligent co-operation of the men on the platform, the operating expenses of electric railways have been progressively reduced by many thousands of dollars.

Now the time appears to be at hand to initiate another industry-wide movement, having as its objective the training of the platform man in the sale of rides. From saving energy and avoiding accidents the operator must be called upon to acquire the technique of salesmanship. With little more than the age-old qualities of courtesy and tact and a neat personal appearance upon which to build, he must acquire and put into practice that intangible something, that indefinable quality which will so commend itself to the average patron as to induce him to continue and increase his patronage. Individuals there are in every group of trainmen who already possess this quality to a marked degree. On every property are to be found men with whom the patrons like to ride. With these men as a nucleus around which to build and with the knowledge of sales psychology which is available from other sources, it should be possible to develop the average train force into a group whose presence would be a constructive force in any community. The stake is well worth playing for and a step in this direction would appear to be the next logical development in an industry that must go ahead if it is to survive.

Forward Looking Rapid Transit Project in Cleveland

GREAT things transit-wise appear to be ahead for the city of Cleveland. In one of the most comprehensive plans of its kind ever advanced, the Van Sweringen interests, in a proposal to take over the Cleveland Railway and certain suburban systems, have indicated their true appreciation of the physical side of the problem of supplying suburban service to the modern community. The plans are still in embryo, but even as partially divulged they indicate that the problem of local transit in and about Cleveland is to be approached on the basis of the co-ordination of that service with that of the entrance of the trunk lines into the city. This is most important.

As in so many other cities the situation at Cleveland has plainly become one in which rapid transit for the longer hauls is necessary. At Cleveland, however, it has been recognized that this rapid transit service should be provided by one agency and not by several competing agencies since that means waste in duplication of facilities.

This recognition alone is significant, but it is still more significant that a militant attitude should be adopted toward it and that recognition should be accorded the existing city transit system in the proposal. Contributions of the Van Sweringens to the growth and development of Cleveland have already shown that they, working with the Cleveland Railway, are incomparably better equipped to study and respond to the new and the real needs of the city in this direction than any new company possibly could be. In fact, this is so obvious as to be self-evident.

The vehicle under which the Van Sweringens propose to work is the Metropolitan Utilities, Inc. That company would control practically all of the public transportation facilities in the metropolitan area of Cleveland, and to the new company would be intrusted the further building of such facilities. Stockholders of the Cleveland Railway are being asked to deposit their stock. While it is too early to predict the outcome, acceptance of the proposal by them appears to be assured. President Alexander of that company and other members of the rapid transit committee favor the proposal. As they see it,

operation of competitive facilities would inevitably result in waste and excessive costs, while co-ordinated control and operation of transit facilities in the metropolitan area will result in decreased cost of furnishing service.

In this move Cleveland would appear to take the lead in rapid transit planning under the far-sighted direction of President Alexander and his associates in the Cleveland Railway, and the equally far-sighted planning of the Van Sweringen interests. There may be some occasion for questioning certain economic phases of the plan, particularly the apparent intention to build with private capital rapid transit facilities which involve heavy fixed charges that become a permanent burden on the community's transportation facilities. But in its physical aspects, and in its recognition that public transportation in a community or metropolitan district is a natural monopoly, the Cleveland proposal is a forward-looking enterprise.

Business Does Its Own Purging

COLONEL STEWART of the Standard Oil of Indiana has gone down to defeat in a contest unusual in the annals of American business. Doubtless it was difficult for the employee-stockholders to realize that the debonair chairman of the board who walked pleasantly among them was the same man associated with the story of secrecy and evasion unfolded at Washington, one of the four responsible participants in the affairs of the phantom Continental Trading Company, the books of which were destroyed and the identity of which faded as mysteriously as its form had taken shape.

It is only right that conclusions should be drawn carefully and that the accused should have the benefit of any doubt. There has been much doubt, and on a technical point the jury acquitted the Colonel. But the fact remains that the Supreme Court said of the Continental Trading Company that it "was created for some illegitimate purpose." If the premise be accepted that a profitable end justifies any means, there would be no more to be said. But that premise is not tenable. Dividends are desirable. But they do not rank ahead of ethics. In seeking to make a contest on the issue Colonel Stewart was ill-advised by his friends. As the *Wall Street Journal* so forcefully said, "modern conceptions of corporation management, while demanding business ability still require that something higher than profits shall be shown."

In the defeat of the Colonel for re-election a salutary lesson lasting in its effect appears to have been administered quite as effective as any the courts could have dealt out, since it evidences again the growing disposition of business to administer its own rebuke to proponents of practices among its members that do not square with the revised business morality of the present day.

Adding to the Convenience of the Patron

GOOD merchandising, whether it be of a luxury, a commodity or a service, requires that attention be paid to the convenience of the customer. It must be made easy for him to buy, or he is not likely to undertake the effort unless he is particularly desirous of obtaining what the merchant has to offer. When the sale is that of a service the facilities for making the customer acquainted with the service are an essential part of the product itself. The enormous increase in the use of electricity in the home, for instance, is due in no small part to the many campaigns made directly to the user to show the convenience obtainable with some new device, or to indicate additional uses to which a device already installed may be put.

With transportation systems the problem is the same in principle as it is in other lines of business, but there is considerable difference in the methods that must be employed. For the average patron the rail or bus line is not directly at the door of his home, nor is it always adjacent to his place of business. When the patron gets off his daily beaten path it is necessary for him to learn the most convenient routes and the car schedules.

It is for the benefit of such patrons that the methods used on the London Underground have been developed. These have been discussed in this paper from time to time. In last week's issue appeared a series of illustrations of the latest developments of the Underground to direct its patrons. Destination and route signs are used effectively to prevent confusion and uncertainty on the part of the passenger, so that he may save time and worry. The methods used are the result of careful study, and are of great value in making the use of the transportation facilities pleasant and profitable. Some of them are similar to arrangements in use in this country, while others are entirely novel. A study will indicate that practically every one of them can be adopted here, although some are especially adapted to rapid transit lines. With the present-day demands of the patrons for more convenient transportation service, no company can afford to do otherwise than to adopt similar means of giving the patrons all the information possible as to routes and destinations of its vehicles.

A Property That Helps to Make Circumstance

YEAR after year certain street railways publish annual reports which are most heartening. One of these companies is the Chicago Surface Lines. True, Chicago is a big city—a city of magnificant distances. It is growing fast, but the explanation of the extraordinary record made by that company is not to be found there. The ordinary explanations do not account for the growth in gross receipts from $31,966,049 in 1915 to $62,391,622 in 1928, in total rides from 1,115,312,129 in 1915 to 1,621,215,876 in 1928 under an average fare per ride that has advanced from 2.81 cents in 1915 to 3.80 cents in 1928.

Circumstances of the growth of Chicago and other economic factors do, of course, play some part in the final record. But under similar circumstances other systems elsewhere show an entirely different trend. Furthermore, the rate of fare charged by the Chicago Surface Lines is 7 cents, which is considerably less than the average for the industry. For the explanation of the unusual results achieved by this property in increasing riding and earnings one must look beyond mere circumstances to the attitude of the management itself. Even there one finds little that is spectacular or novel. In the last analysis, this property is producing results by the simple process of putting into practice the principles which have been widely discussed within the industry for several years.

First of all, the Chicago Surface Lines management has confidence in the possibilities of the local transportation business. It believes that patronage can be attracted by improvement of service, and it has more than proved

this to be a fact. For several years the property has been speeding up its cars to the uttermost and striving toward the objective of "a car in sight" as a policy for increasing off-peak riding. The extent to which this policy has been applied is reflected in a service increase for the fiscal year ended Jan. 31 of 728,354 passenger car and bus-miles. Every year since 1922 there has been a corresponding increase in traffic. For the year just closed the increase in total rides was 35,774,749 and in revenue passengers 10,355,973. All the more remarkable is this record since, as the ELECTRIC RAILWAY JOURNAL has pointed out before, the system is without adequate credit and is operating under temporary franchise extensions due largely to a badly muddled political situation and no real assurance of its future operating rights.

Keeping up to date is a fetish with this management. A new world's record for the operation of every car on five successive days was established by the Chicago Surface Lines for the period Dec. 17 to Dec. 21, inclusive, when 3,639 cars were in service. Such records are merely some of the talismans that tell the tale. Too many street railways, far too many, wait upon circumstance. The Chicago management helps to make circumstance, where circumstance is within the possibility of its molding.

Electrification Receiving New Impetus

QUIETLY but steadily the work of electrifying the steam railroads is going ahead. The article appearing in the JOURNAL this week treating of the expansion of the facilities for power supply to handle the trains of the Pennsylvania Railroad in the Philadelphia-Wilmington district gives an indication of the magnitude of the work involved. While the installation is made necessary by the extension of the electrified zone to Wilmington, already in service, the present demand is much less than will be the demand when the electrification northward to New York is completed and all the trains in the vicinity of Philadelphia are moved with electric power.

Electrification has been facilitated greatly by the use of power purchased from the local utility company, as it is in Philadelphia, and as it is planned to do with other electrification projects of the Pennsylvania. The power loads in railway service are large and fluctuate over a wide range, so that if independent power plants are built they must be of great maximum capacity compared with the average. When purchased power is used it is possible, on the contrary, to adjust schedules so that train movements, particularly of freight and certain long-distance passenger trains, are made at such times that the additional power does not add in full value to the industrial and lighting peak. Thus the railroad can obtain power at a cost usually less than if it were generated in the company's own plants, and the investment of the railroad itself is reduced materially, since power facilities are one of the major items in the cost of electrification.

The installation discussed in the present article is only a small part of the entire project being put through by the Pennsylvania. While this project when completed will be the largest in America, other roads in the United States already have electrification work under way or have announced plans that represent major additions in the progress of electrification. These have been referred to in this paper from time to time. In the aggregate the contracts already made will increase the mileage of electrified track in the United States within the immediate future by about 2,000 miles, or 50 per cent of the existing mileage shown in the review published in the issue of Jan. 12. It also is well known that other railroads have been studying the subject intensively. The success of the present electrifications and the great advantages, particularly in the handling of heavy traffic, of electric operation, are bound to bring about an extension far beyond what has yet taken place or been announced.

Lack of Regulation Is Taxicab Weakness

IF ONE were to judge from surface indications alone it would appear as though the taxicab had elected to follow the path of the discredited jitney. Of course, this is not the case as the taxicab has a legitimate place in the transportation picture along with the street car and the rapid transit train, but certain recent developments in which taxicabs have been involved are anything but reassuring to those who have any interest in the future of this very much troubled industry.

From many sections of the country, from large cities as well as small, come accounts of taxicab wars, of the attempted establishment of single-fare or zone-fare taxicab systems and of the difficulties arising out of various and sundry attempts of taxicab owners and operators to make money by selling goods below cost. Seldom do we hear of a competitive taxicab system bidding for business upon the basis of better service, of safer service or of more courteous drivers. Always it is lower fares or longer hauls for the same fare. And all attempts of this nature lead inevitably to the same result, the failure of the operators, poorer service instead of better, and loss of credit and disillusionment all around.

From its very inception there has been something fundamentally unsound about the taxicab industry as it is generally conducted. The question of a proper rate of fare aside, too much dependence has been placed upon practices which have long since been outlawed or tabooed by the legitimate carrier. Almost alone in the transportation industry the taxicab driver depends for a living upon long hours of service, supplemented by tips. Put the independent taxi driver on an eight or a nine-hour day and deprive him of the hand-outs which he receives from his passengers and he would not stay on the job a month. In the course of time the matter of hours of labor will probably adjust itself, but the tipping evil is apparently here to stay and will continue to be the bait held out to induce the uninitiated outsider to try his luck in the business of public transportation. A small matter, perhaps, but sufficient to throw the entire industry out of balance when it comes up for regulation and economic consideration.

The lack of regulation has, of course, long been apparent, and is probably the basis of most of the afflictions by which the industry is plagued. In certain instances the cut-rate taxicab has been given the tacit support of city authorities on the theory that cheap transportation and plenty of it without regard to the cost can be synonymous with good transportation. Fortunately this idea has been pretty generally discredited and is now rapidly going into the discard. With the growing recognition of the fact that the principal function of the public highway is to serve as an avenue for the movement of traffic has come a realization of the necessity for the proper regulation of all vehicles using these avenues. The taxicab cannot continue to dodge the issue indefinitely, and with proper regulation will come an end of many of the evils with which the industry is beset.

Erie Canal Now Rochester's Subway

Overhead of the rapid transit line designed for high-speed service. Grooved intermediate wire and single No. 0000 grooved contact wire suspended from 1.02-in. messenger

In the oval is a view of the old Erie Canal in Rochester, where it passed over the Genesee River. This same section, now occupied by the subway and decked to give a new street to the city's downtown section, is shown in the other view

THREE years previous to the opening of the Erie Canal, on Oct. 29, 1822, a consignment of flour left Rochester by canal boat bound for Little Falls, N. Y. This was the first shipment of merchandise offered by the city to the new, and as yet uncompleted, Erie Canal, and marked an important event in the transportation history of Rochester. Just 106 years later a second important date in the transportation history of the city was recorded with another initial shipment over the same canal bed. However, instead of being carried by boat, the shipment was carried by rail and over a 9-mile rapid transit line.

During the first six years after the opening of the Erie Canal, Rochester grew from a village of 2,700 to a town of 11,000. The completion of the subway seems likely to stimulate another growth in the city. It has already increased bordering real estate values as adjacent lands have been purchased and new industries have moved into the section served. It appears that the payment of $12,000,000 by this municipality for the undertaking has already proved a sound investment.

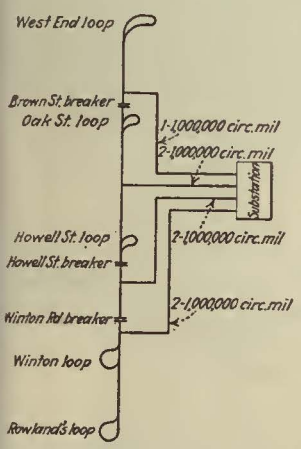
Because the new Barge Canal does not make use of the old bed of the Erie Canal, negotiations were started in 1911 for the abandonment of the lands of the latter within the city. In August, 1921, the Common Council authorized the acquisition of these lands. Plans already had been made by E. A. Fisher, then city engineer, for a railway in the bed, the railway to be used particularly for interurban cars and freight. There were many industries located adjacent to the canal and Mr. Fisher's plan offered an excellent method for freight interchange.

When in January, 1922, the State of New York ceded the canal lands to the city for a consideration of $1,500,000, plans had been made for the laying of tracks from Monroe Avenue in the town of Brighton to Western Widewaters near Driving Park, a distance of 9 miles. The plans called for two tracks to extend the full length of the proposed route and, in addition, one freight track for 7 miles and two other freight tracks for 1½ miles. Connections were proposed with the Rochester & Eastern, the Rochester & Syracuse, the Rochester, Lockport & Buffalo, the New York Central, the Lehigh Valley, the Erie, the Buffalo, Rochester & Pittsburgh, and the Pennsylvania Railroads. These plans all have been accomplished with the exception of the Pennsylvania and the Erie, whose connection cannot be made until an old canal race is abandoned. In addition to these, connections

with the New York State Railways' surface lines have been made at Monroe Avenue, Oak Street, Lyell Avenue and Emerson Street.

Prior to the completion of the subway, a citizens' advisory committee suggested that the New York State Railways operate the subway. Accordingly, the Common Council in November, 1927, arranged for the New York State Railways to operate the subway under their "service-at-cost" contract.

At the present time rapid transit cars operate on a ten-minute headway during rush hours and a twenty-minute headway on base schedule. During the first month of operation, December, 1927, 85,248 passengers were carried, and in March, 1928, 116,633 were carried. The number of passengers has increased steadily from that time until the present. In addition to the regular city lines all interurban lines are using these tracks. Shelter stations are located approximately every half-mile along the system. At the City Hall station there is a comfortable waiting room with interurban ticket office, newsstand and rest room.



Feeder diagram of the system, showing how the line was divided into four sections, each fed separately from the substation

The legal formalities which opened the subway for use by the New York Central, the Lehigh Valley and the Buffalo, Rochester & Pittsburgh Railroads were transacted on Aug. 31, 1928. At the present time the freight interchanged by these railroads is being handled by one electric locomotive.

With the exception of a few locations all structures supporting the overhead are of the bridge type, spaced 300 ft. apart on tangent. Practically all bridges span four tracks, a few, however, spanning five. Some of the bridges are as long as 90 ft. Tubular steel poles are used for special pull-overs and loops while many wood poles are used on commercial spurs. Pole bracket construction is used almost entirely on these spurs.

The trusses as well as the columns that make up the bridge structures were erected by a self-propelled locomotive crane with a 60-ft. boom. For column setting the crane was located on the track nearest to the cement foundations. For swinging the trusses into position from the flat cars, the crane was located on one of the center tracks. Wherever possible the steel was placed on top of the retaining walls. This decreased the amount of steel needed and simplified the structures. This also gave a decided advantage on curve structures where large end thrusts were encountered. Incidentally, on one of the curves near the aqueduct an end thrust of 20,000 lb. has been attained during winter weather.

Overhead Designed for High Speed

The overhead system, designed for rapid transit service, consists of a 1.02-in. diameter copperweld-copper

Catenary construction was used on all open-track main line of the Rochester rapid transit line

messenger wire from which is suspended a No. 0000 grooved intermediate wire. A single No. 0000 grooved contact wire is suspended, in turn, from the intermediate wire. The contact and intermediate wires are of the same material: phono-electric on one section and cadmium-bronze on another. Connections between the main messenger and intermediate wire are by means of bronze rigid hangers, spaced approximately 20 ft. apart. The contact wire is suspended 6 in. below the intermediate wire with flexible hangers of the loop type. To prevent arcing of loop hangers during the period when a car is drawing current from the contact wire, frequent copper bonds have been inserted between the contact and intermediate wires.

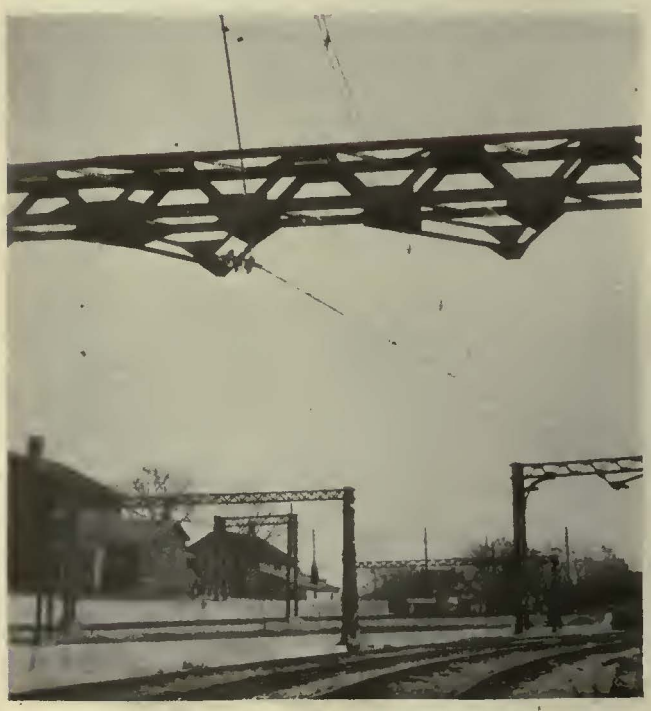
The main messenger has a breaking strength of 49,000 lb. and an area of 587,000 circ.mil. The combined intermediate and contact wires have an area of 254,000 circ.mil, making a total of 841,000 circ.mil for the overhead system and a total of 3,364,000 circ.mil for the four-track system downtown. This section is fed

At left—The messenger end of the curve hanger is clamped securely to the messenger wire. At right—The intermediate wire is held in the curve hanger by peaning-over a lip on the top of the clamp

A locomotive crane made cable stringing comparatively easy

with two 1,000,000-circ.mil copper feeders. All messenger wires, with the exception of those for the commercial sidings and loops which are directly suspended, and those in the covered section of subway, are insulated and suspended with two suspension insulators. They are of the ball-and-socket type with a 7½-in. shell diameter and 5-in. section length. A closed-seat, forged-steel, suspension clamp is used on all tangent and curve work. A combination mechanical grip and cast-spelter button clamp is used for dead-ends and splicers. A split chuck surrounds the cable and is backed up by a spelter button, cast on the end of the cable. The split chuck is tapered on the outside and fits into a sleeve which is cone-shaped internally. Pulling the cable forces the spelter button to push the split chuck deep into the cone-shaped sleeve, thus causing the split chuck to grip the cable. The main messenger dead-end insulation consists of two parallel strings of 4¾x6¾-in. porcelain strain insulators, two units per string. Each string has an ultimate breaking strength of 30,000 lb., thus providing a dead-end assembly capable of withstanding any strain imposed on the main messenger. The porcelain insulators are assembled with copper U-bolts, the copper bolt having about the same characteristics as the strand at the mechanical loads encountered.

Dead-ends for the intermediate and contact wires are made to the same steel yoke. Insulation of similar design, but smaller in size and strength, is employed. The No. 0000 grooved wire is held with a clamp containing a chuck similar to the Cleveland splicer.



A typical curve span showing hanger location

Construction for Curves

On curves a 10½-in. high-strength insulator was used for supporting the messenger wire. Many of the curves of greater degree required two strings of these insulators with a total breaking strength of 30,000 lb. All curves with the exception of approaches to stations, which had only a slight curvature, were constructed with incline catenary. A solid or rigid bronze clamp allowing 6 in. of separation between the intermediate and contact wires was designed for the curve hanger. The lower or contact wire was clamped while the intermediate wire was held by peaning-over a lip on the top of the clamp. The hanger rod was inserted through the center of the clamp and held with nuts on both sides. The messenger end of the hanger was clamped to the messenger wire. Thus good feeder taps from the messenger wire to the contact wire were made.

On the higher degree curves, particularly the 12 to 18-deg. sections, the curve hanger rods are almost horizontal. With the usual construction, employing an intermediate wire 1½ to 2 in. above the contact wire, pantograph operation would be impossible. In the Rochester construction there is a clearance of 3 in. from the hanger rod to the pantograph shoe at the contact wire. This clearance together with the slight upward angularity of the hanger rod provides sufficient clearance for future pantograph operation.

The overhead wires were cross-bonded at approximately 1,000-ft. intervals. Lightning arresters also were cut in at these points.

Overhead in the Subway Proper

All overhead in the subway proper was suspended from a wood trough. Standard composition mine hangers and a mechanical feeder clamp suspended at 20-ft. intervals supported the intermediate wire, the main messenger wire being dead-ended at the entrance of the subway and carried through as feeder only. The contact wire was connected to the intermediate wire with duplex clips at 10-ft. intervals. Steadies and pullovers were made by replacing the short bolt in the duplex clip with an eyebolt and eyenut, a guy wire being attached to the eyes. Incidentally, all guys within the railway, as well as those outside, were double-insulated with porcelain strain insulators.

At the present time the use of wheels and shoes requires trolley frogs at all turnouts and crossovers. Clearance, however, is provided for pantograph operation on the main line, but not on the loops and a few of the sidings.

Non-ferrous materials were used in the overhead system where feasible. The parts included cables, catenary hangers, intermediate hangers, pullover fittings, splicers,

Staging on box and flat cars aided the linemen in connecting catenary hangers

dead-ends, and other hardware. Such items as suspension clamps, insulator caps and pins were of steel and malleable iron. The non-ferrous parts were constructed from selected grades of bronze.

Track and Bonding

The roadway was built with 90-lb. A.S.C.E. rail, laid on tie plates and 7-in. x 9-ft. ties, with washed gravel and cracked stone ballast. The roadbed was located in a cut throughout its length which required an extensive drainage system. It was estimated that future surfacing and ballasting will raise the roadbed outside of the subway proper about 6 in. This was anticipated during the overhead design and, consequently, all suspension insulators on tangent were suspended with a steel strap which would permit of 6 in. of shortening, thus maintaining the original contact-wire height.

The track was bonded with gas-weld, steel terminal bonds of No. 0000 capacity. This work was all handled by contract. Frogs, crossings and other special work were bonded with long bonds. Future bonding can be handled with arc-weld bonds, the power being drawn from the 600-volt d.c. overhead system.

Educating the Public Concerning Traffic

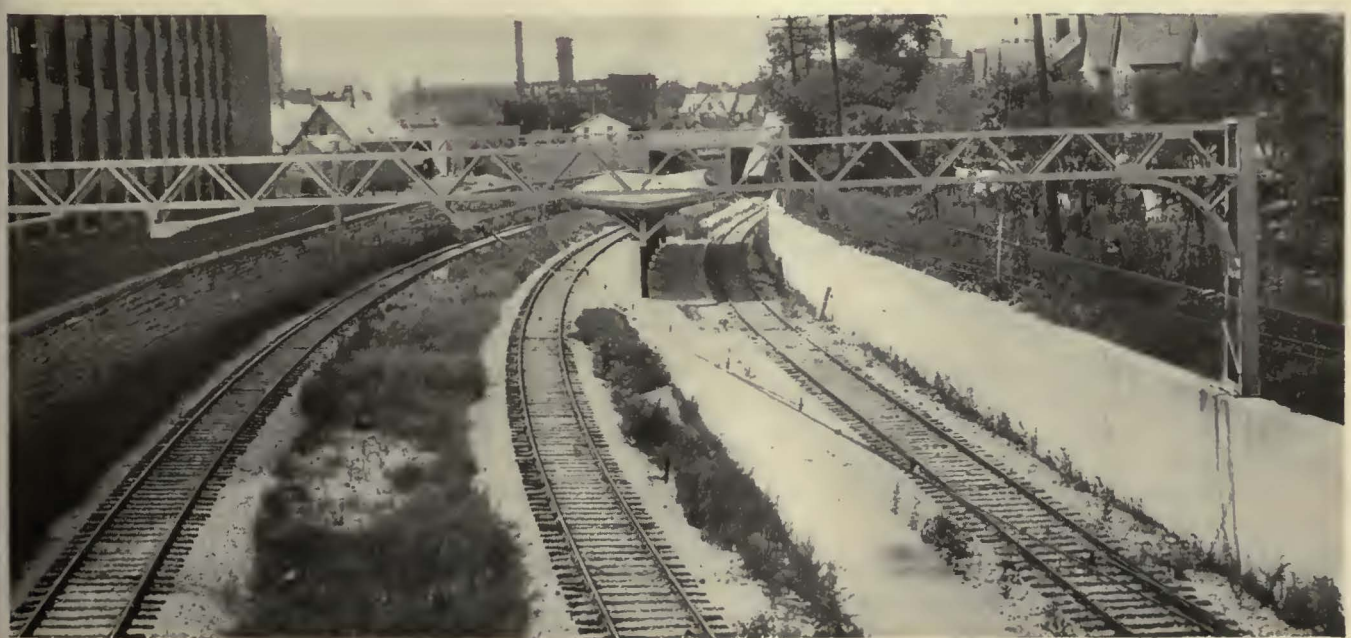
P.R.T. uses many lines of approach in arousing interest in efforts to reduce street congestion

MOTION pictures, radio talks, newspaper stories and advertisements, signs and folders in cars, cabs and buses and a prize contest for letters suggesting cures for traffic ills all served to arouse public interest in the traffic problem during the "80 per cent" campaign recently carried on by the Philadelphia Rapid Transit Company. Besides centering attention on the congested condition of Philadelphia's streets, the campaign, by emphasizing the urgent necessity for traffic relief, served also to enlist the co-operation and sympathy of the people of Philadelphia in a traffic survey now being undertaken by Mitten Management.

This annual campaign takes its name from the fact that 80 per cent of Philadelphia's street users make use of public transportation mediums. "Give the 80 Per Cent a Square Deal" has been the slogan of these campaigns, which have endeavored to point out that the 20 per cent who do not use the street cars and buses utilize a great deal more than 20 per cent of the available street space, especially when parking is permitted in the downtown district.

The use of the motion picture, the radio and the letter contest constituted the principal points of departure from last year's campaign.

"The Peace Time Big Parade" was the name given the motion picture which portrays the similarity between the movement of troops in wartime and the daily trans-



The presence of retaining walls materially decreased the cost of steel for supporting the spans

portation of the "Peace Time Army" in a modern city. Official government war pictures were used and were interspersed by pictures taken in the streets of Philadelphia and at different locations of the transit organization. One of the best shots was taken in the early morning and shows a seemingly endless procession of cars streaming forth from the barn to make their first trip of the day.

"The Peace Time Big Parade" was shown in more than 30 theaters in Philadelphia and surrounding territory to an estimated audience of 115,000. In addition, it has been shown in connection with nine talks on traffic ills before various organizations. A 16-mm. film was made from the standard film, so that the picture might be shown with a small projector if desired.

Mitten Management's half hour program over station WIP each Friday evening was devoted wholly or partly to the 80 per cent campaign on eight occasions. It was used not only for traffic talks but also to announce the traffic survey and the prize letter contest. The winners of this contest were also announced over the radio, the program being extended to an hour for this purpose, and the first five winners gave short talks at this time.

This contest offered prizes aggregating $500 for letters of 1,000 words or less giving practical suggestions for the alleviation of traffic congestion. Proposals of huge engineering projects such as double-deck streets, overhead sidewalks or underground trolley service in the downtown district, measures involving great expense and requiring many years for completion, were discouraged, the car-riders being asked instead to devise measures which would secure more immediate relief.

Public interest in traffic betterment was well demonstrated by the results of this offer. For although the prizes were not large (first prize $125, second prize $100, third price $75, fourth prize $50, fifth prize 25 and 25 prizes of $5), nevertheless 1,936 letters were received between Nov. 19, when the contest was announced, and Dec. 15, the closing date. These letters were all read and acknowledged and the suggestions tabulated. All of those which showed promise were copied and sent to a committee of traffic engineers who graded them and awarded the prizes.

The top prize winners turned out to be men quite conversant with traffic problems. First prize was won by T. Elmer Transeau, an instructor in highway engineering at Drexel Institute, Philadelphia. William V. Brandt, the second prize winner, is with the Electric Storage Battery Company. The third man, H. C. Crowell, is assistant to the chief engineer of the Pennsylvania Railroad, while the fourth, T. H. Henkels, is an engineer with the Commercial Traffic Association.

It is interesting to note that the point most generally discussed was the parking problem, 521 contestants having introduced this into their letters. Of these, 133 proposed total abolition of parking in the downtown district. Another much discussed subject was the restriction of delivery trucks in the downtown district. Contestants to the number of 236 agreed that a more rigid control of deliveries would speed up the movement of traffic, while many of these saw in consolidated delivery service a partial solution of the problem.

Other suggestions made included abolition of the horse-drawn vehicle in the central business district, pedestrian traffic control, legislation to keep slow-moving vehicles off the car tracks, boulevard stops, skip stops, the segregation of trolley and vehicular traffic in the downtown streets, city-built garages in the central business district, staggered office hours, side-chute coal trucks, the elimination of grade crossings and the marking in a prominent manner of a belt line around the city.

The contest was not without its humorous side. Some of the suggestions were very fantastic indeed, including such things as placing derricks atop the trolleys to pick up automobiles that go dead on the tracks and the running of trolleys in the wrong direction on one-way streets, so that autos would perforce keep off the tracks.

Most of the letters, however, were fundamentally sound, and while no startling new and at the same time practicable ideas were proposed, still the contest was considered highly successful in view of the good will and public interest which was developed. For, if nearly two thousand people took the trouble to write letters, it must necessarily be assumed that a great many times that number gave some thought to the subject.

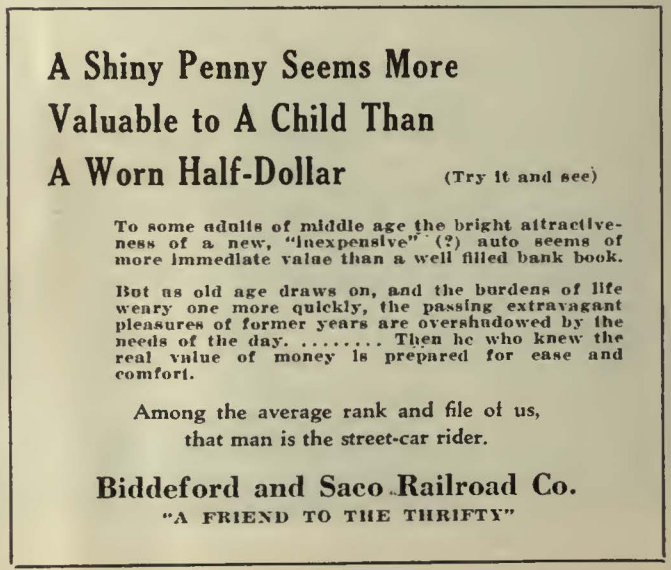
The letter contest, as well as the whole 80 per cent idea, was given wide publicity through newspapers and through folders and signs on the cars and buses. The "80 per cent" idea has by this time become so familiar to Philadelphians that it is no longer necessary to define the phrase. Consequently the ads carried such messages as "Help to keep traffic moving for the 80 per cent" and "Broken down vehicles caused 151 delays to the 80 per cent in October," without attempting to explain the meaning of "the 80 per cent."

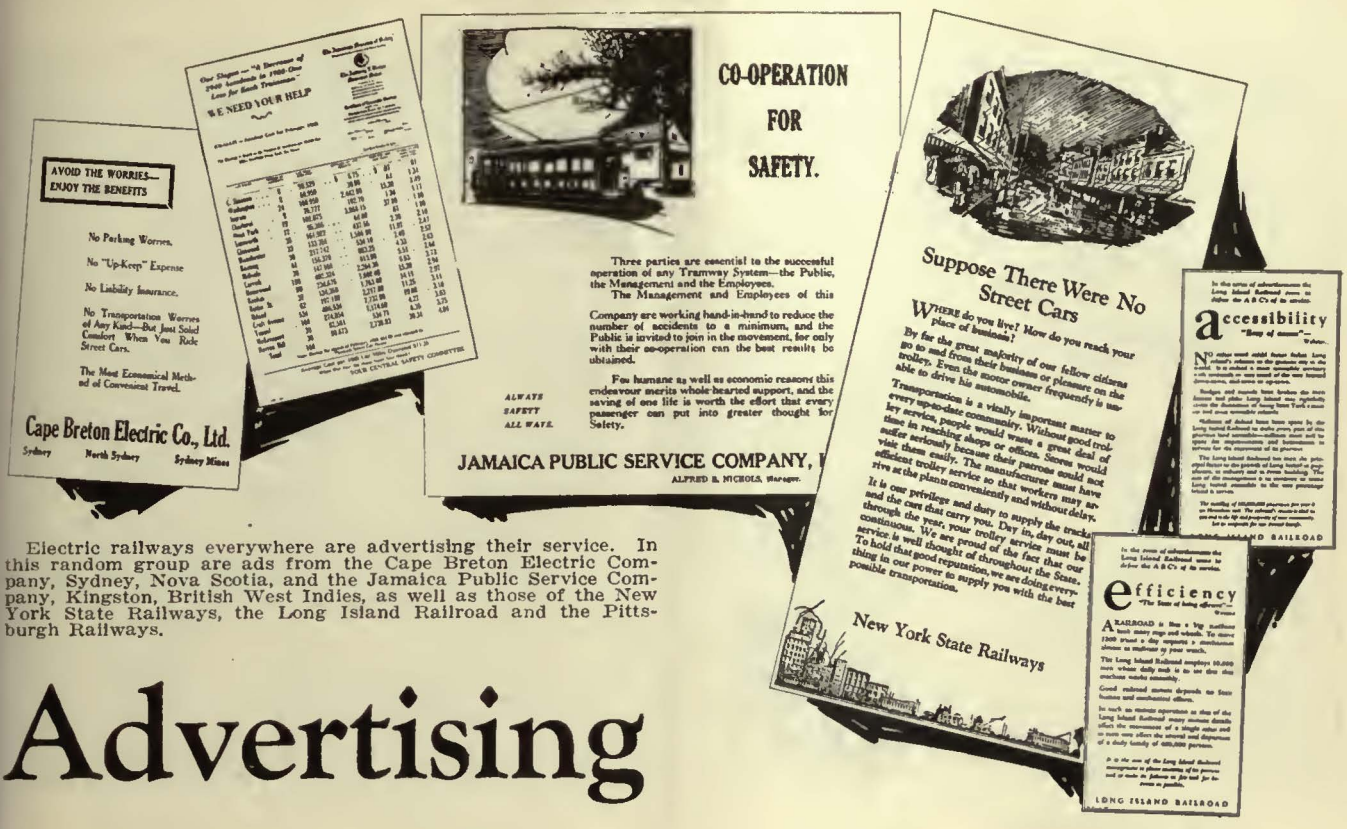
Another bit of favorable publicity during the campaign came with the announcement of the new corps of co-ordinated supervisors for the downtown district, men who have charge of trolley cars, buses and taxicabs.

The whole campaign has served to bring the public face to face with the problem which confronts Philadelphia. Progress reports of the Mitten Management traffic survey are assured of an eager audience, and there is reason to expect that the whole survey will be given thorough consideration by the people of Philadelphia.

Yankee Thrift Emphasized in Advertisement

"DOWN in the State of Maine" old-fashioned Yankee thrift is still a prevalent characteristic of the population, and the Biddeford and Saco Railroad has not failed to recognize this in its publicity, as can be seen from the accompanying example of its advertising.





Electric railways everywhere are advertising their service. In this random group are ads from the Cape Breton Electric Company, Sydney, Nova Scotia, and the Jamaica Public Service Company, Kingston, British West Indies, as well as those of the New York State Railways, the Long Island Railroad and the Pittsburgh Railways.

Advertising

An Active Force in Selling Transportation

Red heads, clowns, historical spots, points of interest, company facts and letters of the alphabet attract the public's attention to posters and other mediums bearing messages from the electric railways

THAT the electric railway industry is selling street car and bus transportation by means of advertising, on a scale never before attempted, is forcibly demonstrated by the flood of copy that continues to pour into the JOURNAL's office. Display "ads," posters, window strips and pamphlets covering every phase of the service and employing all psychological mediums to curry public approval are received in every mail from the nation's four corners, from Canada and from the British possessions in the West Indies.

Starting on the west coast, the Portland Electric Power Company, Portland, Ore., recently has completed an extensive newspaper campaign, linked with posters displayed in all of its rolling stock, which accomplished the dual purpose of celebrating the property's twentieth anniversary and selling service.

The campaign opened with a full page spread, entitled "That the People of Portland May Be Served." This appeared in the city's four principal dailies. It was followed by a series of 10x14¾-in. and 8x12½-in. display ads attractively illustrated, these appearing alternately in the papers, so that Portlanders read the messages four times every seven days. With each page of copy was carried the notation that it was No. 1, 2 or 3, etc, "of a series dealing with the daily mass transportation of a great city."

Copy for the initial broadside contained eleven paragraphs, stressing the cardinal principles of service, with special emphasis laid upon employee efficiency. Above the main caption and extending across the ad was a list of the 31 trolley lines. Midway on the page and to the left were seven italicized paragraphs revealing such pertinent items as the fact that the company carried 250,000 passengers daily, operated 568 street cars and 33 buses, maintained more than 200 miles of trackage, and operated 41,000 car-miles a day.

Of special significance is "ad" No. 3 in the series, which deals with the safety record of the company—one of the first to foster the safety movement. The copy is striking in arrangement and text. In the upper right-hand corner, framed by a scroll, is given the earth's total population by continents. Beneath the tabulation one reads:

> The total world's population is 1,885,531,210, according to the most recent figures. The total number of passengers carried by the P.E.P. city and interurban lines from January 1, 1907, to the present time is 1,858,718,622, or nearly the world's population . . . without the loss of a single passenger life!

This theme is reiterated in large type, the text ending with: "The safest place in Portland is on a trolley." It is again very effectively employed in a later piece of copy captioned "Mother knows they're safe." In addi-

This striking ad, relating in terms of the world's population the company's safety record, was one of a series prepared by the Portland Electric Power Company

tion to its use in the press, the first safety ad was made into a poster done in several colors, red predominating.

The same punch and attention-attracting phrases characterize the other ads in this series. They cover the much-discussed questions of private vs. public conveyance, traffic congestion attendant upon the use of private cars in business, parking worries, the responsibility of public utilities in storm and stress, and the economy effected by the use of bus service. They bristle with such phrases and captions as these: "There are no 'parking tags' in street cars!" "40 cents for 5 miles or 8 cents a mile," "Are you sure you use your car in business," "Trolley riders never have to say, 'Good morning, Judge!'" "Pay us 8 cents and we take care of your parking," "The street car man will tell you," "Bent fenders and scratched bodies never worry the trolley rider!" and "A cigarette isn't the only thing that makes you walk a mile." In every case the arrangement of text and illustration has been given thoughtful study, ample white space being left to set off the message.

From the Pacific Electric Railway, Los Angeles, Cal., comes an outstanding sample of publicity in the form of a night picture taken from Inspiration Point, Mount Lowe. This is a panorama of 41 miles of territory showing the lights of Los Angeles and 26 adjacent cities. In striking contrast to the light-studded night are five scenes on Mount Lowe which the text of the poster states is southern California's world-renowned resort, located on Pacific Electric lines.

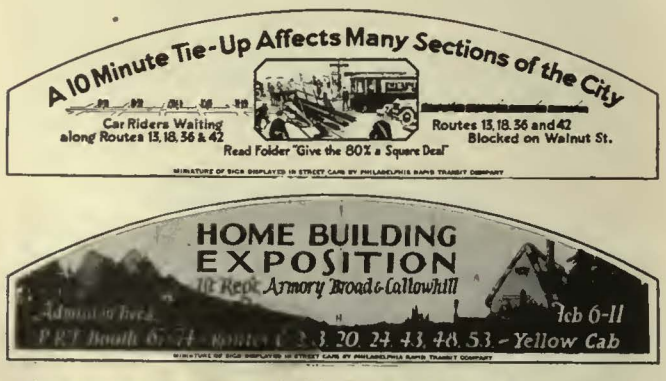
Jumping from the coast to Kansas City, Mo., one encounters another lively newspaper campaign, conducted by the Kansas City Public Service Company, which had a dramatic climax with the publication of an advertisement paid for by employees of the company, as a streamer line at the bottom of the ad states, with money "subscribed in cash by them so that the public and company may know their true sentiments." This piece of copy gave a detailed account of the Brotherhood's agreement with the company, a list of benefits which it enjoys, embracing health, accident and life insurance, free medical and legal advice, hospital and nursing service, and also a creed expressing the employee's duty to the public.

The company's campaign consisted of eighteen display advertisements featuring the "mutuality of interest between the community and its transportation system." Copy was prepared by the commercial department, and the art and layout work by the advertising department and art staff of the Kansas City *Star*. The ads were run in the *Star* and Kansas City *Journal* four times a week.

Display type and illustrations dominated the copy for this campaign, which included selling the property's rehabilitation projects. A skillful combination of type, halftones and sketches was used in this series. One striking ad in this group tells the story of "$705,354 for improvement" by means of thumbnail sketches of and statistics on the number of tons of rails, ties, sacks of cement, cubic yards of sand and crushed stone required to construct new track in localities detailed opposite the material data. A freight train illustration repeats this story in a most effective manner, as does a contrasting view of an old and a new viaduct.

Features of safety and modernization of rolling stock comprised the copy for two of the most striking ads of this series. Costs of private and street car transportation were presented by means of a per cent tabulation on the automobile upkeep per mile as compared with monthly average of 26 round trips via the trolley. The saving effected is shown by a series of entries in a savings account book. As a pedestal for these graphic illustrations there is a forceful testimonial letter on the subject of parking worries vs. comforts of the street car. This letter, from a citizen, was addressed to the president of the company. In striking contrast was a humorous piece of copy revealing, by two sketches, that since the first automobile made its appearance trolley cars have always been considered the safest place in the street.

Invading Canada, one finds that the charming historic points of old Montreal have been presented pictorially to car patrons of the Montreal Tramways in a series of 28 newspaper spreads, under the general caption of "Your

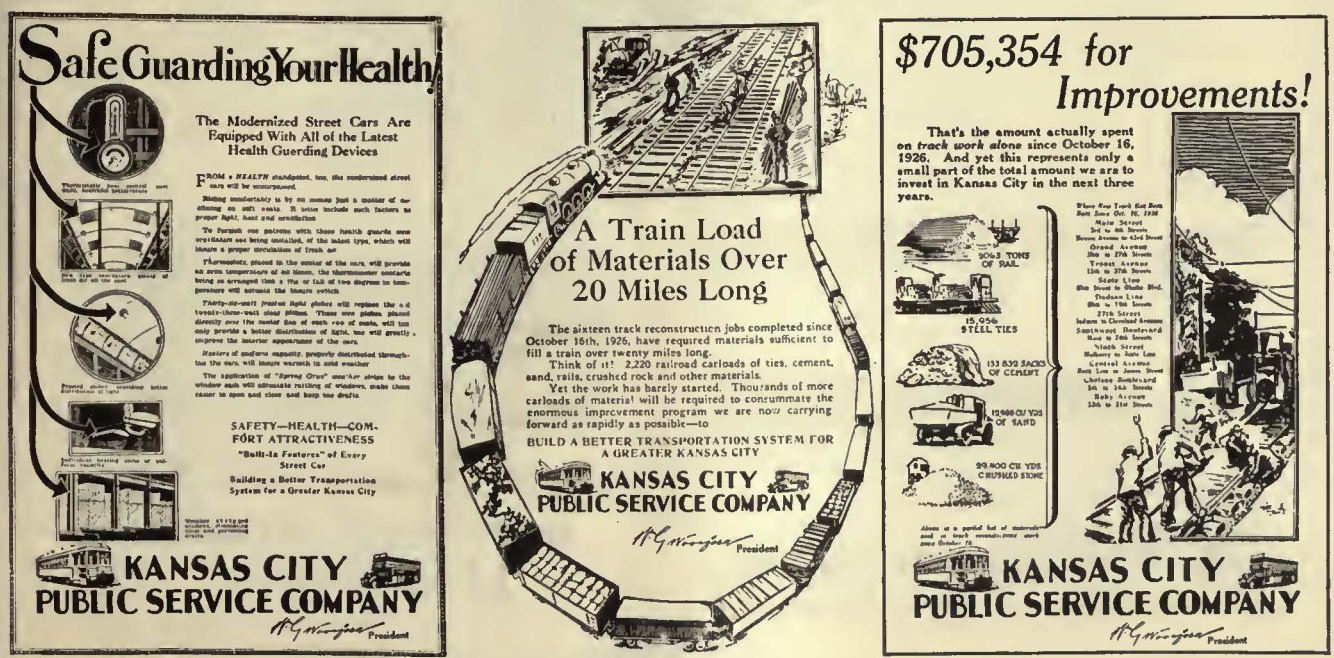


The diversity of the Philadelphia Rapid Transit Company's advertising subjects is illustrated by these two car cards

This poster from the Pacific Electric Railway, showing a night picture of Pasadena, Los Angeles and other neighboring cities, taken from Mount Lowe, and five views of the resort itself, is an outstanding example of publicity

Montreal." So valuable were these ads, considered from both historical and artistic standpoints (the illustration in many cases approaching the technique of old wood cuts), that they have been reproduced in a handsome booklet, a copy of which was sent the JOURNAL by Lieut.-Col. J. E. Hutcheson, vice-president and general manager of the Montreal properties. In a letter accompanying the booklet Colonel Hutcheson states, incidentally, that in the first three months of the year the Montreal Tramways carried 4,500,000 more revenue passengers than during the same period of the previous year. Although he does not attribute this increase to the publicity program, the booklet makes one wonder if in some measure it was not responsible for this interesting record.

An analysis of the copy in this series is difficult and is best accomplished with the eye, both from the standpoint of illustrations and the valuable text which accompanies them. Some of the points covered are Notre Dame, Parish Church, Château de Ramezay, Jacques Cartier Square, showing the old market and Nelson Monument, the Cartier Monument, St. Joseph's Oratory, Fort de la Montagne, Notre Dame de Bonsecour, Montreal Harbor,

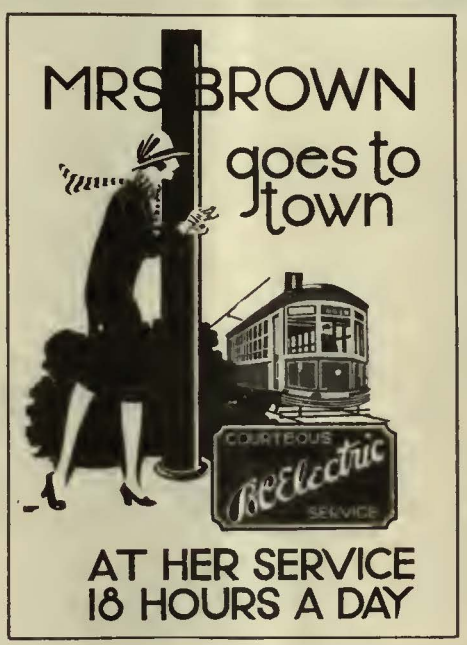


Display type and illustrations dominated the copy of the Kansas City Public Service Company in its campaign consisting of 18 display advertisements in newspapers. The series featured "the mutuality of interest between the community and its transportation system"

St. Helen's Island, Notre Dame de Lourdes, the Art Association, Historic Place Royale, the Hotel Dieu, Montreal's first hospital, the new courthouse, the Royal Victoria Hospital and the Université de Montreal. The period of a year was used to cover these and other points of interest, and, according to Colonel Hutcheson's foreword, the object of the campaign "was to awaken the interest of Montreal's citizens and also to furnish authentic and accurate information that would be appreciated by visitors to the city."

To the east of Montreal, the Cape Breton Electric Company, Ltd., Sydney, Nova Scotia, has been active in publicity matters, using the newspaper medium. While these advertisements are small, they cover all the up-to-the-minute selling points of modern transportation.

Another company beyond our northern border which is telling the public of the value of car and bus transportation is the British Columbia Electric Railway at Vancouver, B. C. Its publicity activities have been confined to 19x27-in. poster sheets, and 9½x12½-in. poster cards



Two Canadian companies that have advertised extensively are the British Columbia Electric Railway, Vancouver, B. C., and the Montreal Tramways. The two illustrations at the top, the two at the bottom and the one in the center are of posters prepared by the B. C. Electric. The other two are typical advertisements from a series of 28 featuring points of historic and general interest in and about Montreal

and sheets. The large posters are done in several attractive colors, while the small sheets are a combination of solid color for a background with the message and illustrations in a contrasting color. Such a slogan as this adorns the posters: "What Delays You—Too Many Stops to a Mile?" This is illustrated with sketches of an open drawbridge, automobiles cutting in and running in front of cars, and late passengers running for cars. Besides stressing the causes for service interruption, the small posters have been effectively used to lure the public to the countryside around Vancouver, by means of coach, interurban and observation cars.

Lately, the New York State Railways, Rochester, N. Y., used the newspapers as a forum to discuss with the public, among other subjects, its reasons for asking for an increase in fares. Under the caption "We want you to know all the facts," six paragraphs in display type were used to present the argument. These were arranged in a space 6x12½ in. so as to leave ample white space and to attract instant attention. One paragraph announced that the company had prepared a series of statements "which will explain frankly and in detail the facts on which our appeal is based." The closing paragraph invited patrons to study the question in order that their intelligent cooperation could make for better service. Other ads detailed the necessity for adequate transportation service, under such captions as: "Where do you work?" "A Useful Citizen," "Suppose There Were No Street Cars" and "Just After the Whistle Blows."

Transportation problems in and around Buffalo were made known to the public in a series of posters prepared by the International Railway. "Thank you!" was the heading for one of these posters, which expressed appreciation to car riders on one line for their forbearance during the process of construction work. Another poster, issued in co-operation with the Buffalo Council of Churches, reads: "The test of a city's greatness is the kind of men it brings forth." On the back of this attention is called to the constructive civic advertising which was being run in the *Saturday Evening Post.*

Employing 25 letters of the alphabet to discuss its service from A to Z, the Long Island Railroad recently put on an extensive campaign in 107 Long Island newspapers, the advertisement appearing once a week in each paper. C. C. Pennington, assistant general passenger agent and advertising manager, was responsible for the unique copy. Commenting upon the effectiveness of this service, George Flotow, publicity agent, writes: "I think this type of advertising has had the important effect of giving the traveling public and general public on Long Island a better understanding of our problem. Several local papers have published favorable editorials on this series."

In make-up the ads left little to be desired. By the use of a large boldface but lower case initial with smaller letters, also bold face, for the remaining letters of the key word of each ad, the main theme commanded the reader's instant attention. In keeping with the Websterian flavor of the series, under nearly all of the headings a definition from Webster was given. For instance, the first ad had as its theme "accessibility." Directly under this word was: "Easy of access—Webster." Key words in the campaign included "Betterments," "Confidence," "Efficiency," "Fairness," "History," "Knowledge," "Optimism," "Wages" and "Vision." In each case the ads occupied a space two columns by 7 in.

In line with its confrères in the States, Jamaica Public Service Company, Ltd., Kingston, B.W.I., has used the newspapers in appealing to investors in utilities stock, as

These posters, conspicuous for their color combinations and "snappy" subjects, are from the Pittsburgh Railways, which advertises extensively

SUNDAY CONCERTS 4 P.M.
CARNEGIE MUSIC HALL
GO BY TROLLEY
Pittsburgh Railways Co

well as for the purpose of selling car service and electric appliances. It also is using 16x24-in. stiff cardboard posters in its trams, dealing with safety and other subjects. Such slogans as "Ride the Trams, There Is an Organization Behind Our Service," "Careless People Take Short Cuts in Life," and "These Cars Carry 25,000 Passengers Daily," comprised the text. The lettering was in large capitals alternated in red and black ink. Christmas copy was especially effective from the standpoint of text and illustrations.

Turning to western Pennsylvania one discovers the Pittsburgh Railways pursuing its usual extensive cooperative publicity campaign in conjunction with civic organizations. Claiming first interest are the 18¾x26¾-in. posters, conspicuous for their color combinations and snappy items. For example, upon a lemon-yellow background is a charming red-headed flapper holding up a weekly pass. The caption reads: "Girls, 'tis leap year. Pick a winner." The lettering is in black and green, shaded with red, and the facsimile of the pass is made rather striking by using black letters on a white background. Less flamboyant, yet none the less attractive, was a poster used in connection with the recent International Art Exhibition at the Carnegie Museum. Here a graceful action picture of a Spanish dancer was employed to tell the story. The color scheme of rich browns and reds of the dancer's costume was contrasted effectively with an indigo blue background. Another striking poster of this class invited inspection of "Utility Hall," a model home of the Equitable Gas Company and Duquesne Light Company. The illustration and text were in white on a field of blue. Enticing color pictures of the same size have as their theme the beauties of spring and autumn in the country. In conjunction with the Western Pennsylvania Safety Council and Pittsburgh Chamber of Commerce a large poster in colors was issued in the interest of clean-up week.

Employee no-accident records also have been skillfully made use of in poster work. A large poster featuring the photographs of three motormen and giving the names and carhouses of twenty others, bore the caption: "These motormen had no accidents during the past year." Beneath the operators' names were statistics showing the decreases in accidents and accident costs over corresponding one-month periods. Following this was a detailed record of carhouses, enumerating the number of accidents, car-miles operated, settlements and verdicts, cost per 1,000 car-miles and accidents per 10,000 miles operated, the latter being the basis of comparison. The statement was signed "Your Central Safety Committee."

Civic pride combined with civic achievements have largely influenced the text matter which the Pittsburgh company has placed on its 7x15½-in. end rack cards. In one year 135 different examples of text were used. Each card was kept in approximately 1,400 cars and trailers, in daily service, for a period of seven to fifteen days and was viewed by almost 400,000,000 patrons during the year. A handy booklet giving the text of 311 end rack messages has been distributed to the industry.

As examples of promoting community and civic interest the following messages are typical: "Pittsburgh Has the Largest Tube and Pipe Mill and the Largest Structural Steel Plant in the World" and "Greater Pittsburgh's Power Plants Produce More Electric Power than the American Niagara Falls." Of diversified interest are such slogans as "To Keep Out of the Crowds, Shop From 10 Until 4," "Ah, Madame, Shopping via Weekly Pass is So Pleasant" and "Pedestrians Should Be Seen and Not Hurt." Another good example is this clever jingle:

I always take a street car
Whene'er I go to market;
'Cause when I take a trolley
I never have to park it.

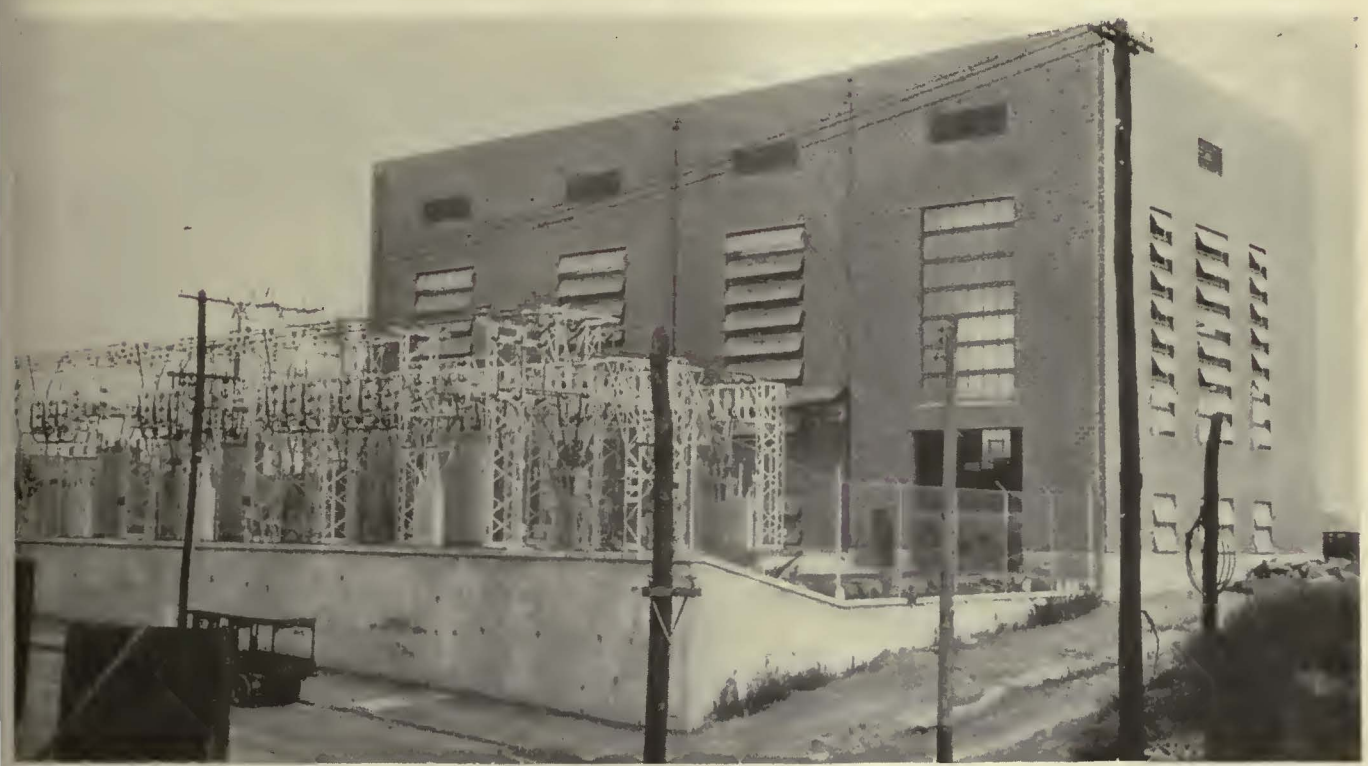
Large brightly-colored posters are used by the Cincinnati Street Railway to sell its service. These three, with varied subjects, are typical

In addition to these mediums, effective publicity is secured through *The Transit Guest,* a weekly publication. The company also issues *Trolley Travelog,* a comprehensive guide to the points of interest in and around the city.

The Philadelphia Rapid Transit Company continues its publicity and advertising campaign with a diversity of subjects and illustrations. The cards displayed not only sell car rides but feature current civic events. For example, for the Penn-Notre Dame basket ball game last season this text was used: "The 'Four Horsemen' Against Traffic Congestion—Trolley, Bus, 'L' and Yellow Cab to Penn-Notre Dame Game." Many of these cards are cleverly illustrated. In design and spirit they reflect the city's historical atmosphere as well as its modern-day bustle and progressiveness.

Electrification Program at Philadelphia Gains Momentum

Extension of suburban railway electrification, including the Philadelphia to Wilmington division, requires additional power supply. New frequency changing station of 200,000 kw. ultimate capacity installed to carry additional load of electrified sections



The 60-cycle outdoor substation and the station building which will ultimately accommodate six frequency changing sets

EXPANSION and improvement of transportation facilities in Philadelphia and the surrounding territory have been necessitated by the continuous industrial growth of the district. The entire territory is served by three large steam railroad companies, two of which offer extensive service in suburban traffic. The need for improved schedules, faster service, increased comfort for the passengers and those living in the vicinity of the railroad, and lower operating costs, made electrification of the railroad inevitable. The Pennsylvania Railroad took the initial step and electrified its tracks of heaviest service, the Paoli and Chestnut Hill divisions. The other two railroads are making preparations for electrification in this district within the next few years.

The Paoli and Chestnut Hill divisions of the Pennsylvania Railroad are fed from the Schuylkill steam plant, a part of a large interconnected power system. Electric power generated at 25 cycles, 13,200 volts is delivered through submarine cables to the Arsenal Bridge substation erected by the railroad across the Schuylkill River. At this point it is metered and passed through transformers which step up the voltage to 44,000 for single-phase transmission along the electrified tracks.

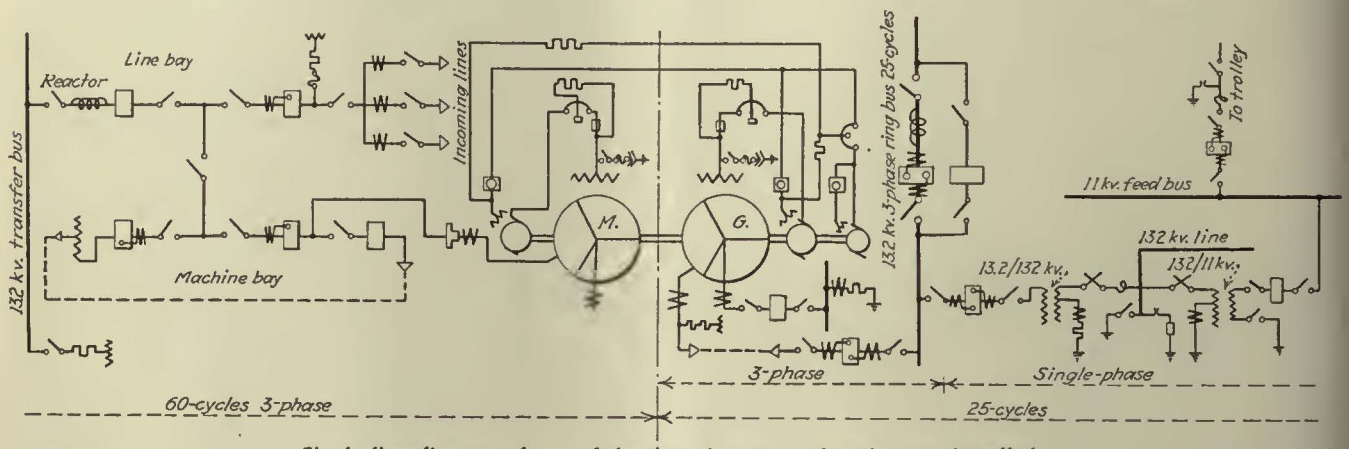
The present extension of the electrification, including the Maryland division between Philadelphia and Wilmington, demanded additional power and a point nearest the center of the new load was selected at Lamokin, in Chester, Pa., as the site for the new substation adjacent to the Pennsylvania Railroad tracks. Power at 60 cycles, three phase is received from the network of the Philadelphia Electric Company through underground cables. It is converted to 25 cycles, three phase through frequency changing sets and delivered from the terminals of the 25-cycle generators through underground cables to a three-phase outdoor ring bus. Single-phase transformers stepping the voltage from 13,200 to 132,000 distribute power to feeding stepdown substations by means of single-phase high-tension transmission circuits running along the railroad right-of-way. Each stepdown substation will transform to 11,000 volts for trolley-rail circuit.

Lamokin station is of the outdoor type with the exception of the frequency changing sets and operating room, which are housed in the station building. There is a railroad standard gage track and a broad gage transformer track on the outside of it passing through the yard and the station building on the lower floor to permit

equipment to be hoisted to the upper floor by means of a 100-ton Niles crane, provided with a 10-ton auxiliary hoist. The property of the power company accommodates the 60-cycle outdoor substation and station building. The 25-cycle outdoor substation equipment is located on the adjacent plot belonging to the railroad. The ultimate development is to consist of six frequency changing sets, of which three were installed in the initial construction.

Special care has been taken to provide reliable source of feed for this substation. Power is delivered to each machine from the Chester steam plant through 350,000 circ.mil underground cables, each phase being carried by three single conductor cables. This arrangement was considered more advantageous than the use of one large conductor per phase because of greater flexibility and ease in handling the smaller cables.

The entire outdoor equipment is supported by a rugged steel structure consisting of two longitudinal sections made of standard structural steel. The outdoor substation consists of fifteen bays, of which one line and one machine bay act as a unit operating each frequency changing set. There are six double bays of that type to be installed. Of the remaining three bays two are to be used for switching equipment of two station light and power transformer banks, and one for bus sectionalizing equipment. The main conductors are $2\frac{1}{2}$-in. I.P.S. copper tubing provided with grounding points in places where inspection and maintenance are necessary. The grounding of the outdoor substation consists of $2 \times \frac{1}{4}$-in. copper bus with taps taken to the columns, tanks, bases and frames of the outdoor equipment, each tap consisting of a $3 \times \frac{1}{4}$-in. copper bar. Galvanized iron pipes are driven on all corners of the substation and tied to the grounding network. These pipes terminate in boxes and the connection with the ground bus is made in a manner to facilitate testing. The two station light and power transformer banks are located south of the building, each consisting of two 150-kva. OISC transformers. The 60-cycle outdoor substation and station building are shown in an accompanying illustration.



Single line diagram of one of the three frequency changing sets installed

Quick Response Excitation for Frequency Changers

The station will ultimately accommodate six frequency changing aggregates, each consisting of a 60-cycle, three-phase, 13,200-volt, 300-r.p.m. synchronous motor, rated 18,000 kva., 90 per cent power factor, coupled with a 25-cycle, 13,200-volt generator, rated 30,700 kva., 70 per cent power factor lagging, single phase, and 15,000 kw. when used as a three-phase machine. Three of these units are used in the initial installation. The ultimate capacity of the station will take care of the entire power demand of the Wilmington-Philadelphia section when full electric service is installed.

Each foundation of a frequency changing set is supported on piling driven under all bearings, the piling being 15-in. iron pipe filled with reinforced concrete. The piling is connected to the general grounding system by means of standard rail bonds. Vibration may be expected due to the pulsating torque caused by the loading of only one phase of the generator. An expansion joint 1 in. wide is provided on the main floor level all around each unit to prevent vibration being transmitted beyond the machine's foundations. The armature frame of each motor is welded and can be shifted for the purpose of synchronizing. The 20-in. shaft of the machine is supported on four 20x40-in. standard bearings. Temperature exploring coils are imbedded in the stator and each machine is provided with two 2-in. brass manifolds that may be connected with adjacent water pipes for fire protection. Each machine has a sheet steel inclosure with ventilating openings in the upper part of the yoke. The exciter of the motor is mounted on the extension of the motor shaft and is rated 60-kw., 250-volt direct current. The generator has also a 135-kw. direct connected exciter with a 15-kw. (pilot) auxiliary exciter mounted on the extension of the main shaft.

The field air circuit breaker and rheostats are located on the main floor of the machine hall adjacent to the corresponding exciter. The auxiliary exciter feeds the field windings of the main exciters and has a 200-amp. 250-volt air circuit breaker in series. The main exciters, therefore, are separately excited machines while the auxiliary exciter is a shunt machine. The use of the auxiliary exciter eliminates the necessity of large main field rheostats and permits a quick response of excitation during short circuit disturbances and heavy load fluctuations.

The neutral leads of the generator, after passing through current transformers used for differential protection, are tied together and continued through a single-phase, 1,200-amp., 15,000-volt oil circuit breaker in series with 1,000-amp., 15,000-volt disconnecting switches. All neutral oil circuit breakers are tied to a neutral bus brought outside. This bus passing through a current transformer becomes grounded through a 4-ohm resistor rated at 2,000 amp. for one minute. This current transformer and three unit resistors are located along the south wall of the building in back of the station light and power transformer banks. The basement under the machine hall accommodates the instrument transformer

compartments and auxiliary equipment, including a frame shifting motor and motor-driven oil pump for each machine, an oil purifier heated by an immersion electric heater with three heat control, a rotary oil pump and a 7x6-in. air compressor. Electrolytic lightning arresters with fuses and balancing resistors connected across the field of each machine are located in the basement on each machine foundation. A Cory interlock system is used on all outdoor switching equipment to prevent the opening of disconnecting switches under loads by unauthorized persons, or damage from the same cause through malicious tampering.

Switching Under Load on the Low Tension Side

The outdoor equipment of the railroad consists of a three-phase, 13,200-volt, 25-cycle ring bus, ultimately to be sectionalized in three parts or six sections. Each section is to be fed from a separate frequency changing set. The two middle sections feed one single-phase transformer while two-single phase transformers will be connected to each end section. The adjacent sections are tied by means of oil circuit breakers with reactors and disconnecting switches in series. There also will be a shunt tie having the same kind of equipment but no reactors. Each section is to have its potential transformers with fused resistors.

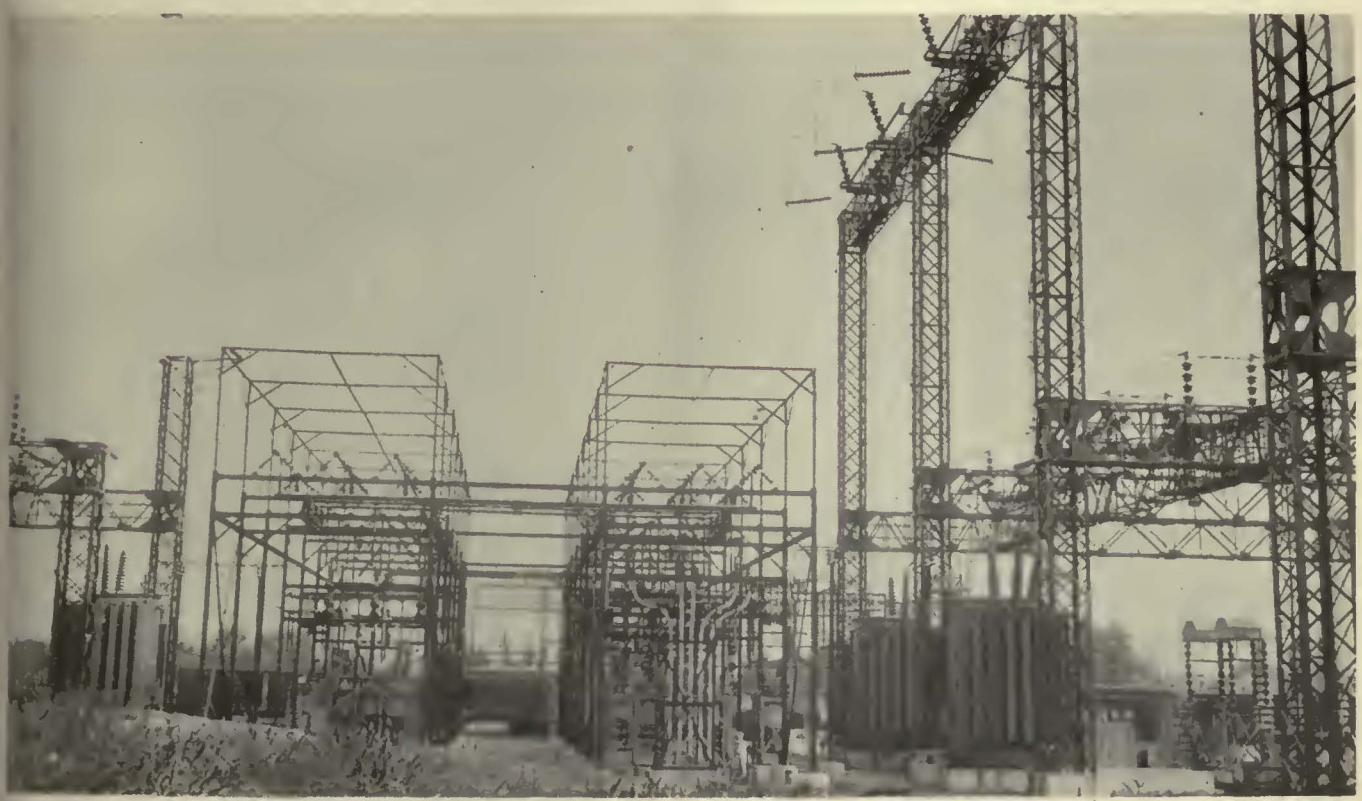
The low-tension side of the single-phase transformer connects to the 13,200-volt bus through an oil switch with disconnecting switches in series. The high-tension winding of this transformer steps up the potential to 132,000 volts, having the middle point of the winding grounded through a resistor located outdoors under the high-tension switching structure.

The high-tension structure carries the 132,000-volt line air current breakers, choke coils and lightning arresters. A tap is taken from the high line to a single-phase transformer stepping down to 11 kw. for feeding the contact wires of the local section of tracks. Only that part of the outdoor equipment which is directly tied into the 13,200-volt, three-phase bus is controlled from the two 25-cycle switchboards located in the operating room. All the secondary control wires from the bushing type current transformers and from the potential transformers in the outdoor substation are brought directly to the pipe room under the 25-cycle board, or indirectly when passing previously under the 60-cycle control boards. Such indirect routing of cables was caused by the duplication of ammeters connected in series on both instrument boards.

The initial installation is to consist of three-bus sections sectionalized with no shunt ties, each section being fed from an individual generator.

All secondary control cables are brought in iron conduits to the pipe room located directly under the operating room. A steel frame is built in the pipe room under each switchboard to carry connection boxes for the pipes, auxiliary panels for fuses, cutouts, secondary relays and other equipment of the secondary control circuits. All pipes carrying d.c. control leads are brought under the relay board, and those carrying a.c. secondary leads terminate in boxes under the instrument board. The intermediate and cross connections between the boards are made in pipes running under the pipe room floor or overhead.

The 60-cycle control boards are of a circular type centrally located in the operating room. This arrangement requires a fanlike steel structure to permit the passing of control pipes from the pipe room to the switchboards. To avoid an excessively heavy structure the operating room floor was not made entirely self-supporting, part of the load being taken by three columns in the



The outdoor equipment of the railroad includes a 13,200-volt, 25-cycle ring bus which will ultimately be sectionalized in three parts

pipe room. The benchboard is centrally located in the operating room, and concentrically in relation to it is the instrument board, with the relay board back of it. The station light and power board and the d.c. board are to the right side facing the circular boards, and to the left is the 25-cycle instrument board with the relay board back of it. The remaining part of the floor space in back of the station light and power board is occupied by the railroad signal equipment, consisting of two motor generator sets with switching equipment for generating 440-volt, 100-cycle, single-phase current. Each set consists of a 75-hp., 60-cycle, three-phase motor using 2,300 volts from the station light and power two-phase, 220-volt circuit, transformed to 2,300 volt, three phase by means of a bank of two 37½-kva. single-phase transformers per machine. These transformers are located outdoors in the railroad switchyard.

A Lundin and flash test panel is located in the basement to facilitate testing of cables. Two motor generator sets are installed on the operating floor level for generating direct current and feeding the two storage batteries. Two

The high-tension structure carries the 132,000-volt line air circuit breakers, choke coils and lightning arresters

battery rooms are provided in the basement, only one being equipped for the initial installation. The 25-cycle control and relay boards accommodate all meters and protective apparatus necessary for outdoor bus and transformer equipment, and a duplicate control is provided for the generator oil circuit breakers. These breakers can therefore be tripped from both boards while the closing can be made only from the circular board. All high-tension 132,000-volt switching equipment is controlled from a switchhouse located on the railroad premises.

Ground Resistors Have Relay Protection

This station, acting as a link between the highly fluctuating railway loads and the immense source of power of the Philadelphia Electric System, must have an adequate and reliable relay system. Electric instruments, therefore, must be interposed between the main circuit or apparatus and the current breakers in such a way that any abnormality in the circuit will act on the relays. These in turn, after proper discrimination as to the magnitude and character of the fault, cause the circuit breaker to trip, thus relieving or protecting the circuit or apparatus.

In deciding upon the type of protection two important factors must be kept in view: The protection against interruption and the apparatus protection. The service protection requires an automatic sectionalizing of equipment in the station, so as to isolate the disabled section without disturbing the normal régime of all the remaining equipment.

The 60-cycle equipment is protected by type CO overcurrent relays actuated from bushing-type current transformers located on the incoming power side of the running oil circuit breaker. The secondary control current passes through auxiliary HG relays used for tripping the running oil circuit breaker, the field air breaker, and for operating the alarm and auxiliary circuits. Each motor also has a differential protection consisting of PQ type relays actuated by current transformers located in the line compartments of the machine hall. The d.c. control circuit of these relays actuates a special hand reset, multiple contact, auxiliary relay, tripping the running oil switch and the field breaker, and operating the annunciating system. The necessary hand resetting of this auxiliary relay prevents the operator from an immediate reclosing of the starting and running oil circuit breakers, thereby inducing him to investigate the cause of trouble previous to reclosing the breakers.

The tripping of the differential or overload relays of the motor does not cause cutting the generator loose from the ring bus. Under those conditions the machine will continue running from the 25-cycle side, providing the adjacent 25-cycle bus sectionalizing switch is closed. The unit will be started anew if tripped by the overload relays, or shut down by the operator when tripped by the differential relays.

In the initial installation the station will be operated on the unit basis, each machine being fed separately from the generating station. In the ultimate installation each incoming line will have power directional relays actuated by bushing-type current transformers in the line oil circuit breakers. Provision also is made for overcurrent protection of the magnetizing switch, three-phase type

COA relay being used for compactness instead of three single-phase relays.

The protection of the generator is entirely independent from the protection of the motor. It also has overload and differential relays working in a manner similar to that of the motor except that the exciter field breaker is not tripped simultaneously with the machine oil circuit breaker.

The protection of the single-phase 13,200 to 132,000 volts step-up transformers is accomplished by means of differential type MC relays operating the transformer oil circuit breaker, and actuated by bushing-type current transformers in the breaker and the power transformer. The outgoing high-tension lines are protected by type CO overcurrent relays actuated from bushing-type current transformers on the high-voltage leads. The line also has a ground protection by means of an overcurrent relay, type CO, actuated by a current transformer in the grounded middle point lead. This middle point of the high-tension winding is grounded through a 330-ohm outdoor type resistor, protected by an overcurrent type CO relay connected in series with the ground relay. Bus differential relays, type MC, are used for protection of the bus, and are actuated by bushing-type current transformers on the incoming side of the generator oil switch and the outgoing side of the bus and transformer oil circuit breakers.

The 132,000-volt air circuit breakers are controlled from the control house on the railroad premises. The control circuits of these breakers and the oil switches are interlocked by means of auxiliary d.c. relays to insure the opening of the air breakers upon the action of the differential resistor protecting relays. The ground resistor relay has a logarithmic characteristic and becomes energized whenever the ground current of the line is not sufficiently high to actuate the ground relay yet sustained and high enough to cause damage to the resistor.

The design and installation of converting and distributing equipment for the Pennsylvania Railroad was in charge of Gibbs & Hill, consulting engineers of New York City.

Parking Prohibited After Snow Storms

UNDER agreement with the city of Montreal, the Montreal Tramways pays 50 per cent of the cost of snow removal from "tramway streets." This expense to the company is in addition to the ordinary broom and short wing work done by snow sweeper equipment. Before automobile parking interfered, the tramways' equipment winged the snow out to a "windrow" alongside the track, after which city equipment piled the snow near the curb, from whence it was removed. During the past few years, however, automobiles parked at curbs during and after storms, have interfered greatly with the use of long wings on the tramways' equipment, as well as street cleaning operations, thus increasing the cost of snow removal. In many instances, after storms, moving vehicles made such use of the space cleaned by sweeper equipment as to cause serious delay to street car traffic.

Dash sign carried on Montreal cars to warn motorists against parking during and after snow storms

In December last the situation was discussed at a conference between officials of the roadway department of the city and officials of the company. The result of this conference was that the chief of police was authorized (under existing city by-laws) to prohibit parking on "tramway streets" and bus routes, during and after a snow storm, when requested by the roadways department to do so.

In order to aid the city in notification of such a prohibition, the tramways agreed to carry "No Parking" signs in the street cars, and display them on the front or rear of the car, on notice from the city.

Magnitude of German Street Railways

STATISTICS of German street railways are given in the latest handbook of German street railways, light railways (interurban lines) and private railways, published by *Verkehrstechnik* for the Verbandes Deutscher Verkehrrswaltungen, formerly the Association of German Street Railways, Light Railways and Private Railways. A total of 182 street railways, 309 light railways (of which 34 are electrically operated) and 128 private railways are listed, which together have a working length of 20,864 km. (12,957 miles). The capital invested is 2.8 billion marks ($666,000,000). In the latest year for which reports were received 154,681 persons were employed, 4.66 billions of passengers were carried and 86.4 million tons of goods were dispatched. Some of the most interesting figures are given in the accompanying tables.

TABLE I—GERMAN STREET RAILWAYS MORE THAN 100 KM. (62 MILES) OPERATING LENGTH

	Km.	Miles
Berlin Street Railway System	615.0	381.3
Hamburg Street Railway	217.3	134.7
Rhenish Railway of Dusseldorf	172.0	106.6
Street Railway of Hanover	166.9	103.5
Aix-la-Chapelle Light Railway (25 km. additional in the Eupen district sequestrated)	152.1	94.3
Dortmund Street Railways	150.2	93.1
Municipal Railway of Dresden	139.8	86.6
Greater Leipzig Street Railway	128.8	79.8
Bochum-Gelsenkirch Street Railways	125.6	77.9
Street and Vorort Railway of Cologne	115.7	71.7
Municipal Street Railways of Munich	110.1	68.3

TABLE II—GERMAN STREET AND INTERURBAN RAILWAYS, CLASSIFIED BY LENGTH

Length Km.	Length Miles	Number of Railways: Street Railways	Interurbans	Total
Under 3	Under 2	13	1	14
3– 10	2– 6	43	12	55
10– 20	6–12	51	10	61
20– 30	12–19	12	6	18
30– 40	19–25	12	2	14
40– 50	25–31	15	0	15
50– 60	31–37	7	1	8
60– 70	37–43	3	2	5
70– 80	43–50	4	0	4
80– 90	50–56	1	0	1
90–100	56–62	3	0	3
Over 100	Over 62	13	0	13
Length not stated		3	0	3
		180	34	214

TABLE III—NUMBER OF PASSENGERS CARRIED BY LEADING GERMAN STREET RAILWAY SYSTEMS

Berlin surface lines	834,701,449	Hanover	76,192,180
Hamburg	335,272,342	Bremen	70,152,167
Berlin elevated	222,530,000	Dortmund	69,351,698
Cologne	222,103,908	Chemnitz	50,924,848
Dresden	201,146,742	Magdeburg	49,665,946
Munich	166,806,096	Bochum	44,949,126
Leipzig	159,224,496	Karlsruhe	40,526,449
Frankfort-on-Main	143,622,050	Mannheim	39,409,543
Dusseldorf	139,684,449	Konigsburg	38,938,926
Breslau	125,987,832	Halle	38,595,178
Stuttgart	121,154,314	Stettin	32,805,116
Essen	84,690,830	Duisburg	30,817,066
		Dantzic	30,768,111
		Aix-la-Chapelle	29,770,847
		Kiel	25,499,731

The architectural treatment of this new garage of the El Paso Electric Company makes the building distinctive

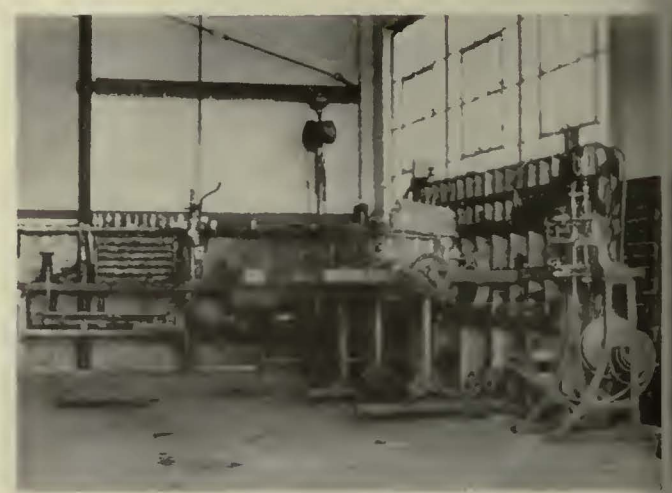
Attractive Garage Houses El Paso Buses

Well lighted and ventilated building used for storing, inspecting, servicing and washing the buses. Repair shop completely equipped

BUSES of the El Paso Electric Company, El Paso, Tex., are now quartered in an attractive new garage, equipped for servicing and repairing the buses, as well as storing them. The building is of steel and brick construction, with inner walls of steel lath and plaster, concrete floors and gypsum roof. Steel sash running the entire length of the outer walls permit an abundance of natural light to enter and also provide ample ventilation.

The main part of the garage, used for bus storage, inspection, servicing and washing, is 50x80 ft. This room is entirely open at both ends but can be closed tightly by means of sliding doors. There is a large skylight in the center of the roof. The inspection pit is long enough to accommodate two buses at a time, and is illuminated by electric lights set in depressions in the walls. There are a number of sewer drains in the floor to take care of bus washing.

The shop is located in a room 20x40 ft., and is adequately equipped for all repairs. It has two 2-ton chain block hoists, which travel on overhead beams, for lifting the bus bodies, and a jib crane with a ½-ton chain block hoist for handling the motors. There is a motor stand for holding the motors while they are being repaired or



The repair shop is equipped with two 2-ton chain block hoists, a jib crane and all necessary machines and tools

Main part of the garage where the buses are stored and serviced

overhauled, and located in one corner of the shop is an air compressor with a storage tank 2 ft. in diameter and 7½ ft. long. The air-supply system is connected to the storage tank in the carhouse by a pipe running under the street. Other equipment in the shop includes a main bearing and connecting rod bearing boring machine, a valve refacing machine, a drill press, a bench grinder and a brake lining machine.

Four 110-gal. oil tanks with pumps are used for storing the motor oils. The buses are fueled at two gasoline pumps, one at the front and one at the rear of the garage. Each pump is connected to a 1,000-gal. storage tank.

Two rooms in the northwest corner of the garage serve as offices for the master mechanic and his clerk. A locker room and lavatory, equipped with showers, also is located in the building. Hot water is furnished by an automatic electric heater. The building itself is heated throughout by steam radiators. Both the heating plant and the electric water heater are in the basement.

London Underground Completes Extensive Station at Piccadilly Circus

It serves two tubes and has a capacity of 50,000,000 passengers a year. All excavation and construction material had to be conducted through one 18-ft. shaft

LONDON'S new and extensive underground passenger station has just been completed at Piccadilly Circus at the junction of two tubes, the Piccadilly tube and the Bakerloo tube. The original station at this junction dates from 1906, when the two tubes which cross each other at this point were opened. At the time it was built, this station seemed adequate to meet the requirements for many years to come, as it had to deal at that time with an annual traffic of only 1,500,000 passengers. Since then Piccadilly Circus has become a busy commercial center, being close to the retail shopping and theater districts of London. In consequence, the traffic at this station has grown until 25,000,000 passengers now pass through its portals annually.

When it became evident ten years ago that the old station was becoming inadequate, the new one was planned, and the last four years have been devoted to its construction. The public opening took place on Dec. 10, 1928, with appropriate ceremonies and was attended by a large gathering of distinguished guests. The cost of the new station was more than £500,000 ($2,500,000).

The latest tube station to be opened in London is at Piccadilly Circus, a congested traffic center. Four years were required in its construction and its cost was about $2,500,000

It connects the Piccadilly tube, 102 ft. below the ground, with the Bakerloo tube, 86 ft. below the ground, and it provides entrance and exit to the platforms of both tubes by passageways and escalators. Owing to the necessity of keeping obstructions on the streets at a minimum during the work of construction and thus permit a constant movement of traffic, the engineering problems were complicated. An important factor in making them so was the need also not to disturb the services supplied by the gas, electric light, telephone, water and hydraulic power mains running in all directions immediately below the roadway. To complicate the problem further, a large sewer passed directly through the projected location of the main ticket office.

After the engineering drawings had been prepared, the custom was followed, as has been done with previous new underground stations, of preparing full sized models

of the various levels so as to experiment with them and thus obtain the most satisfactory arrangement. In the case of this station, the models were built up with scaffold poles, cardboard and other pliable material, and the layout was arranged and rearranged and submitted to various tests until finally the most suitable scheme with respect to the position of escalators, landings, passageways and other features was produced. These tests were carried on at a place where covered accommodation was available for setting up a full sized plan of the main ticket office.

When work was actually begun on construction, excavation was conducted through a small "island" near the center of the area on which a monument stood. This was removed for safekeeping, and a shaft, 18 ft. in diameter and 92 ft. in depth, was sunk at this point. Through this shaft, the construction of all of the work with the exception of the main entrance and ticket office was carried out. This shaft was also used for the passage of materials, equipment, etc., to and from the work and for bringing spoil up to the surface. Fortunately the subsoil was suited to make construction fairly easy. It consisted largely of clay, with an overlay of gravel near the surface. Water was not, therefore, encountered to any extent, so that it was not necessary to build coffer dams or to work in compressed air.

After the shaft was sunk, the next procedure was to drive headings or tunnels at various depths. Before actual work could be begun on the station and its passageways, however, a special subway had to be built to carry the water, electric light and other mains which underran this area. This pipe subway is 12 ft. in diameter, or $3\frac{3}{4}$ in. larger than the railway tubes. It is of similar design, being of circular section and lined with cast-iron segments. Herein it differs from pipe subways constructed elsewhere in London, as they have been of square or arched section and brick built. This pipe subway extends around the Circus at a depth of from 18 to 30 ft. below the surface, and forms a sort of outer circle to the station. It is 550 ft. in length, but instead of being level throughout its course, it has frequent undulations, so that it may pass above or below obstructions that lie in the path. Inclined tunnels having a total length of 300 ft. lead from this subway to the streets around it.

When the pipe subway was finished, the various conduits, cables, etc., were placed in it. They are now quite readily accessible, and henceforth any work concerned with them can be conducted without the former necessity of opening the roadway and hindering traffic.

The most difficult part of the work was the construction of the main ticket office, as none of the streets overhead could be blocked or opened up while the work was proceeding. This task was achieved by a series of methodical burrowings, until the ground below the surface became a labyrinth of steel roofed and steel supported tunnels. Then, through the removal of the intermediate walls of earth, an elliptical chamber, 155x144 ft. in area and 9 ft. in height, was opened up only a few feet below the surface. The permanent steel work was then put in place.

Each of the four columns erected in the central portion of this floor is capable of supporting a weight of 309 tons, while the 60 columns erected in a double row around the perimeter of the hall are capable of supporting individual loads ranging from 78 to 150 tons.

The six subways that radiate from this main entrance and ticket office were excavated by a similar method. Headings were driven from the main room along the sites of the subway sidewalls, and in these the foundations were built and the subways gradually completed. These subways connect the main ticket office and the various exits and entrances at the different corners. Incidentally, these passageways are arranged so that pedestrians can use them in crossing from one corner to another without buying a railroad ticket. Hence, the station is a public convenience also.

This large circulating area is only 2 ft. underneath one of the busiest traffic centers in London

Owing to the depth of the platforms below the surface of the street, it was necessary to divide the escalators into upper and lower flights. In all there are eleven escalators, the greatest number in any London underground station, and the five in the upper flights are the largest number yet installed side by side. All have a speed of 100 ft. per minute.

An average of about 150 men were constantly engaged during the four years that were occupied in the construction of the station and its appurtenant work.

The greater part of the main ticket office is finished in travertin marble and presents a handsome appearance. The flooring is of large white tiles, each 1 ft. square. The decorations include some paintings in oil along the inner side of the headwall of the escalators. The central compartment contains a map of the world, showing the British Empire in a distinctive color. Backing this map are smaller panels with pictures representing the activities of the Underground in the sphere of urban and suburban transport.

The tiling of the public subways is of biscuit color, relieved by black borders. The lighting is by lamps of opal shade.

Following the recent practice of the company, a large part of the ticket sales will be by automatic machines. The latest types are arranged to print the tickets as well as deliver them. Twenty-six of these machines are arranged around the ticket office. As the zone system is used, they issue tickets ranging from 1 penny to 6 pence in denomination. There is also an automatic change-making machine.

Pacific Coast Executives Hold Regional Conference

First of series of meetings to be held in various sections of the country under the auspices of the Advisory Council inspires frank discussion of current problems and outlook for industry

DURING two busy days, on Feb. 27 and 28, 1929, executives of electric railway properties in the Far West met in San Francisco for an informal and frank discussion of problems of policy and operation and for a comparison of views with respect to the outlook for the industry. The meeting, which was held under the auspices of the Advisory Council of the American Electric Railway Association, was well attended by principal executives representing electric railway companies along the entire Pacific Coast from Portland to San Diego and eastward to the Rocky Mountains. J. N. Shannahan, chairman of the Advisory Council, presided.

In opening the meeting Mr. Shannahan announced that this was the first of a series of regional conferences of principal local transportation executives to be held in various sections of the country for an intimate discussion of regional problems of mutual interest. He expressed a firm conviction of the basic need for organized community transportation service in modern cities, and pointed out that such service must be put on a sound and profitable basis before new capital can be expected to flow in to permit transportation service to keep pace with growing community requirements.

Transportation Vital to Community Progress

"The public has a vital interest in the local transportation problem of the country," said Mr. Shannahan. "The very existence of modern cities as we know them today depends upon the maintenance and expansion of efficient public transportation service. To accomplish this, these properties must earn more than merely enough to pay fixed charges and operating expenses. The public must be brought to recognize this situation and to understand its own interest in the continuation and development of efficient community transportation." Mr. Shannahan expressed the belief that the public can be brought to recognize the facts of the transportation situation and to deal fairly with them, by outlining briefly his experience in Omaha during the effort to obtain an equitable franchise there, following a long drawn-out controversy and a previous popular defeat of almost the same franchise that was recently passed by a vote of almost 4 to 1.

In discussing the purposes of the conference and the outlook for the industry, L. S. Storrs, managing director American Electric Railway Association, directed attention to the striking similarity of the problems faced by various companies throughout the country. Each property, however, explained Mr. Storrs, is inclined to consider its own problems to be individual and special. To this point of view he attributed the apparent inertia on the part of individual managements in applying the methods which have proved successful on other railways. Mr. Storrs indicated that it was to help in overcoming this inertia that the plan of holding a series of regional conferences among the principal executives of operating companies in the several sections of the country was suggested.

Paul Shoup, president Southern Pacific Railroad and member of the Advisory Council, expressed the belief that the transportation industry of the country has made progress toward better public understanding of its problems. He felt that the American public may be expected to deal fairly with a question upon which it is properly informed and that it can be interested in the facts of the transportation situation if they are properly presented.

Problem of Congestion Presents Opportunity

"The public, however, is not interested in other people's troubles," warned Mr. Shoup. With respect to the growing traffic congestion arising from the widespread use of automobiles, Mr. Shoup felt that the increasing difficulties encountered by modern communities as the result of congestion may be expected to react to the benefit of public transportation companies provided that equipment and service improvements are developed to take advantage of the opportunities presented. He held that the adequate development of efficient public transportation offers American cities a solution of the problem of congestion that has assumed extremely severe proportions in practically every large community.

As the discussion progressed, speakers dealt with various details of management and operation, but there was a persistent effort to keep in the forefront broad questions of principle and policy dealing particularly with fundamental economics and the relation between transportation and community development. "The local transportation industry," declared Samuel Kahn, president Market Street Railway, San Francisco, "presents three broad questions that are fundamental in any business enterprise. First of these is that of the right to do business; second, is the question of the right to earn a fair return on the investment, which shall be adequate to attract capital for improvements and expansion. Finally, and equally important, is the question of ability to earn an adequate return even after the right to do so is not an issue."

Mr. Kahn agreed with previous speakers that the current problems of many properties are common and similar

in general terms. He held, however, that each property presents many special problems and pointed to the men ace of municipal ownership propaganda as a basic question of particular importance in the Pacific Coast region.

Importance of Personal Leadership Stressed

Chairman Shannahan stressed the importance of personal leadership as a factor in the success of all American business today. "The growing size and complexity of business organizations have increased rather than decreased the importance of that single individual who furnishes the vision to plot a course through the shoals of unsound economic methods, and the inspiration to build esprit de corps in a vast organization frequently spread throughout the country or the world," declared Mr. Shannahan. "In each great business enterprise characterizing this modern industrial era, there is always one dominant personality that provides inspiration and leadership. Bankers recognize the importance of the man at the top in business success. In this respect the electric railway industry is no exception, and there is great need for leadership in the solution of its problems.

"Conferences of principal executives for the discussion of policies are of importance to the entire industry and to the future of each individual property," continued Mr. Shannahan. "The local transportation industry must look for its rejuvenation and advancement to the general recognition and application of sound economic principles. Many of the industry's past and present difficulties are attributable to its readiness to grasp at unsound expedients and its failure to recognize dangerous policies that were followed during the promotional and competitive stage of its development. In large measure, the continuing difficulties that have existed since the war are attributable to the industry's failure to dig below the surface of daily operating routine and to establish clearly the principles upon which the rehabilitated structure of community transportation must be reared. Great harm is done whenever an individual property adopts an unsound expedient in the attempt to work out its own salvation. For that reason, conferences among principle executives are vitally important in order that unsound policies may be avoided and the entire industry may be united in its advocacy of the principles upon which the complex economic problems of community transportation may be worked out."

At the request of Chairman Shannahan, Charles Gordon, editor Electric Railway Journal, discussed the general outlook for the industry and some of the factors involved in putting the local transportation business on a really satisfactory financial basis. "After all," said Mr. Gordon, "there is only one great basic question with respect to the local transportation industry, and that is whether or not any combination of rates and service can be devised which will satisfy the public on the one hand and, on the other, produce a satisfactory return for investors."

General Improvement in Basic Conditions

The speaker pointed out that there has been more progress in rebuilding the foundations of the industry than is apparent from a close-up view of daily operating results. In three principal respects, he held, there has been marked underlying improvement, extending to many properties throughout the country. First, in respect to franchises, former grants with arbitrarily fixed terms and conditions have given way in many cities to documents sufficiently flexible in their provisions to permit changing conditions and requirements to be met as they arise. Most notable among the characteristics of modern franchises are those of the indeterminate type as to duration, and service at cost as to rates. Only a casual survey is needed, according to the speaker, to give an impressive perspective of the extent to which modernized franchises have replaced the former type of rigid, fixed-term grants that were largely responsible for the serious difficulties into which the industry was plunged during the war and post-war period.

Next, but by no means secondary in importance, according to Mr. Gordon, is the vast improvement that has been made in the relations between local transportation companies and the public they serve. In city after city, as the past decade is reviewed, a condition of suspicion and unfriendliness on the part of the public, and dogged, stubborn combativeness on the part of railway managements has been replaced by cordial relations and a mutual effort toward co-operation. In many instances the change in public relations was a quick and complete reversal of conditions, brought about in a surprisingly short period of time through a change in method and attitude on the part of railway managements themselves.

Furthermore, the speaker pointed out, the change in the condition of franchises was accompanied by a breakdown in the former arbitrary 5-cent fare which had become a political fetish upon which politicans rode into office with a total disregard of the fundamental transportation requirements of their communities. With only a few notable exceptions the 5-cent fare has been definitely eliminated throughout the country and it is of particular significance that a satisfactory solution of local transportation problems seems most remote in those cities that have continued to be misled by fixed 5-cent fare advocates.

Ability to Earn Adequate Return Primary Question

All of this, declared Mr. Gordon, is evidence of the marked improvement in the basic conditions that underlie the local transportation industry. He held that only one great question exists to which the answer appears to be in doubt. That, in brief, is the question of the ability of the industry to earn a satisfactory return at any reasonable level of rates in the face of growing competition from private automobiles. It is to this question that any discussion of the outlook for the industry inevitably leads.

On this point Mr. Gordon maintained that local transportation rates have been largely makeshift expedients, and that there has been no really serious effort to develop the principles upon which an economically sound local transportation rate structure should be built. The speaker explained that the question of proper rates is only one phase of the general problem of meeting automobile competition. He declared that there is a great need for the perfection of more satisfactory vehicles and for higher standards of service. There is likewise great need for the application of merchandising methods in the transportation business; for the rerouting and relocation of lines that no longer serve efficiently—in fact, for the application of those many methods and practices which have produced improvement on individual properties but which are being adopted only very slowly by the industry as a whole. Although there has been much discussion of the need for improved service and methods in meeting the changed condition brought about by the competition

of the automobile, the surface has barely been scratched in the application of the many ideas advanced. Until greater progress is made in meeting the requirements of this changed situation there is no substantial reason for questioning the ability of the industry to earn a fair return.

Public Subsidy Expedient Condemned

The speaker condemned the tendency which has been evidenced in recent discussions to grasp at another expedient; namely, some form of public subsidy for transportation properties. If it should ever become apparent that a proper combination of rates and service will not attract sufficient revenue to put the local transportation business on a satisfactory financial basis, he held that any form of general public subsidy would lead to constantly recurring difficulty and would offer little hope of permanent improvement or stabilized finances that would permit the industry to keep pace with a growing community's requirements.

As an alternative for a general public subsidy, the speaker suggested relief from special taxes and imposts as a means of removing from the industry unjustified burdens that directly affect the cost of providing service vital to the community. He held, further, that it would be economically sound, and equitable as well, for a community to consider the track structure and rails as a special form of paving to be assessed, as are other street improvements, against the property directly benefited by the existence of a public transportation facility in a given location. Mr. Gordon explained that the principle involved in relieving the car rider of the fixed charges on the capital invested in street railway track and spreading the cost over the property benefited by the existence of such a transportation facility in a given location is similar to that at present widely advocated for the construction of rapid transit lines, and to the principles at present followed in the operation of buses over pavement in which the capital investment is wiped out through the special assessment method. The rental charge or tax to be imposed upon an operating company for the use of such community-owned facilities, according to the speaker, should be limited to a sum adequate only for the proper maintenance of the facility provided, whether it be a rapid transit line, a street car line or just the surface paving of the street itself.

Results for Fare Changes Discussed

The general subject of fares and fare structure occupied considerable attention during the discussions at the conference. O. A. Smith, passenger traffic manager Pacific Electric Railway, outlined the experience of his property in attempting to establish a rate structure which would bring a satisfactory volume of revenue. The general plan followed is that of zone rates supplemented by various forms of passes. Mr. Smith felt that on the basis of Pacific Electric experience the zone system is both desirable and wise.

Some of the principles involved and the experience to date on the Los Angeles Railway resulting from an increase in fares from 5 to 7 cents was outlined by G. B. Anderson, superintendent of transportation Los Angeles Railway Corporation. When fares were recently increased from 5 to 7 cents cash, or four tokens for 25 cents, there was some decrease in the volume of travel. However, an immediate increase in the amount of service provided, resulted in bringing the travel back nearly to what it had been before the fare increase. On the basis of Los Angeles experience to date, Mr. Anderson expressed the opinion that the combination of an increased fare with a corresponding improvement in service is a step in the right direction in approaching the problem of developing increased revenue.

A brief outline of the conditions existing in San Diego and of the outlook for the transportation property of the San Diego Electric Railway was given by S. E. Mason, general manager. In this southern California city, having a population estimated between 160,000 and 170,000, where wide streets and moderate temperatures offer unusual attractions for the use of automobiles, this company has held its traffic and revenues to a favorable figure through improved service and a combination of zone fares and several forms of passes to attract riders. Mr. Mason pointed out that, although the property has continued to enjoy increasing business, the rate of increase has not corresponded with that of the growth in population.

An unusual example of high-speed interurban operation with one man was described by Julian M. Bamberger, president and general manager Bamberger Electric Railroad, Salt Lake City, Utah. On this property, which is a double-track line approximately 36 miles long, there are ten zones with a fare of 10 cents per zone. All passenger equipment was rebuilt for one-man operation. These cars are run at speeds of 55 to 60 m.p.h. Carload and l.c.l. freight business has been built up by consistent and intensive effort, so that passenger revenue now represents only 55 per cent of the total, whereas it formerly constituted 74 per cent of the entire revenue. Mr. Bamberger expressed the opinion that the industry has in the past feared new ideas and has been more inclined to find reasons why new things could not be done than to meet changed conditions with a serious effort to develop changed methods.

Depreciation Accounting Requires Attention

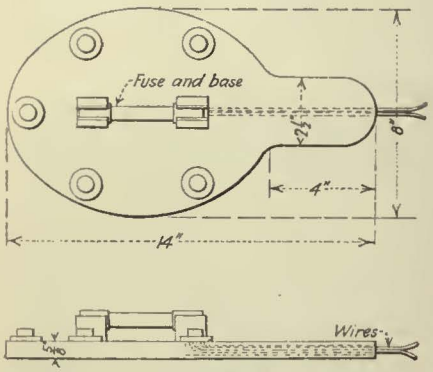
Subsequent discussion covered a wide range of additional operating questions. These included recent developments in trucks and equipment, particularly the new type worm-drive trucks; results of the trackless trolley experiments in Salt Lake City; handling of complaints; possibilities of pick-up and delivery service on interurban roads; experience with amusement parks and special beach traffic, football traffic, etc.; use of de luxe buses for special service, and depreciation accounting by electric railways. The latter subject was brought up by R. O. Crowe, auditor of the Los Angeles Railway, who maintained that the present Interstate Commerce Commission classification of accounts does not give a true record of costs and is misleading and unfair to the investor with respect to depreciation. Although the limited time available did not permit Mr. Crowe to go into this question at length, he called attention to the seriousness of this problem and declared that electric railways need to give very much more serious attention to the establishment of sound principles of depreciation accounting than has been done in the past.

At the close of the meetings a portion of one afternoon was devoted to an inspection of the "comfort cars" developed by the Market Street Railway in San Francisco, and of the sample four-wheel car built by the Twin Coach Corporation and in experimental service on the Key System Transit Company in Oakland.

Better Maintenance Through Improved Methods

Fused Portable Lamp Bank

FREQUENT trouble formerly was experienced in the shop of the New York & Queens County Railway, Woodside, N. Y., because of portable lamp banks becoming short circuited or grounded. The shop fuse was always blown when this occurred, which extinguished any other lights on the same circuit. This condition compelled a number of men to stop



Banjo lamp cluster with fuse used in New York & Queens County Railway shop

work until the fuse was replaced. To prevent this the lamp bank shown in the accompanying sketch was designed and constructed. It consists of a piece of white pine $\frac{5}{8}$ in. thick, 14 in. long and 8 in. wide. It is spoon shaped and provided with a handle 4 in. long x $2\frac{1}{2}$ in. wide. Five lamps and a fuse are installed and connected in series for operation on a 550-volt circuit. The handle is bored for the entrance of the wires. The fuse is of such capacity as will protect the five lights only. In case of a short circuit or a ground occurring, the fuse will blow and the shop fuse will not be affected. It has successfully accomplished the results for which it was designed.

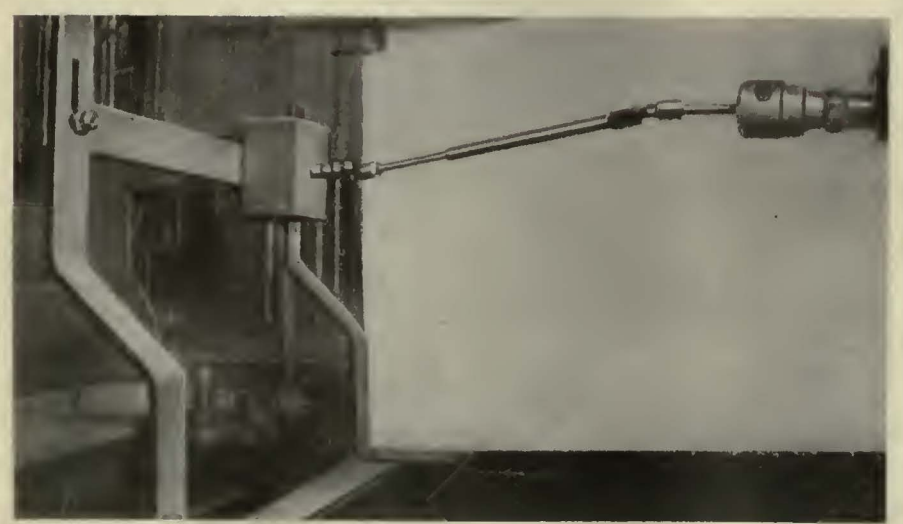
Revolving Oscillating Valve Grinding Device*

By Harvey L. Bullock
Superintendent of Electrical Equipment
Cleveland Union Terminal
Cleveland, Ohio

FOR grinding compressor head valves a power-driven device connected with a small compressed air motor through a telescope shaft and universal joints is in general use in the White Plains shop of the New York Central Railroad. A smaller hand operated model is also used for reseating electro-pneumatic valves which are used with General Electric Company's PC-10 controllers.

This valve-grinding device, which can be found in many automobile repair shops, is composed of two disks mounted on a horizontal shaft on opposite sides of a pinion, the latter being fitted to the end of a vertical shaft and connected to a spring-cushioned sleeve and screw-driver bit. One disk has six teeth and the other nine. This causes the bit to operate and the unequal number of teeth on the disks causes the bit to make one complete revolution to every five oscillations. The arrangement makes a simple, accurate tool.

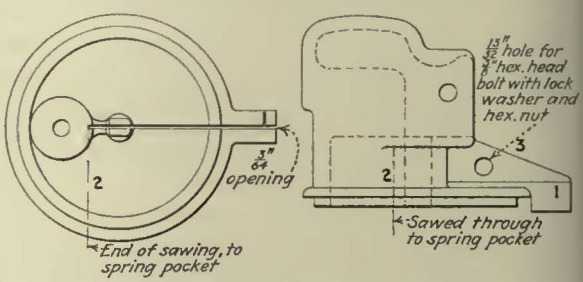
*Submitted in Electric Railway Journal Prize Contest.



Valve-grinding device used in the shop of the New York Central Railroad

Clamping Arrangement Keeps Controller Handle Bases Tight*

By F. A. Marsh
Superintendent of Equipment Municipal Railways of St. Petersburg, Fla.



Saw-split and clamping bolt method of keeping controller handle bases tight

TROUBLE from looseness due to wear formerly was experienced on the safety car device type of K-10 controller handle base and pilot valve, as used on the cars of the Municipal Railways of St. Petersburg, Fla. Despite the setscrew which is provided with this equipment, the base sometimes gets loose on the controller drum shaft and tips over until the stop lug drags on the controller housing. This condition has been overcome by stripping the base and cutting the $\frac{3}{64}$-in. saw kerf through the lug and base to the spring pocket, as shown in the accompanying sketch. A $\frac{13}{32}$-in. hole is drilled and by installing a $\frac{3}{8}$-in. hexagonal headed bolt with a lock washer and nut the base is ready for use.

As the controller drum shafts have become worn and are out of true,

*Submitted in Electric Railway Journal Prize Contest.

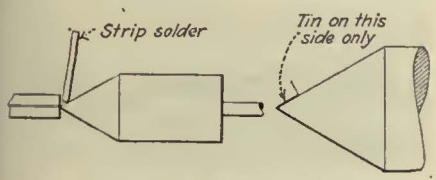
these are built up by brazing and are then milled to the original dimensions. The complete job costs about $1.90 per car, and this small expense has made the device more solid than originally, and has overcome the trouble.

Saving Solder

By Dr. James Silberstein
Chicago, Ill.

To facilitate soldering operations, the solders commonly used for electrical apparatus come in strip or wire form. Many times it is necessary to hold the soldering iron in a horizontal or nearly horizontal position, and then only the upper side at the edge of the soldering iron should be tinned. This results in a considerable saving in solder and also a saving in the time necessary for the soldering operation.

If both sides of the iron are tinned, part of the solder runs through the



Proper method of applying solder with iron in horizontal position

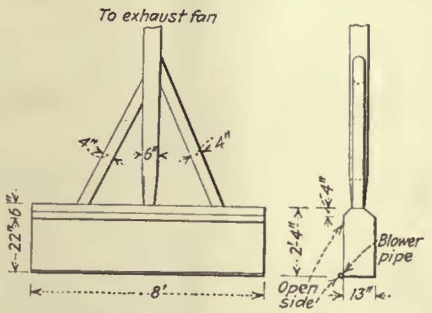
space between the soldering iron and the metal part against which the iron is held. The part of the solder which runs through and drops on the floor is ordinarily much greater than the part which flows into the joint. The floor spillings are ordinarily not lost, since they can be remelted, but they become dirty and there is danger of getting the contaminated metal mixed with good metal, which of course reduces its value.

By tinning the upper side of the soldering iron only, the solder flows first into the joint and then any superfluous solder runs out. It is evident that there is a saving not only in solder but in time and labor as well.

Hood for Sign Painting Used in St. Louis

TO REMOVE the paint fumes while lettering destination signs with an air brush using Duco, a convenient ventilating hood has been developed in the shops of the St. Louis Public Service Company. This hood is of sheet metal, 8 ft. long, 28 in. high and 13 in. deep. A half-inch perforated pipe runs along the bottom of the ventilating frame and a stream of air from these openings forces the

Destination signs are stencilled quickly, easily and safely with an air brush and Duco under this sheet metal ventilating hood

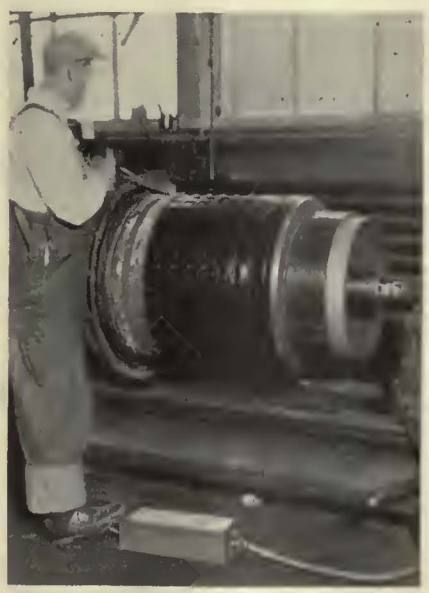


The ventilating hood occupies little floor space, yet is large enough to permit of rapid handling of freshly lettered signs

fumes up the three large vent pipes in the top of the hood. These three vent lines are connected together in a main vent which is equipped with an exhaust fan.

Foot-Operated Belt Shift for Banding Armatures

ONE man can now wind and solder the banding wires on large railway motor armatures with the foot-operated switch shown in the accompanying illustration and a

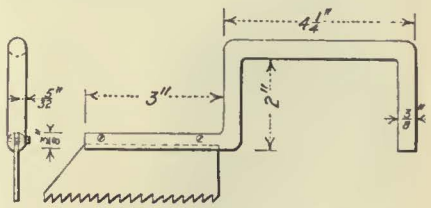


Foot-operated belt shift enables one man to band armatures

pneumatic belt shifting device in use in the Deer Lodge shop of the Chicago, Milwaukee, St. Paul & Pacific Railroad. Owing to the size and length of these armatures and the space required to place and remove them from the lathe, it has been found impractical to employ belt-shifting levers on the lathe drive. To obviate the necessity for a man to control the lathe, an electric foot switch connected by flexible armored cable to a solenoid, which in turn actuates the valve on an air-operated belt shifting engine, is used. The engine is mounted on the ceiling near the motor.

Commutator Slotting Hand Saw

ALL COMMUTATORS are slotted by a power-driven circular saw in the shop of the Richmond Railways, Staten Island, N. Y., but it was found in many instances that small particles of copper remained in the slots and a thin film of mica adhered to the commutator bar after the slotting process was completed. This condition caused failures when the armature was under test,



Frame for hand hacksaw used for commutator slotting

and in several instances service failures. It was, therefore, decided to clean out each slot with a hand saw after the circular saw work had been completed. This is accomplished by the tool shown in the accompanying sketch, which was designed and constructed in the company's shop. The frame is made of ⅜-in. round iron and is 7¼ in. long over all. The handle is 4¼ in. long and is provided with a 2-in. offset. A piece of an ordinary hacksaw blade is used for cutting. The end of the frame is split for a distance of 3 in. and the two pieces clamp the saw blade by means of two machine screws. Blowing out the commutator after the circular saw slotting and cleaning the slots with the hand saw have eliminated the previous troubles. It is claimed that even though a slight additional labor expense is required to complete the slotting process a substantial saving has been effected.

Improved Equipment Suggestions

Safety Push-Button Control

DESIGNED primarily for use with the Lincoln induction motor, but also adaptable for use with any type of push-button starter, a new type of safety push button is announced by the Lincoln Electric Company, Cleveland, Ohio. In this a ball top start button is surrounded by a large cylindrical stop button which projcets over the former. This protects it from accidental contact since it can be operated only by the tip of a thumb or finger inserted inside the stop button. The latter can be operated by a finger or the palm of the hand.

New type of safety push-button control

The colors of the push button correspond with accepted standards of signal colors for controlling railway, vehicular and pedestrian traffic. The start button is a vivid green moulded Bakelite with the word "start" in white letters across the ball top face of the button. The surrounding stop button is a brilliant red moulded Bakelite.

The inner mechanism of the control switch is enclosed in an arc-welded steel box 2½ in.x3¼ in.x2½ in. in size. All insulated parts are of moulded Bakelite. The exterior is jet black with the exception of the push buttons. Four screws hold the moulded black Bakelite face plate to the container. By removing these screws the operating mechanism may be removed from the case for wiring. The binding posts are indicated by white letters on the moulded black Bakelite, thus preventing chance of error in making connections. An opening in the top of the steel case of ⅞ in. diameter permits entrance of conduit enclosed wire to the button. For easy attachment two holes are located in the back of the case for bolts, rivets, or screws.

Fan-Cooled Totally Enclosed Shop Motor

DESIGNED to meet exceptionally severe operating conditions, a new type totally enclosed, fan-cooled electric motor is being placed on the market by the Cleveland Electric Motor Company, Cleveland, Ohio. The output of any motor is limited largely by the temperature rise. For this reason a totally enclosed motor is larger and more expensive for a given rating than is the "open type."

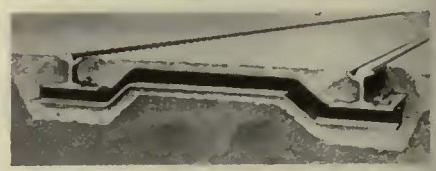
This disadvantage of the totally enclosed motor has already been partly overcome by a recently developed improvement in which the end-covers are open, thus permitting free air-circulation through the motor, the windings being protected by an enclosing jacket of stamped copper having a "running-clearance" hole at either end to permit the shaft to pass through it.

The new Cleveland "Security" ball-bearing type totally enclosed motor, however, goes a step further and eliminates the possibility of even the smallest dust-leakage along the shaft into the windings. The motor is built with a double shell. The inner shell, which contains the entire motor, is enclosed completely and entirely dust-proof. This inner shell is mounted in the outer shell, so as to allow a free air space between them, the shaft passing through both. One end-cover of the outer shell is provided with holes for admitting air.

At the end away from the motor pulley, a fan is mounted in the space between the inner and outer end-covers. This draws in a steady current of air through the holes already mentioned and blows it over the outer surface of the inner shell. Thus, although dust is permanently excluded from the working parts, ample cooling effect is obtained. The makers state that this type of motor permits practically the same rating for a given frame size as an open type motor.

New Shape for Steel Ties Saves Excavation

SAVING 300 cu.yd. of concrete and excavation per mile of single track is the chief feature claimed for the new shape of steel ties just announced by the International Steel Tie Company, Cleveland, Ohio. This tie was developed in conjunction with the engineers of the Capital Traction Company, Washington, D. C. The tie plates are electric-welded to 3 in. x 2 in., 4.1-lb. steel angles. The cross members are bent upward in the form of an elongated arch between the tie plates. This arch strengthens the construction and saves excavation and concrete in a space 7 in. x 3 in. wide, through the entire length.



New steel tie with 7-in. girder rail

High Strength Bronze Welding Rod

AN IMPROVED bronze welding rod, designated as Oxweld No. 21, has been placed on the market by the Oxweld Acetylene Company, New York City. The new rod is recommended for all bronze welding, including the fusion welding of brass and bronze, bronze welding of malleable and gray iron castings, joining of dissimilar metals and building up bearings and other wearing surfaces.

Due to its composition, the new welding rod has a low melting point, and the flow is controlled easily. It produces a weld metal as hard and wear resistant as that formerly made with the manganese-bronze rod. By its use, tough and ductile weld metal having a tensile strength of more than 45,000 lb. per sq.in. can be produced. Properties of this rod eliminate nearly all boiling and fuming of the weld metal. Annoying fumes are reduced.

News of the Industry

Higher Fare in Grand Forks

Following the conclusion of franchise negotiations with the city of Grand Forks, N. D., rates of fare on the Grand Forks Street Railway were increased on Feb. 1, 1929, as follows: 8 cents cash; seven tokens for 50 cents; sixteen for $1; and $11 worth for $10 when purchased at the office of the company.

Recently the old franchise was amended and passed by the City Commission, and adopted by the company. The terms of the amendments are: extension of time for ten years, which is in addition to present life of franchise or gives a new franchise for twenty years. Permission was allowed to increase the fare to a rate not to exceed 10 cents and authorization was given to operate buses. There was no relief extended in regard to paving requirements, or repairs to paving. The company still continues to pay in the case of new paving a proportionate strip 8 ft. in width in case of single track and 16 ft. in case of double track.

In accepting the amendments as agreed upon by the City Commission, the company paid old disputed paving claims. This settlement was made for approximately one-third of the original amount. The question of the company's liability for procedure in the case of new paving will be determined when new paving projects come up.

Final Draft of Jacksonville Franchise Presented

The City Council of Jacksonville, Fla., on Feb. 26 stood firmly on its action of two weeks before in requiring the Jacksonville Traction Company, under the direction of Stone & Webster, to double-track its line on Main Street, from Twelfth to 32d by declining to reconsider the ordinance which would have permitted the proposed plan of the company to withdraw its rails on Main Street and supplant railway service with buses to Brentwood, Norwood and Panama Park.

To relieve the transportation situation in the outlying districts on the north side of town, the Council adopted two resolutions, one of which requires the company to extend its tracks to Norwood and Panama Park and the other authorizing the public service committee to negotiate with the company for the rent of buses to serve this territory and to charge a 7-cent fare with full transfer privileges.

The other development of the session was the introduction of the proposed new franchise for the company, the principal features of which are the relieving of the company of original paving charges but requiring it to maintain pavement adjacent to its rails and meet the assessment of the present franchise tax of 3 per cent on gross receipts. Action on the franchise, which must be submitted to the voters of the city within 30 days after passage by the Council, can be had at the city primary election in April if the Council sees fit to pass the ordinance at its meeting on March 12.

At a subsequent meeting between the public service and laws and rules committees of the Council and representatives of the company, it was found that only a few changes to clarify various provisions of the proposed new franchise for the Jacksonville Traction Company will be necessary. The only suggestion for a major change in the proposed franchise was made by Peter O. Knight, general counsel for Stone & Webster interests in Florida, who wanted the 3 per cent franchise tax provision cancelled. This proposal was rejected by the Council committees.

The revised draft of the franchise will be sent to Stone & Webster in Boston for approval. After this is received the Council will act on the measure, which then will be presented to the voters probably at one of the city primary elections on April 16 or April 30.

Co-ordination for Cleveland

Proposal just made would include system of Cleveland Railway in system of Van Sweringen interests which contemplates development of rapid transit facilities

A FINANCIAL proposal under which Van Swerengen interests seek to acquire control of all local transportation services in Greater Cleveland, including the Cleveland Railway, was made public on March 7 by Joseph H. Alexander, president Cleveland Railway. The proposal was approved by the Cleveland Railway directors at a special meeting on March 2.

Through a company known as Metropolitan Utilities, Inc., the Van Sweringens propose to acquire not only immediate control of the Cleveland railway but also actual stock ownership over a period of twenty years. Metropolitan Utilities also is to acquire ownership of four other companies. These are:

The Cleveland Traction Terminals Company, which holds a lease from the Cleveland Union Terminals Company, giving it exclusive rights in the traction terminal zone and also exclusive rights in the concession area in the terminal.

The Traction Stores Company, organized to develop trade possibilities created by rapid transit traffic. It now owns and operates three station buildings on the Shaker and Moreland rapid transit lines and holds other property important for future and similar development.

The Cleveland Interurban Railroad, which owns rights-of-way and facilities used in the Shaker and Moreland rapid transit lines and which leases other rights-of-way from the Cleveland & Youngstown Railroad.

The Cleveland & Youngstown Railroad, which owns a part of the right-of-way used by the Shaker and Moreland rapid transit lines, but leased to the Cleveland Interurban Railroad.

In addition the Metropolitan will own or control rapid transit facilities now in process of construction along the Nickel Plate right-of-way between the Union Terminal and East Cleveland and will own or control such other rapid transit lines as the Van Sweringens may decide to build along the rights-of-way of other railroads entering the terminal.

Stockholders in the Cleveland Railway will be asked to deposit their stock with the Cleveland Trust Company, the Van Sweringen proposal to go into effect when 50 per cent of the stock has been deposited. Acceptance of the proposal is practically assured by reason of the large amounts of railway stock held or controlled by Cleveland banks, officers of which are members of the railway board.

The carrying out of the financial agreement will not require an amendment to the Tayler grant, nor will it be subject to any action on the part of the City Council of Cleveland. The Council will continue to exercise control over service and capital expenditures of the Cleveland Railway, but will have no direct voice in the planning and operation of rapid transit services.

It is known that the rapid transit operating plans contemplate operation of the Shaker and Moreland rapid transit lines and the projected Nickel Plate rapid transit, but it has not yet been announced what other rapid transit lines will be built, how much subway construction will be recommended or what changes will be proposed in street car and motor coach routing to make them conform to a uniform transportation system.

The method by which the Metropolitan proposes to acquire control and eventual ownership of the Cleveland Railway is described as follows:

When 50 per cent of the stock has

been deposited, stockholders will be paid $10 for each share. Interest will be paid by the railway to the depositary and distributed by the depositary to the stockholders at the rate of 6 per cent. Expenses of the depositary will be paid by the Metropolitan.

Stockholders will grant the Metropolitan an irrevocable option to purchase their stock at any time during a twenty-year period at $100 a share plus accrued dividends. The Metropolitan will agree to make an annual payment to the depositary of an amount equal to 5 per cent of the par value of the largest amount of stock at any time on deposit.

This money is to be used to purchase a fixed percentage of stock every year at $100 a share. Thus, if all the stock is deposited, every share will have been purchased by the Metropolitan at the end of the twenty-year period. If there is any failure by the Cleveland Railway to pay a dividend, the Metropolitan may advance to the depositary an amount sufficient to make such payment. If the Metropolitan fails to advance such amount, stockholders may offer their stock to the Metropolitan and the Metropolitan will be obligated to purchase it at $100 a share.

The rapid transit committee of the Cleveland Railway is composed of President Alexander, A. R. Horr and John Sherwin. In a report to the directors they said that their recommendation in favor of the proposal was based chiefly upon the conviction of the members that co-ordinated control and operation of transportation facilities in the metropolitan area will result in decreased cost of furnishing since and will materially increase the factor of safety of the 6 per cent return to which the Cleveland Railway stockholders are entitled under the Tayler grant. The operation of competitive facilities, on the other hand, would inevitably result in waste and excessive costs.

To the committee "it seems clear that if private interests, already embarked in rapid transit enterprises, can see their way clear to bear the burden of the experimental years and undertake the great task of financing rapid transit development as rapidly as the needs of the city justify transit extension and, at the same time, those private interests can be brought into a sympathetic and co-ordinated relationship with the Cleveland Railway without disturbing the relations between that company and the city, on the one hand, and the security of the investment of the stockholders, on the other, the best approach to this new problem of development will have been made."

Supreme Court Recess Without Passing on New York Case

The United States Supreme Court on March 11 recessed until April 8. Among the cases remaining undecided is that involving the issue of the right of the Interborough Rapid Transit to raise car fares in New York City.

Working Order Awaited in Grand Rapids

The Grand Rapids, Mich., City Commission has instructed City Attorney Ganson Taggart to draft the necessary legal procedure to allow the Grand Rapids Railroad to carry out the suggested consolidation of transportation facilities in Grand Rapids by the augmentation to its system of buses and taxicabs. The report of Gerald J. Wagner, city consulting engineer, is the foundation of the service extension and recently the railway, through L. J. DeLamarter, vice-president and general manager, informed the commission that the company was willing to invest in the added service if the city would promise a broad policy of co-operation. With the proposed arrangement that now seems assured of realization, the railway plans to furnish mass, group and individual transportation services for the convenience of all classes.

Operation to Be Continued in Colorado Springs

The Colorado Springs & Interurban Railway, Colorado Springs, Col., will continue to operate regardless of the accumulated deficit of $470,696, according to William Lloyd, president of the board of trustees Myron Stratton Home Corporation, owners of the company. With substitution of buses on some lines and readjustment here and there, they business for 1928 showed a loss of only $57,306 compared with $77,808 during 1927, when abandonment was considered.

Colorado Springs is laid out so that most of the people live within walking distance of the office and business district, and most of those who live a little farther out own automobiles. It is a real tourist city, but during the summer months there are numerous sight-seeing bus concerns that garner the visitors. It is generally conceded, withal, that the railway is coming back into favor.

New Fare Basis Likely in Vancouver

Demands of Vancouver citizens for revision of the agreement with the British Columbia Electric Railway are being presented to the company by a committee of the City Council. In this connection, Mayor Malkin explains that the Council committee will present the city's case for a uniform fare over the whole greater city, for extensions to the transportation services and increased rolling stock. The result of the meeting will be reported to the City Council. If the committee fails to agree with the company, it is possible that discussions will be continued by the full aldermanic board. All hearings must be completed by April 8, 30 days before expiration of the agreement between the old city and the railway.

At present the fare in the city limits is 6 cents. The company feels the rate should be increased while the city, which recently amalgamated with Point Grey and South Vancouver, desires a reduction. At present the car fare through the two municipalities which have become part of the city is 12 cents, or 7 cents if strip tickets are used. A compromise believed to be fair would give 6½ cents as a uniform fare for the three areas, if tickets are used, with 7 cents when the fare is paid in cash.

Fare Question Up Again in Washington

Directors of the Capital Traction Company, Washington, D. C., are expected soon to consider renewing their application to the Public Utilities Commission for an increase in fare.

The company applied for the increase of fare on June 14, 1928, and several public hearings were held. In the course of the hearings the commission ordered the Washington Railway & Electric Company made a party to the case. This action was interpreted as meaning that any increase to the Capital Traction would also apply to the railway.

The case was decided on Oct. 24, 1928, when the petition was dismissed without prejudice to the Capital Traction Company to renew its petition at any time subsequent to March 5, 1929. The reason for the action was that legislation looking to a merger of the railways was at that time pending in Congress, and the commission wished to await the outcome of the merger bill.

Responsibility in Philadelphia Accepted by Commission

Full responsibility for the drafting and introduction of the enabling legislation to permit the condemnation of the underlying companies of the Philadelphia Rapid Transit Company by the city has been accepted by the Public Service Commission.

Commissioner Benn, who sponsored the measure, acted in the matter for and by direction of the commission as a whole. This step was taken, the commission explains, to carry out the recommendations of its own expert investigator, Judge McChord, that condemnation was the "only permanently satisfactory solution of the Philadelphia transportation problem." Its own activity in the matter the commission defends as logical and in line with precedent, and as one commentator put it "in this it makes out a case that will be proof against reasonable criticism." The Philadelphia *Ledger* says:

The clearing up of this particular point, however, does not obviate the need for a thorough inquiry into the affairs of the P.R.T. There can be no permanently satisfactory solution of the transit problem here until all these doubtful points are clarified nor until the audit now in progress has restored a confidence that has been greatly shaken by the numerous charges that have been made and by the suspicions that have been raised.

Consolidation Bills in Chicago Ready for Submission

Four of the legislative bills needed to pave the way for a settlement of Chicago's local transit problems have been completed and will be submitted to the City Council for approval on March 18 or at a special meeting to be held soon after that date. The measures now ready provide for consolidation of local transportation facilities, creation of a metropolitan transportation district and a local regulatory commission, an indeterminate permit and construction of subways by the city. The bills were prepared by the city's attorneys in cooperation with Walter L. Fisher, legal advisor of the citizens' traction settlement committee, appointed by Federal Judge James H. Wilkerson to assist the city and companies in coming to an agreement. Favorable action by the Council will allow the bills to be presented in the Assembly before it adjourns.

A proposal that James Simpson, chairman of the citizens' committee, resign from his position was made in an open letter delivered to members of the City Council recently by John M. Harlan, attorney for F. J. Lisman and associates of New York, who are seeking a twenty-year street car franchise in Chicago. Mr. Harlan based his suggestion on the ground that Mr. Simpson was disqualified to serve in this capacity because of a personal interest in the Chicago Rapid Transit Company. Mr. Simpson is a director of the Commonwealth Edison Company, an associated utility company. In a formal reply to this charge, the head of the citizens' committee declared that he told Judge Wilkerson before he was appointed that he was a director of the Edison company. "I told him that my resignation would be in his hands from the time of my appointment until it is accepted or the job is done," said Mr. Simpson, "and that statement still holds good."

Interborough Against Transit Bill

The Interborough Rapid Transit Company, New York, has attacked the transit control bill now pending before the Legislature, designed to aid in the unification of the city's rapid transit facilities by setting up a board of transit control to take over and operate the lines which are to be merged in a new system. In the preparation of the plan representatives of the Brooklyn-Manhattan Transit Corporation have cooperated with the city and the Transit Commission, but the Interborough has held aloof. Under the tentative plan now before the Board of Estimate the rapid transit lines of the B.-M. T. will be linked with the new Eighth Avenue subway being built by the city and intended originally to be run by the municipality. The Interborough is left to be dealt with later. If in the mean time the Interborough should win its suit for an increase in fare, the city in all probability would proceed to exercise its right of recapture and take over the east-side lines of the Interborough. This would leave that company with only its west-side lines and the unprofitable elevated. As one of the commentators sees it, in that event the Interborough's west-side lines would face the competition of the new Eighth Avenue subway, operating at a lower fare. If the Interborough should lose its fare suit, the city might even then persist in taking over the recapturable half of its subways.

Commission Authorizes Operation in Newark Canal Bed

Operation of a rapid transit line by the Public Service Co-ordinated Transport along the bed of the old Morris Canal in Newark, N. J., in accordance with an agreement reached between the company and the city on Jan. 9 last, has been approved by the State Board of Public Utilities Commissioners. According to the commission, the contract provides for the operation of the new rapid transit line as an addition to the existing transportation lines of the Public Service Company in Newark. Since it will avoid the congested area of Newark, the new line will afford a more rapid service to passengers.

Recommendations Made by Rolling Stock Committees

Members of the standing and twelve special committees of the rolling stock division of the American Electric Railway Engineering Association met in Cincinnati, March 11 and 12.

Hugh Savage, chairman of the current collecting devices committee, stated that equipment men on many properties failed to answer the questionnaires which his committee had sent out. Others gave unreliable information to create a good impression. All of this hampers the committees that are really working for the interest of the industry. The committee recommended three standard sizes of trolley wheels, three standard sized trolley poles, and a standard hardness for manufactured wheels.

In a paper entitled "Proposed Standard Car Change Record," E. J. Jonas, superintendent of equipment of the Cincinnati Street Railway, suggested that the term "car change" be substituted for "pull-in" because it is a more concise and clear description of what takes place when a car fails in service. He also suggested a schedule of classification of pull-ins arranged under a few general groups that give opportunity for thorough analysis of conditions as well as a basis for comparison.

A. T. Clark told of favorable experiences in Baltimore with low viscosity oil in journal bearings. Other chairmen reported on various maintenance problems.

The members were entertained by the Cincinnati committee including several local manufacturers and manufacturers' representatives. They also inspected the Cincinnati Car Company shops and the Winton shop of the Cincinnati Street Railway.

Severe Snows in South

Nashville, the capital city of Tennessee and the middle division, suffered more from snow that has blanketed parts of the South than did west Tennessee. The snow fall at Nashville was about 15 in.; at Gallatin in Sumber County, a city served by interurban lines, the snow fall was 14 in. There were few autos on the streets on Feb. 20 and 21, only the buses and cars operated by the Nashville Railway & Light Company and the milk wagons being very active. Many moved on foot to their work, but the railway was able to maintain its schedules with only little interruption. The snow fall at Memphis and in west Tennessee, approximately 8 in., was the most severe since 1917, but the record at Nashville in 1892 was 17.1 inches in 24 hours. There have been colder weeks than the one recently ended, but very few in which there has been so much sleet, snow and ice. Few of the recent winters in middle and west Tennessee have been severe and in most of them in recent years there has been no snow. The mountainous sections of east Tennessee, of course, have winter snows.

Lexington, Ky., and central Kentucky experienced the heaviest blanket of snow in twelve years. With recurrent falls within 24 hours, the snow fall amounted to 10.3 in. As a precaution against suspension of service the Kentucky Traction & Terminal Company kept the city cars running all night. The interurban system did the same.

Arkansas experienced the heaviest general snow since 1921. The storm prevailed from the Ozarks on the northwest to the Mississippi on the east. The snowfall ranged in depth from 2 in. to almost 12 in., in some parts of the state. Texarkana, on the southwest border, had snow. Little Rock had quite a heavy snowfall, 6½ in. in one night, the heaviest storm of its kind in several years. The Arkansas Power & Light Company kept its snow fighting equipment in continuous operation day and night during the progress of the storm. So seldom are snow sweepers seen in Little Rock that their use by the Arkansas Power & Light Company on the night of Feb. 20 and the day following was of sufficient news value to lead the *Arkansas Democrat*, the afternoon newspaper, to print a picture of the snow sweeper in operation.

The fall of sleet and snow in Little Rock totalled 6½ in., the heaviest in several years.

A. R. Koonce, general superintendent of the railway department, put the snow sweepers in operation shortly after the snow began to fall on the afternoon of Feb. 20 and kept them going throughout the night with the result that railway schedules were maintained as usual.

With the streets covered with sleet and snow, many who usually go to and from work in automobiles were unable to start their cars and others were afraid to tackle the slippery thoroughfares. Thousands were surprised and gratified to discover that railway service was being maintained as usual.

Carries Entire Worcester Population Every Other Day

The Worcester Consolidated Street Railway, Worcester, Mass., is carrying a series of constructive newspaper advertisements to show the value of railway service to the community. In the latest advertisement the company relates that it carried in its cars and motor coaches last year 37,396,261 passengers. The advertisement says the Chamber of Commerce estimates the population of the city of Worcester at 206,000. Therefore, the company says that on its cars and coaches last year it carried the equivalent of each person in Worcester 183 times or the whole population of Worcester every other day.

Four New Bulletins by Bureau of Information and Service

Special reports are being prepared by the American Electric Railway Association to be available to member companies, as follows:

BULLETIN No. 244—*Wages of Trainmen*—An entirely new edition of the association's regular wage bulletin based on replies of approximately 500 companies to a questionnaire sent out in February, 1929. It shows the present wage scale, the effective date and date of expiration, previous scale, union affiliations of trainmen, number of men employed, contract provisions governing the wage scale, and the average weekly wages earned by regular and extra men under the scale.

BULLETIN No. 245—*Wages of Bus Men*—Gives for bus operators substantially the same information as is contained in Bulletin No. 244 for trainmen, namely: the present scale of wages, the effective date and date of expiration, union affiliation of bus men, if any, number of bus men employed, average weekly wages earned under the scale, etc. Information furnished by about 250 companies is included.

BULLETIN No. 246—*The Regulation of Parking*—A summary of the parking regulations in effect in about 50 American cities showing the extent to which parking is restricted or otherwise controlled. It also indicates the extent to which these regulations are enforced, the attitude of the public toward them, the degree of success attained in expediting the movement of traffic through streets, and whether or not further regulation is contemplated.

BULLETIN No. 247—*Index to Street Railway Valuation Cases 1915 to 1928*—A classified list of references to rulings of courts and public utility commissions in electric railway valuation cases. A total of 107 decisions of public utility commissions and federal and state courts, handed down during the period 1915 to 1928, have been collected and analyzed with a view to showing the trend of decisions on the more important questions comprised in the subject of street railway valuation. Decisions in 26 cities, the District of Columbia and Canada are included.

COMING MEETINGS OF *Electric Railway and Allied Associations*

March 20—Central Electric Traffic Association, Keenan Hotel, Fort Wayne, Ind.

March 21—New England Street Railway Club, Annual Meeting, Boston, Mass.

April 5—Metropolitan Section, American Electric Railway Association, 33 W. 39th Street, New York, N. Y.

April 12—Maryland Utilities Association, Annual Meeting, Hotel Emerson, Baltimore, Md.

May 1-3—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.

May 13-15—National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.

May 15—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.

June 3-6—National Association of Purchasing Agents, Annual Convention, Hotel Statler, Buffalo, N. Y.

June 5-7—Canadian Electric Railway Association, annual convention, Montreal, Quebec.

June 21-22—New York Electric Railway Association, Bluff Point, N. Y.

June 27-28—Central Electric Railway Association, Michigan City, Ind.

July 24-26—Electric Railway Association of Equipment Men, Southern Properties, Lexington, Ky.

Aug. 15-16—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.

Sept. 28-Oct. 4—American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.

One-Man Operation Desired in Shreveport

All street cars of Shrevesport, La., will be placed under one-man operation provided a petition filed with the City Council by the Shreveport Railway is granted. A few of the cars now are one-man but most of them are required by city ordinance to have a conductor as well as a motorman. The company wants to go to one-man operation as a matter of economy. It sees a further increase in fares or ultimate collapse unless the request is granted. Repeal of a city ordinance adopted in 1907, requiring two men on cars in the city, is needed.

Information Committee in Pennsylvania Discontinued

Announcement was made on March 13 by Philip H. Gadsden, chairman, that "the work of the Pennsylvania public service information committee had been discontinued." Mr. Gadsden is vice-president of the United Gas Improvement Company of Philadelphia. He praised the work of the committee and said its services were now being handled by the individual companies.

Special Luncheons and Dinners on South Shore Line Diners

Introduction of a new special luncheon and special dinner on the menus of the Chicago, South Shore & South Bend Railroad diners is announced by the management. Suggestions from patrons that special one-price meals be introduced made the change desirable. Sample menus, furnished by the dining car department for the sake of illustration, carry four entrées on the luncheon, and five courses on the dinner.

Three Chicago Employees on Safety Scroll

Three employees of electric interurban railroads serving the Chicago metropolitan area were awarded the Britton I. Budd Medal for the Saving of Human Life on the evening of Jan. 22, when more than 600 employees of the Chicago Rapid Transit Company, Chicago, North Shore & Milwaukee Railroad (North Shore Line), Chicago, South Shore & South Bend Railroad (South Shore Line), Chicago, Aurora & Elgin Railroad ("Sunset Lines") and the Marigold Motor Coach Lines of the Metropolitan System gathered in the grand ballroom of the Palmer House, Chicago, for their seventh annual first aid and safety banquet. The men honored were John B. Andrews of the North Shore; John E. Haney of the South Shore, and Henry W. Matthews of the Elgin line.

This makes a total of seventeen employees of the various transportation companies who have saved human lives as a result of training in first aid principles. Of the three men saved by those to be honored on Jan. 22, two are in no way connected with the utility companies, while the life of one was saved at a place entirely removed from company property.

The medals were presented to the three life savers on behalf of Mr. Budd, president of the comnanies, by George R. Jones, vice-president of the Public Service Company of Northern Illinois and chairman of the committee of awards. The banquet also celebrated the establishment of a new record in first aid training among public utility employees of the Chicago metropolitan area. A total of 558 employees of the five companies completed the training course during the past year. The Rapid Transit Lines lead with a rec-

ord total of 317 graduates. All these completing the course received company certificates and American Red Cross diplomas in recognition of their contribution to the safety and welfare of the public.

Higher Fares Sought in Augusta

The Georgia Power Company, which recently purchased the Augusta-Aiken Railway & Electric Company, Augusta, Ga., has petitioned the City Council for an increase in fares to provide for an extensive rehabilitation program. Under the proposed schedule the present 10-cent cash fare would remain, while the token fare of 7 cents now charged would be increased to 8⅓ cents, sales being in quantities of three for 25 cents. The 5-cent ticket for school children would be continued, but the present 5-cent ticket for school teachers would be discontinued, along with the regular 5-cent children's tickets good at other than school hours.

If the fares sought are allowed, the Georgia Power Company is prepared to expend approximately $310,000 in improving the present facilities in Augusta.

Bill Creating Seattle Commission Progresses

With the passage in the Senate of Senate Bill 296, first steps were taken toward creation in Seattle, Wash., of a street railway commission of seven members to take over and operate the Seattle Municipal Railway system. Under the bill, the commission would have complete power in all matters pertaining to the railway system and refunding of bond issues. It is prohibited from incurring general obligation indebtedness against the city.

Senator E. B. Palmer, who introduced the bill, declared that sooner or later Seattle would be forced to go into the general fund to make good a deficit of $1,500,000 incurred when the system was operated on a fare which brought in revenue below the demands, and that, before such a levy would be made, the system would have to be reorganized and placed upon a business rather than a political basis. Senator Heifner took issue with him, declaring that the bill would permit a refinancing and reorganization of the system on business lines and this would place the system upon a self-supporting basis without any need for general fund aid.

The Seattle City Council, meeting in committee of the whole, registered unanimous disapproval of the commission measure, and set on foot an effort to stop the bill's progress. Councilman E. L. Blaine fears that loans made to the street railway by the city light and city water departments might not be repaid should a group of citizens be given charge of the railway system. Even the political wiseacres appear to be unwilling to hazard a guess about the final disposition of the municipal railway matter.

Recent Bus Developments

Commission Sees Need for Bus Regulation in New York

The annual report of the Public Service Commission of New York, transmitted recently to Governor Roosevelt and the Legislature, said that transportation by bus continued to expand at a fairly rapid rate. Besides the many rural and intercity lines operating within the state, a large amount of city service also is being provided. Bus service in addition to railway service is being operated in the following cities: Albany, Binghamton, Buffalo, Cortland, Jamestown, Kingston, Mount Vernon, New Rochelle, Poughkeepsie, Rochester, Rome, Schenectady, Syracuse, Troy, Utica and Watertown.

In the following cities, all of the city transportation service is rendered by buses excepting the local service given in a few cities on interurban electric railroads.

Auburn, Geneva, Glen Cove, Glens Falls, Hornell, Hudson, Middletown, Newburgh, Olean, Oneonta, Oswego, Port Jervis, Rensselaer, Salamanca and White Plains.

The importance of regulation by the commission is found, among other things, in the matter of safety requirements. It is not possible for the commission properly to supervise bus operation with the present available force of two inspectors who are taken from their usual duties of railroad inspection, but it considers inspection of bus operation equally as important as that of steam or electric railroads.

On several occasions the commission has recommended the enactment of more complete legislation dealing with the regulation of bus operation. It regards the existing legislation as fragmentary and unsatisfactory. According to the commission, a new article should be added to the Public Service Commission law, setting forth a comprehensive statement on the subject of bus regulation in similar manner as other utility corporations are now covered by law.

Chicago Ruling Appealed

Petition for a rehearing of the case involving the right of the city of Chicago to compel the Chicago Motor Coach Company to obtain a local franchise for the use of its streets has been filed with the Supreme Court of Illinois by attorneys for the company.

Simultaneously with the filing of the petition with the Supreme Court, hearings were resumed before the Illinois Commerce Commission on the original petition of the motor coach company for permission to operate a total of 34 miles of new bus routes on the west and northwest sides of Chicago. This authority was granted by the commission last October but the Chicago Surface Lines, which had petitioned at the same time for the right to run feeder buses in the same area, appealed to the Circuit Court, which subsequently set aside the commission's order.

The Circuit Court held the commission order to be invalid on the grounds that the Chicago Surface Lines had not been given due notice of the hearings on the bus line's application.

Buses are operated over the new streets pending the outcome of the present hearing.

Sale of Evanston Project Asked

Approval of the sale of the Evanston Bus Company, Evanston, Ill., and the Niles Center Bus Company, Niles Center, Ill., to the Evanston & Niles Center Bus Company, a newly chartered corporation, was asked in a joint petition recently filed with the Illinois Commerce Commission. The Evanston Bus Company, formerly owned by the Evanston Railway, is a subsidiary of the Chicago Rapid Transit Company and the Niles Center Company is controlled jointly by the Rapid Transit and Chicago, North Shore & Milwaukee Railroad. The new company also asked for a permit to operate the respective properties and for authority to issue $350,000 of capital stock.

Expansion of Facilities in Hamilton

By a deal said to have been closed on March 5 and involving a total expenditure of $100,000, the Dominion Power & Transmission Company has acquired several additional bus lines, which will give it control of all bus services entering Hamilton, Ont., except the Gray Coach Lines of Toronto. Lines included in the latest absorption are: United Lines, operating between Hamilton, Caledonia and Simcoe; the Comet Line, operating to Galt; the Pathfinder service to Guelph; and two smaller lines, one operating to Milton, and the other to Binbrook. Acquisition of the Milton Line, however, is deemed important, as this, it is said, will facilitate the round-the-bay service the Dominion Power Company has been endeavoring to provide.

Several months ago the Dominion Power acquired the bus line operating between Hamilton and St. Catharines. Later it took over the Mountain Line, then the Hamilton and Dundas bus services, and also a line operating between Hamilton and Waterdown.

Toronto bus lines strongly opposed the application of the Dominion Company to operate buses over the North Shore route of the bay, but the latest deal will overcome that opposition, it is said.

The local company thus has a fleet

of 80 buses, including those which supplement the service of the Hamilton Street Railway. It is said the deal was consummated by Denman & Company, bankers of Hamilton.

Experiment in Newport News

Service over the East Hampton railway line at Newport News, Va., will be abandoned for a week by the Virginia Public Service Company as an experiment to determine which is more satisfactory for the section, bus or car service. Under order of the State Corporation Commission, the utility may advertise its intention and for one week substitute buses for cars at the same fare now charged.

More Testimony on Amsterdam Operation

No decision was made by the New York Public Service Commission following an oral argument on March 7 on a rehearing granted the Fonda, Johnstown & Gloversville Railroad over the certificate granted to Charles Vollmer for the operation of a bus line in Amsterdam. Wesley Maider, attorney for the railway, asked the commission to reconsider its order granting the certificate and to amend the certificate, alleging a daily loss of revenue to the railway of $32.16 because of bus operation. Mr. Maider said if this loss continued it would mean abandonment of service by the company, which had invested approximately $4,000,000, covering about 80 miles of tracks in Amsterdam, Gloversville and other territory served.

Arthur Kline, attorney for Mr. Vollmer, disputed the loss of revenue claimed by Mr. Maider. He said residents had petitioned the Common Council to grant the certificates to Mr. Vollmer.

New Service in St. Louis

New competition for the People's Motorbus Company and the St. Louis Public Service Company began on March 6 with the opening of a 15-cent de luxe service to operate between Manion's Park, 8600 South Broadway, and Union Market, Broadway and Morgan Street, St. Louis. A schedule has been arranged under which buses are to leave the terminus at three-minute intervals during the rush hours and five-minute intervals at other times. The line will operate between 6:30 a.m. and 7 p.m. The automobiles are to be manned by members of the International Brotherhood of Teamsters, Chaffeurs, Stablemen and Helpers, Local No. 408.

The People's Motorbus Company Broadway line charges 10 cents while the railway fare is 8 cents. The bid for business being made by the new line depends almost entirely on the promise of the promoters to reduce the running time for the round trip over that of the present service.

Provisions of New York Highway Law Combined

Governor Roosevelt, of New York, has signed the Westall bill, combining into one law all provisions of the highway law relating to motor vehicles. This new law is a product of the committee on reorganization of the state government. It was vetoed last year by Governor Smith, but since then certain controversial points have been eliminated.

The new law places under one cover all of the provisions of state law relating to motor vehicles and traffic and sets up standard state-wide provisions for regulating highway traffic outside of the city of New York. These latter provisions are contained in article 6 of the new law and relate to operation of vehicles, right-of-way, signals, meaning of colors, pedestrians' rights and duties at controlled intersections, turning at intersections, parking, safety zones, cab stands, other vehicles, street surface cars, duties of police authorities, powers of local authorities, penalties.

Under the section "Right-of-Way" it is provided that "when in the performance of duty the following vehicles shall have the right-of-way: United States mail, police, fire, fire patrol, bureau of buildings, repair of public service corporations, ambulances and the military, but this shall not relieve the driver or owner of any such vehicle from liability for injuries inflicted in consequence of the arbitrary or careless exercise of this right."

Under the new law colors are restricted in traffic regulation. Section 84 of the new law reads:

§84. MEANING OF COLORS. Whenever traffic at any intersection is regulated by a traffic control signal, the following colors may be used and none other, and those colors herein authorized shall, when lighted, indicate as follows, except as provided in sections 85 and 86.

Red requires that traffic shall stop and remain standing.

Green requires that traffic shall move.

Amber, when used, shall only warn traffic that the colors in the signal are about to change. No traffic shall enter an intersection controlled by a traffic control signal while the amber is lighted. Amber when used in precautionary signals without other colors, either fixed or flashing, shall mean proceed with caution.

In section 85 it is provided that at intersections whose traffic is controlled by traffic control signals, pedestrians shall cross the street only in the direction of moving traffic and operators of vehicles, when turning, shall yield the right-of-way to pedestrians when so crossing.

A new insertion in the law, under that part where indemnity bonds or insurance policies are required from persons carrying passengers for hire, provides that every person operating a motor vehicle as to which a bond or policy of insurance is required, which in any manner is involved in an accident, shall within five days give written notice of the time and place of the accident to the surety or insurer. Failure to give such notice shall constitute a misdeameanor, but shall not affect the liability of the surety or insurer.

Substitution on Quincy Lines Sought

Authority has been asked by the Illinois Power & Light Corporation of the Illinois Commerce Commission to discontinue railway service on its Maine and Twelfth Streets lines, Quincy, Ill., and to substitute motor coach service. The corporation will pay the city a $50 annual bus license fee and repave all streets where track is removed.

Buses Succeed Cars on Ohio Line

The last car on the Southern Ohio Public Service Company passed over the rails between Newark and Zanesville on Feb. 15. The Columbus and Buckeye Lake end of the line ceased to operate on Jan. 15. This electric interurban road operated between Columbus and Zanesville via Buckeye Lake and Newark for the past 26 years. The Ohio Power Company, which purchased the equipment recently, will continue the operation of buses over substantially the same route.

Temporary Service on Spring Street, Albany

The United Traction Company, Albany, N. Y., will operate buses in Spring Avenue and Hill Street, Troy, under an arrangement to be effected between officials of the company and representatives of the Troy corporation counsel's office. The arrangement will enable a month's trial. If the patronage justifies the service it will be continued.

Permission Sought for Rome Bus Line

The Utica Railway Co-ordinated Bus Line, Inc., filed a petition on March 13 with the Public Service Commission for a certificate for the operation of a bus line in Rome, N. Y., running to the New York Central station. The petition is accompanied by the consent of the Rome Council approved by the Mayor.

Controversy at Menasha Settled

Peace has been declared in the bus license controversy between the city of Menasha, Wis., and the Wisconsin-Michigan Power Company and through operation of buses was renewed on Feb. 23. When the City Council raised the fee from $50 to $300 for each bus and required licenses, the company announced that unless a settlement could be reached all buses would be removed from the Appleton to Neenah and Menasha runs. The license matter was settled by agreement upon a fee based on a charge of a mill per ton-mile. This is the fee charged by the state to public carriers operating on state highways.

Financial *and* Corporate

Louisville Appraisal Presented

Most liberal of five sets of figures by Public Utilities Bureau $2,000,000 under company's claim

AFTER months of work, the Public Utilities Bureau's report on the appraisal of the Louisville Railway, Louisville, Ky., has been handed to the Board of Public Works and Mayor William B. Harrison.

Based on the report covering its investigation of the valuation of property of the railway to establish a rate base to determine a fair and reasonable rate of return, the board submits the following findings:

1. That the rate base on the capitalization of net income for the year ended Dec. 31, 1928, was $12,713,943.

2. That the rate base on original cost of ledger value (book value) for the year ended Dec. 31, 1928, was $21,934,317.

3. That the rate base on the historical cost for the year ended Dec. 31, 1928, was $26,188,718.

4. That the rate base on the outstanding capitalization for the year ended Dec. 31, 1928, was $22,533,210.

5. That the rate base on the reproduction cost new less depreciation for the year ended Dec. 31, 1928, was $26,061,707.

6. That the trend of costs for material used for electric railways increased 103 per cent—1928 over 1913, and the construction costs for electric railways increased 42 per cent—1928 over 1913.

7. That statistical data covering period from 1921 to 1928, inclusive, as shown under exhibit No. 7, indicates the following trend of demand for service of the Louisville Railway.

(a) All passengers carried by street cars showed only 5 per cent increase.

(b) Total passengers carried by street cars and buses showed an increase of only per cent.

(c) Total street car and bus-miles operated were increased 21 per cent.

(d) Total street car-hours operated showed 17 per cent increase.

(e) Passengers carried per car-mile decreased 12 per cent.

(f) Passengers carried per car-mile for combined service of street cars and buses showed a decrease of 14 per cent.

(g) Riding habit per population for street cars showed a decrease of 25 per cent.

(h) Riding habit for combined services of street cars and buses showed decrease of 24 per cent.

In discussion the valuations of property, the bureau said, "unfortunately, no precise definition of fair value has ever been laid down, either by the various statutes providing for rate regulations or by any court in the United States, in passing on the constitutionality of rates from the time of the celebrated case of Munn vs. Illinois State, decided by the Supreme Court in 1876, up to the O'Fallon case now before the United States Supreme Court for a decision." It said further:

The Magna Charta of "fair value" in the opinion of the Supreme Court in the famous case of Smyth vs. Ames, decided in 1898, was that, as a general principle, a company is entitled to earn a fair return on the "fair value of its property used in public service."

It announced that reasonable rates from the standpoint of investors must allow a fair return upon the fair value of the property.

The bureau found that the price index of 1928 over the average from 1913 to 1922 is equal to 28 per cent; this was arrived at by taking the average price indexes of the electric railway construction costs of the American Electric Railway Association for 1913—equal to 100 per cent—down to 1922. This average was 159.2 per cent and the average price index for 1928 was 203.1 per cent. By applying the 28 per cent, the increase in prices, times $20,677,712 produced the total value of the property Dec. 31, 1922, at $26,467,470. Then additions and betterments were added to Dec. 31 last with additions and deductions for price changes and this produced $28,217,700.

Conferences Ahead

From this, the bureau said, it deducted $1,138,714 for property not used and useful and $1,540,047 for the depreciation and reserve account carried, making a figure of $25,538,939.

No allowance was made in this, the bureau said, for intangible values such as going concern value, but the inclusion of cash totaling $329,482 was made as were materials and supplies totaling $320,297, making the total rate base on the factors of the particular study of $26,188,718.

The bureau found five values for the company's property on assumptions which must be weighed in arriving at a value, according to the accepted rulings of the Supreme Court.

Conferences are planned between the board and the bureau over some of the figures, conferences between the Mayor and the board with the railway officials, and then after the various phases have been threshed over, a stand by the city for a certain agreed value of the company's property. The highest value found by the bureau is still nearly $2,000,000 under that claimed by the railway in its recent letter to the Mayor.

$11,281 Deficit for Colorado Municipal Line

Fort Collins' municipally-owned railway showed a deficit for 1928 of $11,281 plus the interest on $75,000 outstanding street railway bonds, and $2,709 for street paving improvement district assessments. The total receipts of the system in the Colorado city for the year were $19,106. The expenditures totaled $30,388. Of the total receipts, $17,539 was received for fares. The expenditure made for labor was $17,384.

Change of Trustee Sought for Massachusetts Road

The petition of the American Trust Company, Boston, to resign as trustee under a mortgage made June 19, 1906, by the Lowell & Fitchburg Street Railway, Lowell, Mass., to secure an issue not exceeding $100,000 face value 20-year gold bonds of the railway was heard by Judge Sanderson, of the Supreme Court, on March 5.

The principal of the bonds was payable in 1926, but a bondholders' committee requested that no foreclosure proceedings be instigated at that time. In the petition just filed a new trustee is sought since all members of the bondholders' committee are residents of Gloversville, N. Y., from which a trustee is desired to avoid expense in case a foreclosure sale is necessary.

The railway is operated by the Eastern Massachusetts Street Railway at a small profit. Representatives of the bondholders' committee said that it would be to the best interest of the bondholders to have an individual trustee appointed. Judge Sanderson said he had never known of a non-resident trustee being appointed for a Massachusetts company. Subsequently, the court dismissed the action by consent of counsel.

Ogden Receiver Dismissed

The receivership of the Utah-Idaho Central Railroad, Ogden, Utah, has been lifted by the federal court. Recently the road was refinanced, and the dismissal of the receiver followed the presentation of evidence to show that the outstanding debts of the road had been liquidated. P. H. Mulcahey was receiver for the road.

Patronage Increases in Milwaukee in 1928

During 1928 the transportation system of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., carried 215,823,326 passengers, an increase of 5,036,753 over 1927. This fact was disclosed in the annual report which showed gross earnings for the entire company of $29,510,946 against $27,507,550 for 1927 and a net income of $4,833,750 against a net income in 1927 of $3,966,905. No separate earnings statement for the railway is included.

Ten new street cars and five street car type buses were purchased for the Milwaukee city system, and ten modern cars formerly in interurban service were reconstructed for use on the South Milwaukee suburban line. Eleven cars of a larger and more modern type were placed on the Racine city system. Improved service with electrically-heated one-man safety cars was provided on several Milwaukee lines, and service extensions were made to a number of outlying districts, principally by means of auxiliary bus operation. The company began work Dec. 3 on a rapid transit

project that will, by means of a contemplated subway terminal and 2.8 miles of new line on private right-of-way, provide high-speed local service between the heart of the city and the rapidly growing urban district to the west.

The Milwaukee Northern Railway, a subsidiary, was merged with the Milwaukee Electric on April 30, 1928. The former Northern company operated a city street car line in Milwaukee and interurban service to Sheboygan.

One of the outstanding railway projects of 1928 was the relocation and grade separation of about a mile of track in the western section of the city of Milwaukee. This project gives Milwaukee its first four-track electric railway line. Two tracks are used exclusively by the Wells-West Allis suburban cars, and the other two by local and interurban rapid transit lines.

The company's Milwaukee-Racine-Kenosha interurban railway line became a rapid transit route on July 15 when this service was routed over 9½ miles of new private right-of-way immediately south of Milwaukee. Arrangements were made in 1928 for freight car interchange between the company's East Troy-Burlington rapid transit line and three transcontinental steam railroads.

Beginning July 4 and continuing to the end of the tourist season the company operated two daily motor coach trips covering many points of interest about the metropolis. These tours were conducted as part of an international system of co-ordinated local sight seeing trips known, from the color of the coaches employed, as Gray Line Tours. International publicity was given the Milwaukee trips in circulars distributed throughout the territories served by the Gray Line system. The company also took over operation of the popular sight seeing trips, conducted daily throughout the summer in connection with excursions by steamer from Chcago.

35,775,749 More Passengers

Another record year scored by Chicago Surface Lines. Total rides 1,621,215,876, including transfers. Gross earnings more than $62,000,000

STREET car riding in Chicago increased to the extent of 35,774,749 rides last year, according to the report of the Chicago Surface Lines for the twelve months ending Jan. 31. Substantial gains also were made in earnings and in service.

Total rides, including transfers, were 1,621,215,876 and revenue rides, not including transfers, 892,814,620—the latter an increase of 10,355,973 more than the previous fiscal year. Each month of the year, with the exception of April, June and December, showed a gain over the corresponding month of the preceding year. Service was increased 728,354 passenger car-miles.

Life, health and disability insurance was established for all employees and an increase in trainmen's wages amounting to 1 cent an hour was effective after June 1, but residue receipts were $13,430,555, an increase of $37,299 over the previous year.

Gross earnings were the highest in the history of the company, amounting to $62,391,622, an increase of $766,870 as compared with the previous year.

These increases by Chicago street cars, it is pointed out, were made in spite of the fact that the electric railway industry of the country showed a decrease for the year of 1.10 per cent and that steam railroads reported the smallest number of passengers since 1905. In summing up the report, Henry A. Blair, president, said:

Although for two years the Chicago Surface Lines has been operating under temporary franchise extensions without ability to provide adequately for present needs or to plan for the future, it still holds first place among the electric railways of the country as an outstanding example of efficient operation, increasing business and maintenance of the property.

As pointed out in the accompanying report, service was improved and new records were established in the operation of equipment, in car-miles and in accident prevention. Due to economy and efficiency in operation, residue receipts show an increase over the previous year in spite of the added burden of more than $600,000 in increased

CHICAGO SURFACE LINES STATISTICAL DATA FOR THE FISCAL YEARS ENDED JAN. 31

	1925	1926	1927	1928	1929
Rate of fare, cents	7c-6¾	7c-6¾	7c-6¾	7c-6¾	7c-6¾
Revenue passenger	830,151,540	842,201,453	876,249,663	882,458,647	892,814,620
Passenger receipts	$57,284,602	$58,076,487	$60,436,705	$60,892,995	$61,597,374
Total earnings	58,081,678	58,785,880	61,173,601	61,624,752	62,391,622
Operating wages	29,246,390	29,012,641	29,812,518	30,280,959	30,348,351
Other operating expenses and taxes	17,328,569	17,615,564	18,058,971	17,950,536	18,612,715
Residue receipts	11,506,717	12,157,674	13,302,111	13,393,256	13,430,555
Less: Joint account expenses	450,000	130,297	363,934	657,038	554,449
	$11,056,717	$12,027,376	$12,938,176	$12,736,217	$12,876,105
5 per cent on purchase price	8,127,158	8,169,099	8,173,948	8,190,354	8,210,205
55 per cent to city	1,611,257	2,122,052	2,620,325	2,500,224	2,566,245
45 per cent to companies	1,318,301	1,736,224	2,143,902	2,045,638	2,099,655

FINANCIAL STATEMENT OF CHICAGO SURFACE LINES FOR YEAR ENDED JAN. 31, 1929

	1929	1928
Earnings:		
Passenger cars	$61,597,374	$60,892,995
Chartered cars	4,447	4,837
Newspaper cars	9,606	16,608
Freight earnings	.....	888
Hospital car service	1,590	2,088
Advertising	300,961	290,263
Rents of buildings, etc	173,018	174,741
Sale of power	99,552	98,056
Interest on deposits	192,124	134,438
Miscellaneous	12,950	9,838
Gross earnings	$62,391,622	$61,624,752
Expenses:		
Way and structures	$2,899,168	$3,006,276
Equipment	4,070,336	4,247,925
Renewals	4,991,329	4,929,980
Power—maintenance	394,378	387,445
Power—operation	3,755,123	3,683,540
Conducting transportation—trainmen	21,938,572	21,789,269
Conducting transportation—other	3,273,154	3,246,443
Traffic	98,495	120,177
General and miscellaneous—damages	1,871,748	1,848,742
General and miscellaneous—other	2,108,764	2,071,698
Taxes	3,560,000	2,900,000
Total expenses	$48,961,067	$48,231,495
Residue receipts	*$13,430,555	*$13,393,256
Dividend:		
Chicago Railways Company—60 per cent	*$8,058,333	*$8,035,953
South Side Lines—40 per cent	*5,372,222	*5,357,302

*Includes city's 55 per cent of net divisible receipts, as defined by ordinances.

COMPARISON SHOWING GROWTH OF SYSTEM SINCE UNIFICATION

	1929	1915	Per Cent Increase
Gross earnings	$62,391,622	$31,966,049	95.18
Operating expenses	$48,961,067	$19,889,276	146.17
Taxes	$3,560,000	$1,439,279	147.35
Operating wages paid	$30,348,351	$10,560,039	187.39
Total wages paid	$33,295,118	$12,379,615	168.95
Revenue passengers carried	892,814,620	627,731,550	42.23
Total rides	1,621,215,876	1,115,312,129	45.36
Average fare per revenue passenger	6.90c	4.99c	38.28
Average fare per ride	3.80c	2.81c	35.23

TRACK MILEAGE OF CHICAGO SURFACE LINES

During the fifteen-year period of unification the companies have constructed 122 miles of new extensions (single track equivalent) at a cost of $6,683,715 and reconstructed 553 miles of single track at a cost of $33,622,017 of which $25,498,790 was paid out of the renewal funds and $8,123,226 was new capital. Track mileage of all companies, compared with the previous fiscal year, is as follows:

	Total Miles Single Track 1-31-28	Extensions 1928	Abandoned 1928	Net Extensions 1928	Total Miles Single Track 1-31-29	*Reconstructed 1928
Chicago Railways	597.09	0.42	0.01	0.41	597.50	20.48
Chicago City Railway	339.01	0.15	....	0.15	339.16	12.36
Calumet & South Chicago Railway	128.05	0.07	....	7.00	128.12	4.20
The Southern Street Railway	17.45	....	....	....	17.45	.....
Total	1081.60	0.64	0.01	0.63	1082.23	37.04

*Includes track taken up and replaced on account of sewers, special straight track renewals, etc.

taxes, $500,000 expended in premiums for life, health and disability insurance for all employees and $250,000 more paid out in increased trainmen's wages.

While all of this is most gratifying it is but an indication of the greater service these properties could render in this community under adequate franchise provisions, permitting their co-ordination with other transportation agencies and the building up of a comprehensive system. Fortunately, some progress is being made in this direction and it is the hope that the near future will see the laying of the foundation for development here of the greatest local transportation service in the world.

Accident prevention work during the year resulted in a decrease of 12 per cent in fatal accidents, making a total reduction of 25 per cent for two years. The number of fatalities was the lowest since 1914, notwithstanding the increase of 45 per cent in the number of riders since that time.

A new world's record for the operation of every car on five successive days was established on Dec. 17 to Dec. 21 inclusive when 3,639 cars were in service.

No Abandonment in Piqua

Announcement has been made by the Dayton & Troy Traction Company that no attempt is to be made at present to eliminate the electric railway system in Piqua, Ohio. Several weeks ago it was stated that the company would petition the City Council for permission to cease operating the Piqua service, due to an alleged loss of $1,000 a month. The franchise to operate the Piqua lines is combined with the franchise permitting the company to operate its interurban system through the city.

Purchase of Oklahoma Belt Line Proposed

The Oklahoma Railway, Oklahoma City, Okla., has applied to the Interstate Commerce Commission for authority to acquire by lease and purchase of capital stock the Oklahoma Belt Railway, a 5-mile line in Oklahoma City. The applicant, an electric line, controls the belt railway, for which it paid $25 a share for 5,910 shares. As indicated previously in the ELECTRIC RAILWAY JOURNAL, the belt line will be electrified.

Successor to Company in New York City Organized

The Second Avenue Railroad Corporation, New York City, has been chartered by the Secretary of State as a reorganization of the Second Avenue Railroad with capital of 34,000 shares no-par value stock. George E. Warren, Stamford, Conn., John F. B. Mitchell, Flushing, N. Y., and C. Lansing Hays, Brooklyn, are directors and subscribers. Merrill, Rogers, Gifford & Woody, New York City, are attorneys for the corporation. Approval of the terms of the reorganization by the Transit Commission was noted recently in the JOURNAL.

Railway Serving Rockaway Resorts to Be Scrapped

Valued in 1927 at $350,000, the Ocean Electric Railway, which carried passengers from Rockaway to various parts of the peninsula for 25 years, has been sold for $500 to H. E. Salzburg, Manhattan dealer in electric machinery. The Long Island Railroad operated the Ocean Electric. It reported that the contract called for complete removal of all the equipment within 90 days. Mr. Salzberg declared he had bought the franchise rights on the Belle Harbor-Rockaway Park and the Far Rockaway sections for $33. At present the peninsula is served by bus lines.

Appraisal in Kansas City

The Public Service Commission issued an order on March 12 directing its engineers to appraise the properties of the Kansas City Public Service Company, Kansas City, Mo., and requiring its accountants to audit the company's books. This is the usual procedure following an application for a new schedule of increased fare. Action on the schedule sought will be delayed 120 days to permit the appraisal and audit to be completed.

Eastern Massachusetts Elects

At the annual meeting of the Eastern Massachusetts Street Railway stockholders, Edward M. Hamlin and E. Sohier Welch were elected directors, filling vacancies caused by the retirement of H. R. Hardwick and Frederick H. Baird.

The stockholders voted to change dates of the payment of dividends on the first preferred, sinking fund, preferred "B" and adjustment stocks from semi-annual to quarterly dates. The first preferred, sinking fund, and preferred "B" stocks will be payable Fed. 1, May 1, Aug. 1, and Nov. 1. Dividends on the adjustment stocks will be payable the first day of January, April, July and October, except in April, 1929, when a semi-annual dividend of 2½ per cent will be paid. The company has declared an initial dividend of 37½ cents on the common, payable on April 1 to stock of record, of March 15.

Lester Watson, director and trustee, said that the management has made every effort to counteract this decline and is going ahead with increased use of buses. He said that fare reduction might in some cases stimulate riding and that the management was now considering a radical change in this direction on one of its divisions.

Encouraging Report to Stockholders of Michigan Line

In spite of a parallel bus line competition, the United Suburban Railroad, Grand Rapids, Mich., successor to the defunct Holland & West Michigan Interurban Company, had a successful year in 1928. Plans for improving the service during the coming year were made at the recent annual meeting.

Additional Stock for Springfield Construction Program

An increase of $500,000 in the 6 per cent preferred stock of the Illinois Power Company, Springfield, Ill., was authorized on March 8 at the annual meeting of the stockholders. The additional stock, which increases the capital stock of the company from $1,500,000 to $2,000,000, will be sold to the public to provide funds for the $800,000 construction program of this year. Approval of the Illinois Commerce Commission must be secured for the increase in the capital stock.

A. D. Mackie, first vice-president and general manager, reported gross earnings of $2,732,116 for the year 1928, an increase of $105,000 more than the previous year. The sum available for the surplus was $185,970, after all operating expenses, taxes, bond interest, depreciation, dividends and retirement of preferred stock had been paid. Depreciation took $150,000 and taxes $187,534. He also explained that the surplus was almost exhausted by repairs following the big sleet storm of December, 1924. The report showed that 3,380 stockholders were paid dividends amounting to $228,246.

In the transportation department, 1,100,000 fewer persons were carried in 1928 on the street cars and buses than in 1927.

During the past year improvements costing $474,000 were financed by the sale of 6 per cent preferred stock. Indebtedness was decreased by $53,000, that amount of the 7 per cent securities being retired.

Line to Be Abandoned in Buffalo

The Public Service Commission on March 12 approved the declaration of abandonment by the International Railway, Buffalo, N. Y., of its shuttle line in Best Street between Genesee and Elm Streets, a distance of 7,320 ft.

New Chairman of Directors in Columbus

Benjamin W. Marr, for ten years a director of the Columbus Railway, Power & Light Company, Columbus, Ohio, has been elected chairman of the board of directors and chairman of the executive committee of that company. Mr. Marr will have complete charge of the company's affairs and will direct its policy in relation to the public. Since assuming the duties of his office, Mr. Marr has stated that the proposed increased rates will not go into effect without the city's sanction. He also stated that the books of the street railway would be open to anyone the city wished to employ to examine them.

Personal Items

Promotions in Cincinnati

Joe R. Ong in charge of research; Harley L. Swift, assistant general manager; Jesse E. Carnes, assistant superintendent of transportation

THREE new directing positions have been created in the operating section of the Cincinnati Street Railway, Cincinnati, Ohio. The positions are, director of research, filled by Joe R. Ong, formerly transportation engineer; assistant general manager, filled by Harley L. Swift, formerly superintendent of substations; and principal assistant superintendent of transportation, filled by Jesse E. Carnes, formerly superintendent of motor coach operation.

Jesse E. Carnes

Harley L. Swift

Joe R. Ong

The changes made necessary by these appointments were as follows: H. C. Genrich was promoted from chief electrician to superintendent of substations; Homer H. Sorter was promoted from coach supervisor to superintendent of motor coach operations.

Howard Nestor, formerly a supervisor, has been made assistant superintendent of transportation in charge of night operation, while N. Wickersham continues as assistant superintendent of transportation in charge of day operation.

Carl J. Wendt has been made superintendent of schedules. He had formerly been assistant in the office of the transportation engineer.

In commenting on these appointments, Walter A. Draper, president, said:

> These changes are made necessary by the expanding business of the system and the continued need of more modern methods. Research plays an important part in all business of today and the experimentation with types of equipment and the study of scientific and adequate schedules has made necessary the research department. The complete reorganization of the power system with nineteen instead of the previous smaller number of substations and the proper correlation of the street car and motor coach branches of the transportation department required an organization in which the duties were more definitely outlined.

P. M. Wentworth Honored by Stone & Webster

P. M. Wentworth, of Orlando, Fla., has been named district manager of the companies comprising the southeastern district under the executive management of Stone & Webster of Boston. The companies include the Jacksonville Traction Company, Key West Electric Company, Tampa Electric Company, Columbus Electric & Power Company, Savannah Electric & Power Company, the Florida Motor Lines, the Orange Belt Motor Lines, the Orlando Rapid Transit Company and the South Terminal Company. Since 1927 Mr. Wentworth has been executive vice-president of the Florida Motor Lines and affiliated companies, moving to Orlando from Sidney, Nova Scotia, where he was manager of the Cape Breton Electric Company, Ltd. Mr. Wentworth will maintain his headquarters at Orlando.

Personnel of Los Angeles Company

Officers of the Pacific Electric Motor Transport Company, Los Angeles, Cal., are C. W. Cornell, president; L. B. Young, manager; L. E. St. John, secretary-auditor, and J. L. Smale, treasurer.

This company was organized to provide a complete store-door, pick-up and delivery freight transportation service in co-ordination with existing rail lines, particularly the Pacific Electric Railway, referred to recently in the JOURNAL.

WALTER J. MCCARTER has been appointed to a newly created position with the title of assistant educational director of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis. He will continue as supervisor of training in the transportation department.

O. C. Wright Succeeds Michae O'Brien in St. Louis

Under a recent reorganization of it equipment and shops divisions, O. C Wright becomes general superintende of equipment St. Louis Public Servic Company, St. Louis, Mo. He succeed Michael O'Brien, retired. Mr. O'Brie as master mechanic, was in charge of th shops.

With the exception of Mr. Gra other officials mentioned in the chang in the equipment department have bee in the company's service for some tim They are:

Shop Superintendent C. M. Gray, wh formerly was shop superintendent f the Pennsylvania Railroad, Indianapoli Ind.

Superintendent of Car Statio A. Riley, who will have charge of th repair work at the various car statio on the system.

Automotive division in charge Adam Ebinger, superintendent garages.

Engineer of Equipment C. W. Youn who will have charge of the drawin rooms and engineering work.

Engineer of Tests M. M. Ridker, wh will direct all test work and chemic analyses.

Almost immediately upon leaving co lege Mr. Wright entered the employ the Pennsylvania Railroad at Columbu Ohio, as a special apprentice in th maintenance of equipment departmer He finished the four-year course of a prenticeship at Fort Wayne, Ind. Fi ishing his apprenticeship he he various positions in the Pennsylvania organization; he was electrical engine and engineer of motive power at Pitt burgh, Pa.; for eight months he serv as master mechanic at the Loganspo Ind., shops and then was made divisi superintendent at Cambridge, Ohi Next he served one year as superi tendent of motive power at Chicago. F four years he was district mast mechanic at Fort Wayne, Ind., wi three divisions under his jurisdictio Later he went to Indianapolis. Goi with the St. Louis Public Service Cor pany, Mr. Wright devoted the r mainder of 1928 to a study of the co pany's equipment problems under Sa Greenland, whom he had served Indiana.

Mr. Wright was born at Marion, In on June 20, 1883. He received h primary grade and high school traini in the public schools of his home cit Later he attended Purdue Universi School of Electrical Engineering fro which he was graduated in 1905.

Under the old plan of organization t master mechanic reported directly to t assistant general manager. Mr. Wrigl who came to the Public Service Co pany from the Pennsylvania Railroad May, 1928, will have direct supervisi over the company's shops and will n only keep the present equipment in ser ice, but will design new equipment a direct any construction program unde taken by the company.

Mr. Wright's predecessor, Mich

O'Brien, will enter private practice with his son, Edward J. O'Brien, a consulting mechanical engineer. Michael O'Brien was born in the city of St. Louis. After serving an apprenticeship as a machinist in the shops of Smith-Beggs & Rankin, Corliss engine builders of St. Louis, he became, in 1889, assistant power house engineer of the Citizen's Railway, now part of the St. Louis Public Service Company, and one of the first St. Louis horse car lines to adopt the cable. After eighteen months in this position he resigned to become deputy boiler inspector of the city of St. Louis, but after one year as boiler inspector he returned to the Citizens Railway as chief engineer of its cable power house. In 1896, when the cable was discarded for electricity, Mr. O'Brien became master mechanic of the company.

In 1900, Capt. Robert McCullough, who had been president and general manager of the Citizen's Railway, went to Chicago as vice-president and general manager of Chicago's southside surface lines. He shortly took from St. Louis, Mr. O'Brien, as master mechanic of the Chicago property and Harvey B. Fleming as chief engineer. In 1904, just before the St. Louis World's Fair, Captain McCullough returned to St. Louis as vice-president and general manager of the St. Louis Transit Company and Mr. O'Brien was brought back to St. Louis as master mechanic.

Since 1904 Mr. O'Brien has been continuously master mechanic of the St. Louis Transit Company and its successors, the United Railways, the receiver of the United Railways and the St. Louis Public Service Company.

D. P. McConnell With Public Service

Daniel P. McConnell, long in newspaper work, has become identified with the publicity department of the Public Service Railway, Newark, N. J.

His newspaper career was interrupted when he was appointed deputy commissioner of parks and public property at Camden, in May, 1927. Mr. McConnell resigned his city position to accept the job of publicity assistant for the southern division with headquarters in Camden.

Entering the newspaper field when 17 years old, Mr. McConnell spent 16 years with the old Camden *Post-Telegram*. He was also court and legal reporter for the *Evening Courier* for a few months and represented the Philadelphia *Public Ledger* in Camden for eight years. At one time he was sports editor of the *Post-Telegram*.

George R. True, a member of the claims department of the Chicago Rapid Transit Company, Chicago, Ill., for the past eighteen years, was recently appointed claims agent for the company. He began his service with the elevated lines in 1911 as claims adjuster. Prior to that time he had been engaged in newspaper work in New York City.

G. M. Gadsby Heads Utah Property

George M. Gadsby has been made vice-president of the Utah Light & Traction Company, Salt Lake City, Utah, succeeding D. C. Green. Mr. Gadsby is also the new president and general manager of the Utah Power & Light Company. Early in the present year he resigned as president of the West Penn Power Company to become associated with the Electric Bond $ Share Company, New York. He had spent more than ten years with the West Penn system at Pittsburgh.

Mr. Gadsby obtained his first practical engineering experience as chemist with the water department at Marietta, Ohio, and early in his career was employed as chemist for the Warren Water Company, a subsidiary of the American Water Works & Guarantee

G. M. Gadsby

Company at Warren, Pa. From there he went to Pittsburgh, subsequently to Little Rock, Ark., and later to New York. Two years later—in 1917—Mr. Gadsby returned to Little Rock to engage in business, but before he had established himself he was requested to return to Pittsburgh as assistant to A. M. Lynn, president West Penn Power Company.

While engaged in public utility work in Pennsylvania he has been very active in association affairs. He has also acted for two years as chairman of the special power survey committee representing the Pennsylvania Electric Association in work with the "giant power" survey board and work in conjunction therewith by the Public Service Commission.

H. Hobart Porter Honored

H. Hobart Porter, engineer and industrialist, has been elected chairman of the Engineering Foundation, 29 West 39th Street, to succeed Lewis B. Stillwell. The new chairman is president of the American Water Works & Electric Company and of the Brooklyn City Railroad. He is chairman of the board of the West Penn Electric Company and is vice-president of the Queensboro Gas & Electric Company. He is a director of several power companies and railways.

OBITUARY

George D. Walden, assistant superintendent of tracks United Electric Railways, Providence, R. I., from 1917 until July, 1927, died recently. Early in his career he entered the employ of the Metropolitan Street Railway, Boston, becoming in time assistant superintendent and finally division superintendent of transportation. During this time the Metropolitan Company was consolidated with the West End Street Railway. Mr. Walden went to Providence as a track foreman in May, 1904. During his years of services he had charge of special track work in Pawtucket, on the Providence-Woonsocket line and later assisted in city installation work in Providence.

James A. Dorsey, for many years superintendent of lines Connecticut Valley Street Railway, died in his home in Northampton, Mass., on Feb. 22, at the age of 60 years. After concluding his service with the Connecticut Valley system he was employed by the Boston & Albany Railroad for ten years.

Matthew Griswold, who retired as manager of the Erie Works of the General Electric Company on Jan. 1 of this year because of ill health, died on Feb. 10. On Nov. 11, 1911, he severed his connection with the Griswold Manufacturing Company to become acting manager of the Erie Works of the General Electric Company. He was made manager of the plant on Dec. 12, 1912. Mr. Griswold was born in Erie in 1866. He was graduated from Sheffield Scientific School, Yale, in 1888.

John A. Guiher, prominent northeastern Iowa attorney, former member of the State Railroad Commission, and remembered in utilities circles for his association as arbitrator in the dispute between the Des Moines Railway and its employees in 1907, died Feb. 26 in Miami, Fla. Mr. Guiher recently was special master-in-chancery in settlement of dispute between the Des Moines Union Railway and the Hubbell interests.

Fayette S. Curtis, formerly president Old Colony Railroad and later vice-president New York, New Haven & Hartford Railroad, died at Boston, Mass., on Feb. 15. Mr. Curtis, a civil engineer in railroad work, was identified first with the Albany & Susquehanna Railroad. In 1874 he was appointed chief engineer New York & Harlem River Railroad and in 1876 was appointed to a similar capacity with the New York, New Haven & Hartford. In 1900 he was elected vice-president of the New Haven road which position he resigned in 1907 to become president of the Old Colony Railroad. Mr. Curtis was 86 years old.

J. C. Nord, for 37 years with the Denver Tramway, Denver, Col., died on March 1. For fifteen years Mr. Nord was chief clerk in its transfer office. He started in 1891 as a conductor.

Equipment Orders in Project

Seattle may purchase 80 new cars. $135,000 Substation for Baltimore. New York, New Haven & Hartford to order new passenger equipment. Improvements in Sacramento

NEGOTIATIONS for the construction of 80 new street cars for the Seattle Municipal Railway will probably be resumed in the near future, according to Councilman E. L. Blaine, chairman of the finance committee, of Seattle, Wash. The order for these cars was placed Aug. 10, 1926, but the actual construction was not started, however, because of financial conditions. The city of Seattle has recently obtained a favorable court decision in the Von Herberg suit, and has been advised that if Von Herberg will not appeal and will agree to discontinue these proceedings, that the financing of the 80 street cars will be reconsidered. The new cars are to be of lighter construction and are designed for faster acceleration and speed.

Baltimore Substation

The United Railways & Electric Company, Baltimore, Md., will start work in the near future on a new substation to be erected at White and Glen Oak Avenues. It will cost approximately $135,000 and will enable the company to improve its facilities in the Hamilton, Blair Road and Carney sections. The station will be of the manually operated type, and considerable attention will be given to the construction of the building. The actual cost of the building is estimated to be approximately $26,000. This substation is scheduled to be completed by the last of June.

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has placed in service a new $40,000 sheltered loading station for street cars and motor buses at 27th and Hopkins Streets. The station is on private property, extending from Hopkins Street to 27th Street, a distance of about 100 ft. east of the intersection. Double-loop tracks accommodate 12th and 27th Street cars, and a drive is provided for North Milwaukee buses. A small building on the property will contain a light lunch concession. The opening of the station is said to clear up one of the most serious traffic conditions in the city.

Sacramento Improvements

The Pacific Gas & Electric Company, San Francisco, Cal., has announced provisions of the 1929 budget of the company, calling for the purchase of seven new street cars of the latest design and thirteen passenger buses for use in Sacramento, as well as the construction of a new substation and extensive additions and improvements to present facilities.

The entire expansion program in the Sacramento district calls for a total expenditure of $1,848,995. The separate items projected for consummation here this year are:

Seven new street cars for use in Sacramento, $91,000; seven 40-passenger coaches, $79,000; four 29-passenger coaches, $34,000; two 21-passenger coaches, $12,000; new substation in southeast Sacramento, $110,000; extension of lines to serve the new substation, $65,000; rebuilding of facilities in substation A at Sixth and H Streets, $62,000, and new paint shop at 29th and M Streets, $15,300.

The passenger coaches and buses likewise will be in operation in the outlying residential districts of Sacramento as extension service from street car lines.

The $110,000 substation in the southeastern section of the city will be started in the near future, when the $65,000 task of extending electric lines to serve the station also will be undertaken.

The $62,000 program for rebuilding the facilities in the substation at Sixth and H Streets will be commenced at once. The entire switching apparatus will be changed and a number of modern improvements and additions will be made.

The projected $15,300 paint shop at 29th and M Streets, which will be used for painting street cars and buses, will be started soon. Plans for the building are being prepared. It will be of brick construction and probably about two stories high.

The United Electric Railways, Providence, R. I., has just completed the installation of a 3-in. gasoline pipe line at its Elmwood and Melrose garages. This line runs from the siding on the Narragansett Electric Company's property on Melrose Street, through the Melrose garage and to the Elmwood garage—a distance of approximately 1,725 ft. This line will enable the company to unload a 10,000-gal. tank car in about 2¼ hours.

This company has also completed alterations in its Elmwood carhouse, whereby all of the middle section has been turned over for use by the bus department, thus providing accommodations for housing and repairing of 30 additional buses. The middle section has been remodeled to accommodate storage and repairs for 36 cars.

Cars for New York, New Haven & Hartford

The purchase of three motor cars and six multiple-unit trailer cars has been authorized by the New York, New Haven & Hartford Railroad. This is part of authorized expenditures for car equipment amounting to approximately $6,500,000. This sum includes the purchase of 90 passenger coaches, 10 combination coaches, 15 apartment mail cars, 6 diners, 20 gasoline-electric cars and 24 trailers for gasoline-electric cars.

The Public Service Co-ordinated Transport, Newark, N. J., is trying out new illuminated signaling devices, which indicate when the bus or car is about to turn either to the right or left. A bus will be equipped with two of these appliances—one on each side of the front. If the experiments now being made prove satisfactory, it is said that they will be installed on all street cars and buses in the Public Service system.

The properties of the Sacramento Short Line have been recently acquired by the Sacramento Northern Railway, Sacramento, Cal., which company has a program for the expenditure of $318,000. $86,000 of this amount is to be charged to operating expenses, and $252,000 to capital account. This does not include $600,000 required to complete the construction of the 16-mile Holland branch, which will in all probability be ready for operation about May 1. The Tidewater Southern Railway has a program calling for the expenditure of $165,000.

The Pacific Gas & Electric Company, San Francisco, Cal., will make extensions to its pole-treating and distributing plant, Stockton, Cal., to cost approximately $65,000. The Citizens Transit Company, Oil City, Pa., has placed an order for three new 29-passenger Dodge buses, at a cost of approximately $10,000 each. With the delivery of these new vehicles, the total number of buses owned by the company will be brought up to 27. The Southern Ohio Public Service Company, Columbus, Ohio, has placed an order for five 20-passenger parlor car type Studebaker buses, and two de luxe street car type Studebaker buses.

Material Purchases

The volume of equipment and material purchases seems to be on the continual increase. The Pittsburgh Railways, Pittsburgh, Pa., has placed orders recently for 25,000 ft. of ¼-in. copperweld span wire, 41,000 ft. of 5/16-in. copperweld span wire, 12,500 ft. of 7/16-in. copperweld span wire, 21,000 ft. of ¼-in. galvanized span wire, 164,000 ft. of No. 10 weatherproof copperweld solid wire, 5,000 ft. of 7/16-in. galvanized span wire, 4,000 ft. of three-conductor weatherproof cable, and 5,000 No. 00 15-in. line ears. This company has also placed orders for 1,800 fir crossarms, 900 insulator pins, 1,000 12-in. bonds, 300 24-in. trolley protecting armors, 500

16-in. bonds, 400 insulators, 8 section insulators, 400 lb. of copper-coated welding rod, and 75 30-ft. creosoted yellow pine poles.

Line materials ordered by the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., include ten cars of poles, two cars of wire and cable, and one car of crossarms.

The Chicago Surface Lines, Chicago, Ill., has placed orders for 250 No. 000 right-hand malleable-iron switches and 550 No. 000 left-hand malleable-iron switches, 100 No. 000 65-ft. radius, 33-deg. malleable-iron galvanized crossovers, and 600 lightning arresters.

Track Equipment

Track materials ordered recently include 13,000 white oak ties, 24,000 screw spikes, 13,000 tie plates, and 285 kegs of track bolts, by the Twin City Rapid Transit Company, Minneapolis, Minn. This company has also ordered one Ingersoll-Rand type 20 portable electric driven air compressor. Other track material ordered includes 400 gross tons of 7-in. 93-lb. T-rail, 600 gross tons of 7¼-in. 102-lb. T-rail, 100 gross tons of 7-in. 114-lb. guard rail, 2,000 welding portions for T-rails, one electric over steam railroad crossing, and one No. 14 S, ½-cu.yd. Smith Paver-Less railway motor.

Pittsburgh Railways, Pittsburgh, Pa., has placed orders for 1,600 tons of 7-in. 122-lb. rail, 1,600 tons of 9-in. 134-lb. rail, 10,000 ties, 300 tons of 80-lb. T-rail, 800 pair splice bars, 1,000 kegs of track spikes, 100 kegs of track bolts, 10,000 tierods, 100,000 tie plates, and 1,850 railroad crossing bolts. This company has also placed orders for 1,386 miscellaneous parts for switches and boxes, 20 sewer drops, 50 sewer drop covers, 20 kegs of tierod washers, 2 concrete cribs, and 16 pieces of special work.

Car Remodeling

For car remodeling, the Twin City Rapid Transit Company has placed orders for 12,000 ft. of 1 x 1¼-in. Philippine mahogany lumber, 200 gear blanks, and 120 steel billets, 6½ in. square by 52 in. long. This company has also placed orders for 80 tons of pig iron and 30,000 lb. of Viscoline lubricant. The Milwaukee Electric Railway & Light Company has ordered eight second-hand cars.

The Pittsburgh Motor Coach Company contemplates the purchase of two 29-passenger parlor coaches. The Pittsburgh Railway is remodeling fifteen low-floor type cars from one-man operation to one-man, two-man operation. This company is also remodeling one high-floor double-end car from two-man operation to one-man operation.

The Chicago Surface Lines has ordered 100,000 vitrified paving brick and 300 grinding wheels. The Milwaukee Electric Railway & Light Company is constructing a substation at the Six-and-a-Half Mile Road. The Pittsburgh Railways has received one 40 series Cincinnati all-steel press brake and one power press.

Mexico Imports Equipment

Importation of street cars, poles, wire and electrical equipment through Laredo, Tex., into Mexico showed a material improvement over 1927, according to a report recently completed by customs officials. During 1928 45 carloads of trolley cars were imported through Laredo, in addition to 38 carloads of poles, and 17 carloads of electrical supplies. A total of 26 carloads of wire was also imported by this country, as well as rails, wheels and miscellaneous items.

Beech Grove Car Delivered

The Beech Grove Traction Corporation has received a one-man motor, city type, passenger car from the Cincinnati Car Company, Cincinnati, Ohio. Mention of the order of this car was made in Nov. 3 issue of Electric Railway Journal. The car is of the single-end, double-truck type, 39 ft., 8 in. long, weighs 25,400 lb. and seats 49 passengers.

The body of this car is of semi-steel construction with an arch roof and sliding-end doors. The insulating material used is cork and the floor aisles are covered with linoleum. The exterior of the car is enamelled a chrome to the rail and an apple green to the roof. The roof is a red color. The interior trim is cherry stained walnut. The seats are attractively finished in brown Spanish leather.

The trucks are equipped with inside hung motors and 26-in. steel wheels. Plain type journal and armature bearings are used. The wheels and trucks are deadened to reduce noise. A light inside the car and a tail light are connected to a three-cell battery which operates when the trolley circuit is broken. Additional details are given in the accompanying specifications.

The interior trim is stained walnut and the seats are upholstered in brown Spanish leather

The rear end of the car is partitioned off and equipped with side seats giving a seating capacity of 49 passengers

The car recently delivered to the Beech Grove Traction Corporation, Indianapolis, Ind.

Weights:	
Car body	11,690 lb.
Trucks	7,600 lb.
Equipment	6,100 lb.
Total	25,400 lb.
Bolster centers	21 ft.
Length over all	39 ft. 8 in.
Length over body posts	30 ft. 6 in.
Truck wheelbase	5 ft.
Width over all	8 ft. 6⅜ in.
Height, rail to trolley base	10 ft. 5½ in.
Window post spacing	33 in.
Body	Semi-steel
Roof	Arch
Doors, sliding	End
Air brakes	Safety Car Devices Company
Armature bearings	Plain
Car signal system	Storage battery
Compressors	2-c p 25
Conduit	Flexible
Control	K 35
Curtain fixtures	Curtain Supply Company
Curtain material	Pantasote
Door mechanism	Consolidated
Energy saving device	Economy
Fare boxes	Cleveland
Finish	Enamel
Floor covering	Linoleum over center floor
Gears and pinions	Spur
Glass	Plate
Hand brakes	Cincinnati Car Company
Heat insulating material	Cork
Heaters	Consolidated
Headlights	G.E. J. 65
Headlining	Agasote
Interior trim	Cherry stained walnut
Journal bearings	Plain
Journal boxes	3 x 6
Motors	Westinghouse No. 508, inside hung
Painting scheme	Chrome to rail, apple-green to roof and red roof
Registers	Cleveland
Roof material	Canvas
Sash fixtures	Edwards
Seats	Hale & Kilburn
Seating material	Brown Spanish leather
Slack adjusters	Gould
Steps	Stationary
Step treads	Oak, edged with aluminum
Trolley catchers	Ohio Brass Company
Trolley base	Ohio Brass Company
Trolley wheels	Slide
Trucks	Cincinnati Car arch bar
Wheels, type	Steel, diameter 26 in.
Wheelguards or fenders	Steel pilot

Specifications on Regina Cars

Seven one-man, motor, passenger cars have been ordered by the Regina Municipal Railway, Regina, Sask., from the Ottawa Car Manufacturing Company, Ottawa, Ont. These cars, mention of which was made in the Jan. 26 issue of the JOURNAL, are the single-end, double-truck, city type and seat 48 passengers. Each car weighs 34,000 lb., is 41 ft. long and 8 ft. 3 in. wide. The bodies are of all steel construction with arch roofs and folding-end doors. The interiors are trimmed in birch and the cars are finished in mahogany with cream trim.

The trucks are spaced on 17-ft. 7-in. centers and are equipped with 25-hp. motors and 26-in. rolled steel wheels. The armature bearings on all of the cars are of the plain type but only five of the cars are equipped with plain type journal bearings. Roller journal bearings are installed on two of the cars for test purposes. The cars are equipped with back-up signals and track scrapers. Additional information is given below.

Weights, car body	17,400 lb.
Trucks	10,000 lb.
Equipment	6,600 lb.
Total	34,000 lb.
Bolster centers	17 ft. 7 in
Length over all	41 ft.
Length over body posts	26 ft. 4 in.
Width over all	8 ft. 3 in.
Height, rail to trolley base	10 ft. 9 in.
Window post spacing	30 in.
Body	All steel
Roof	Arch
Doors	Folding end
Air brakes	General Electric
Armature bearings	Plain
Axles	A.E.R.A. standard 4½ in.
Car signal system	Consolidated
Compressors	General Electric
Conduit	Flexible and metal
Control	General Electric K 35
Couplers	Portable 3 x 1¼ in.
Curtain fixtures	National Lockwasher Company
Curtain material	Pantasote
Destination signs	Colored lights also lettered
Door mechanism	Rear treadle, front manual
Energy saving device	Economy meters
Fare boxes	Cleveland
Finish	Duco
Floor covering	¼ x 1-in. hard maple mat strip
Gears and pinions	Tool steel
Glass	Plate and non-shatterable
Hand brakes	Peacock
Hand straps	Hand rails
Heat insulating material	Cork
Heaters	Forced draft and General Electric
Headlights	Golden glow
Headlining	Agasote
Interior trim	Birch
Journal bearings	5 cars plain, 2 cars S.K.F. roller
Journal boxes	Cast iron for 3½ x 7 in.
Lamp fixtures	Compensating
Motors	25 hp. General Electric No. 264A
Painting scheme	Mahogany, cream trim
Roof material	No. 10 canvas
Safety car devices	Semi automatic
Sash fixtures	Brass satin finish
Seats	Ottawa Car Manufacturing Company
Seat spacing	30 in.
Seating material	Rattan
Slack adjusters	General Electric
Steps	Folding
Step treads	Honeycomb
Trolley	Ohio Brass
Trolley base	Ohio Brass
Trolley wheels	Kalamazoo
Trucks	Canadian Car & Foundry Company
Ventilators	Nichols-Lintern
Wheels, type	Rolled steel, diameter 26 in.
Wheelguards or fenders	H.B. Lifeguards

Weekly Business Conditions

Commercial transactions during the week ended March 9, as indicated by check payments, was greater than in either the preceding week or the corresponding period of 1928, according to the weekly statement of the Department of Commerce. Steel plants during the same week showed larger operating activity than in either the previous week or the similar week of last year. The output of bituminous coal during the latest reported week, while somewhat lower than in the preceding week, was considerably larger than in the corresponding period a year ago. The production of lumber showed a gain over the preceding week and no change from the corresponding week of 1928. Petroleum output was running considerably in excess of last year. Freight-car loadings covering the latest week for which data are available showed a gain over the similar week of last year.

The general index of wholesale prices showed a practical decline from the previous week, but was higher than a year ago. The price of copper averaged higher than in either period, while the price for iron and steel, showing no change from the previous week, was higher than in the corresponding period of 1928. Loans and discounts of federal reserve member banks showed further expansion as compared with both the preceding week and the similar period a year ago. Interest rates on call loans averaged higher than in either period. Bond prices averaged lower than in either the preceding week or the similar period of last year.

Weekly Business Indicators

(Weeks ended Saturday. Average 1923-25 = 100)

	1929 Mar. 9	1929 Mar. 2	1929 Feb. 23	1929 Feb. 16	1928 Mar. 10	1928 Mar. 3	1928 Feb. 25	1928 Feb. 18
Steel operations	122.4	118.4	117.1	114.5	108.0	109.0	111.0	112.0
Bituminous coal productions	.....	114.5	120.6	122.5	106.6	103.0	104.4	96.2
Lumber production	.....	101.4	96.4	84.1	99.1	101.4	108.6	106.4
Petroleum production (daily average)	.....	129.8	129.3	128.4	113.1	113.2	112.8	113.4
Bldg. contracts 37 states (daily average)	.....	124.5	93.1	85.1	110.0	111.0	122.2	114.9
Price iron and steel, composite	87.9	87.9	87.6	87.6	87.6	86.5	86.0	86.0
Copper, electrolytic, price	.....	139.1	129.0	129.0	100.7	100.0	100.0	100.0
Check payments	157.8	124.8	145.5	119.1	126.6	123.7	105.3	110.1
Bank loans and discounts	131.4	130.9	129.5	129.9	121.2	121.2	120.4	121.1
Interest rates, call money	218.2	187.9	169.7	169.7	103.0	109.1	103.0	109.1
Business failures	120.4	131.9	101.0	117.0	125.3	126.8	118.7	127.8
Interest rates, time money	177.1	177.1	177.1	177.1	105.7	105.7	105.7	105.7
Federal reserve ratio	89.9	90.2	91.4	90.1	96.0	95.6	96.4	95.5

Railroad Electrification in Spain

The commission appointed by the Spanish government to decide which sections of the Spanish railroads should be electrified in the near future has decided that the following lines fall into this category: Madrid-Alvila, Madrid-Segoria, Medina, Valencia-Cuenca; Madrid-Villanueva de la Reina; the lines in Catalonia, Valencia-Encina; Miranda-Bilbao and the line from Santander to the Pyrenees. The length of the lines in question is approximately 1,375 miles and it is estimated that 150,000 hp. will be required for their operation. Electric trains are already running on the Pajares railway, the Barcelona-Manresa-St. Jeandes Abesses and the Bilbao-Arenas lines. The electrification of the Ripoll-Puigcerda, and Estella-Vitoria-Alsasua lines has been completed and electric trains will shortly be in operation.

METAL, COAL AND MATERIAL PRICES F.O.B. REFINERY

	March 12, 1929
Metals—New York	
Copper electrolytic, cents per lb.	19.775
Copper wire, cents per lb.	21.625
Lead, cents per lb.	7.25
Zinc, cents per lb.	6.7
Tin, Straits, cents per lb.	48.375
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.425
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago, net tons	1.425
Central, Ill., screenings, Chicago, net tons	1.075
Kansas screenings, Kansas City, net tons	1.70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.35
Weatherproof wire base, N. Y., cents per lb.	22.375
Cement, Chicago net prices, without bags	2.05
Linseed oil (5-bbl. lots) N. Y., cents per lb.	10.6
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.5
Turpentine (bbl. lots), N. Y., cents per gal.	63.5

To Exhibit Waste-Campaign Facts

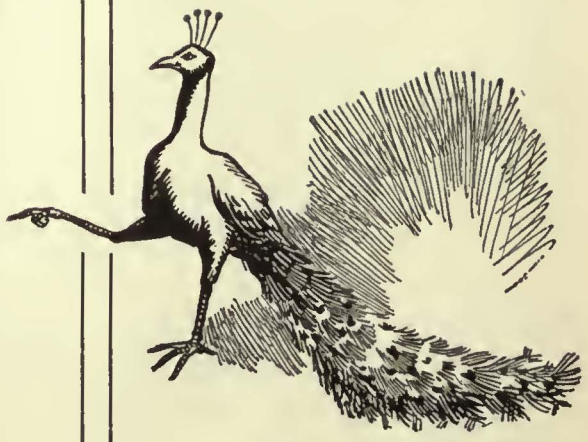
A nation-wide chain of individual industrial exhibits for employees and officials will be an educative feature of waste-campaign week in April. A booklet, describing exhibit campaigns of the Westinghouse Electric & Manufacturing Company, and the Newport News Shipbuilding & Drydock Company, is being distributed to more than 200 manufacturing plants by the local sections of the American Society of Mechanical Engineers and every section is trying to have the plants in its vicinity stage such a campaign in April.

Woodruff Key Standard Proposed

A proposed American standard for Woodruff keys, keyslots and cutters has been recently completed by a subcommittee of the sectional committee on the standardization of shafting. This proposed American standard is now being submitted to the sectional committee for approval. The standards are in tentative form for discussion and suggestions will be welcomed by the committee. They should be mailed to C. B. LePage, assistant secretary, The American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.

Safety—

Plus



A car with good air brakes is considered safe, but for emergencies a set of hand brakes is provided. But what if the hand brakes fail, due to no fault of their own—because of worn brake shoes or slack rigging? What then?

A hand brake that allows for this last condition, that functions in spite of poorly adjusted rigging or worn shoes —such is Peacock Staffless. That's why it gives not only safety, but "safety-plus."

Its special construction permits Peacock Staffless to wind up twelve feet of chain without clogging. You will readily appreciate that this is more than enough to take care of the maximum slack encountered in operation.

Besides this feature, Peacock Staffless also has four others—light weight, small platform space requirements, low maintenance, great speed and power. All these combine to make this brake a safe buy for old cars as well as new.

"PEACOCK"

REG. U. S. PAT. OFF.

STAFFLESS BRAKES!

The Peacock Staffless

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.
General Sales Representatives:
The Ellcon Co., 50 Church St., New York

This MARK *is your* GUARANTEE

Look for the word "Empire" on oiled electrical insulations! It is your guarantee of uniform high quality, of an insulation that successfully withstands the ravages of time.

Only the finest of linseed oil, the strongest, most uniform of cloths, and papers are used. Rigid inspection assures this. Manufacture has been perfected to such an extent that the original high dielectric strength and flexibility of Micanite electrical insulation is retained indefinitely.

If you require cloth, silk, paper or any of the other oiled insulations be sure to ask for "Empire"—the age resisting electrical insulation.

Empire Oiled Insulations: Super-Micanite, and Micanite bonded mica insulation. Mica Insulating Varnishes, Compounds, Cements, Friction and Rubber Tapes are products of the Mica Insulator Company.

MICA INSULATOR COMPANY

New York: 200 Varick St., Chicago: 542 So. Dearborn St.
Works: Schenectady, N. Y. London, England

Cleveland, Pittsburgh, Cincinnati, Seattle, San Francisco, Montreal, Toronto, Los Angeles

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

Make Way for Progress

Suddenly, at the turn of the highway, the motorbus appears ‧ ‧ The light flashes on its colorful sides, its spotless brightwork, its wide glass windows ‧ ‧ High of power, low of body, rhythmically balanced to the road, it strides the curves and straightaways with an easy, conquering speed ‧ ‧ Some of its passengers wave as they pass; others read, work on business affairs, or doze—all deep cushioned in the luxury of this new travel ‧ ‧ Swift, convenient, reliable, comfortable, the new great carrier draws cities closer, banishes isolation, quickens commerce. THIS IS PROGRESS!

‧ ‧ ‧

THE astonishing growth of motorbus service to the point where one may now take a bus to a neighboring village or just as easily to a city across the continent, is steadily accompanied and often pioneered by the development of Goodyear Pneumatic Cord Bus Tires.

The part these dependable tires play in the rapid expansion of motor transport is witnessed by an impressive preference for Goodyear Tires throughout the industry.

Exclusive equipment on the great urban, interurban and transcontinental fleets that number their buses by hundreds, Goodyear Tires also carry the single buses that cover the short branch routes or gather the children for rural schools.

They are thus uniformly favored because they are built with an understanding of motorbus operation and its needs. They have the essential qualities for passenger satisfaction and operating profit:

Freedom from trouble on the road—

Tractive power for starting and stopping—

The safe, sure, anti-skid grip of the famous All-Weather Tread—

The body vitality of extra-elastic, extra-durable SUPERTWIST Cord, insuring uninterrupted revenue mileage over a long life at low tire cost per mile.

Superior as they are for motorbus service, Goodyear Tires cost no more to buy and much less to operate.

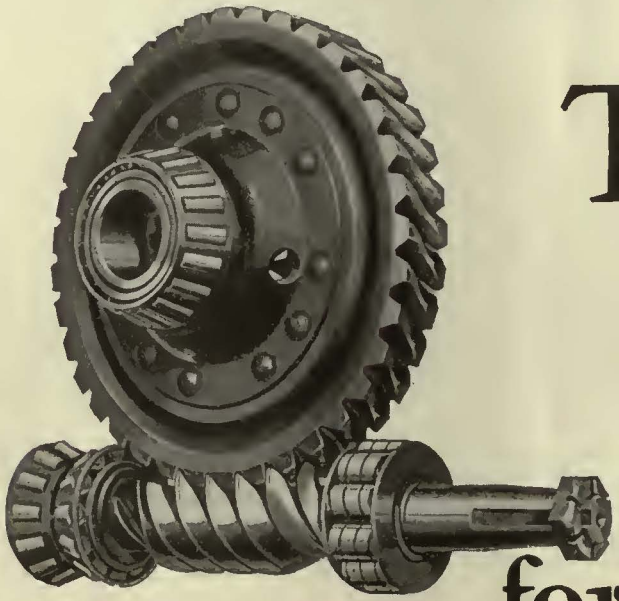
For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, specially built to motorbus needs, and also Goodyear Rubber Tire Chains.

The Greatest Name in Rubber

GOODYEAR

This advertisement also appeared in the March 2nd issue of the Saturday Evening Post, in full colors

Comfortably right and economically right



Timken Worm Drive for electric railway cars

For those who look for comfortable transportation, for those who look for profits—from both points of view, Timken Worm Drive for electric railway cars is fundamentally practical. A dead silent, sturdy, long-lived driving unit; light weight high-speed motors; long, flat, comfortable springs; smooth starting and acceleration—smooth stopping; differentials for quiet, and prolonged life of wheels and rails—these are all definite contributions to comfort and profit, by Timken Worm Drive Car Trucks.

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.

Note convertible compartment for trunks and other baggage—a wonderful convenience. Readily changed for comfortable seating of passengers or loading of bulk luggage.

UNION PACIFIC SYSTEM — THE OVERLAND ROUTE

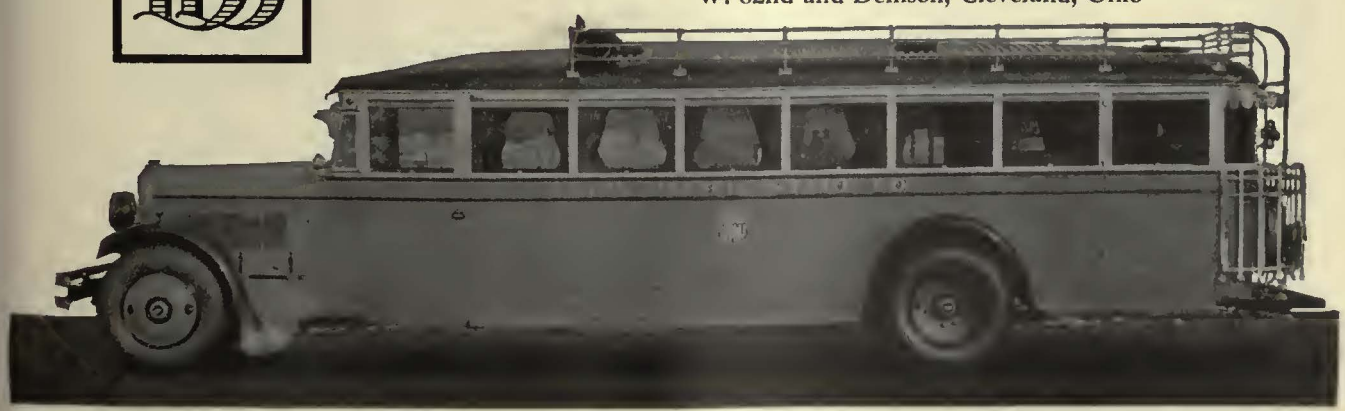
Body ...by... Bender

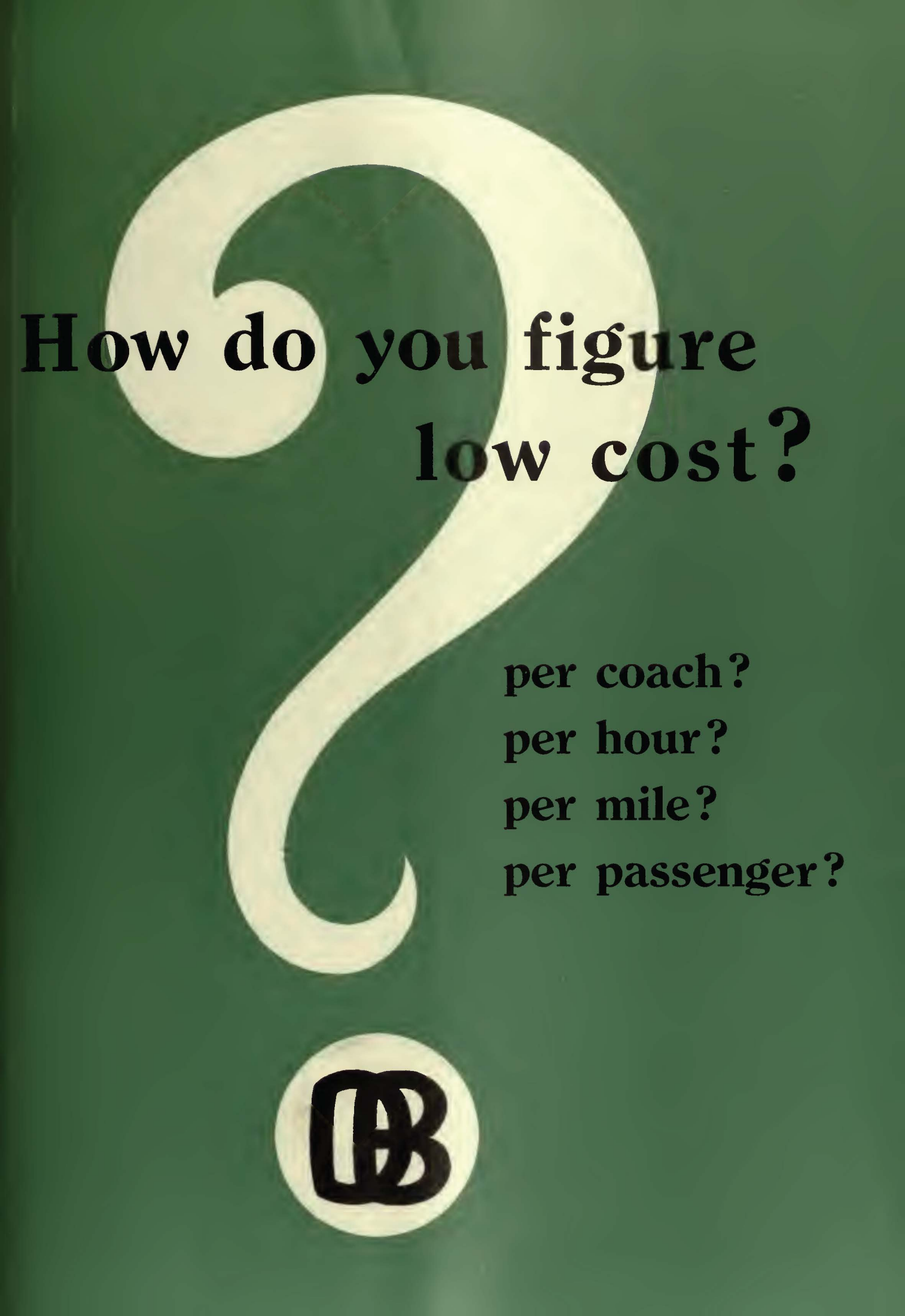
BENDER believes that comfort comes first in building bus business. Therefore, each body is Bender constructed throughout even to the seats which Bender designs and builds.

Yet comfort is not all that distinguishes Bender Bodies. There are constant improvements that actually anticipate the needs of the industry. For instance, the convertible luggage compartment. No sacrificing of inside space—good head room.

Before deciding on any bus job it will pay you to talk to Bender.

THE BENDER BODY COMPANY
W. 62nd and Denison, Cleveland, Ohio




How do you figure
low cost?
per coach?
per hour?
per mile?
per passenger?

Your costs are lo
operat

DODGE BROTHERS

CHRYSLER MOTORS PRODUCT

DODGE
MOTO

SOLD BY DODGE BROTHE

n any basis–if you
)odge Coaches

Investment is small, you save on depreciation and operation and maintenance charges are low on 21-Passenger street car type Dodges.

Many operators have made their second and third purchases of Dodge Brothers 21-passenger motor coaches — some operators their fourth and fifth.

Their fleets number up to and over 300 coaches. Their experience is important to all operators. Their reasons for repeated purchases of Dodges can be summarized as follows —

Power aplenty in the 6-cylinder engine. Excellent flexibility in the use of this power with 4-speed transmission. Safety of hydraulic 4-wheel brakes. Riding ease of 3-stage rear springs. Comfortable seats properly arranged. Fine appearance — everything a modern motor coach should be or have . . . . .

And all this at minimum cost—whether you figure cost per mile, per hour, per coach or per passenger.

BROTHERS
COACHES

ALERS EVERYWHERE

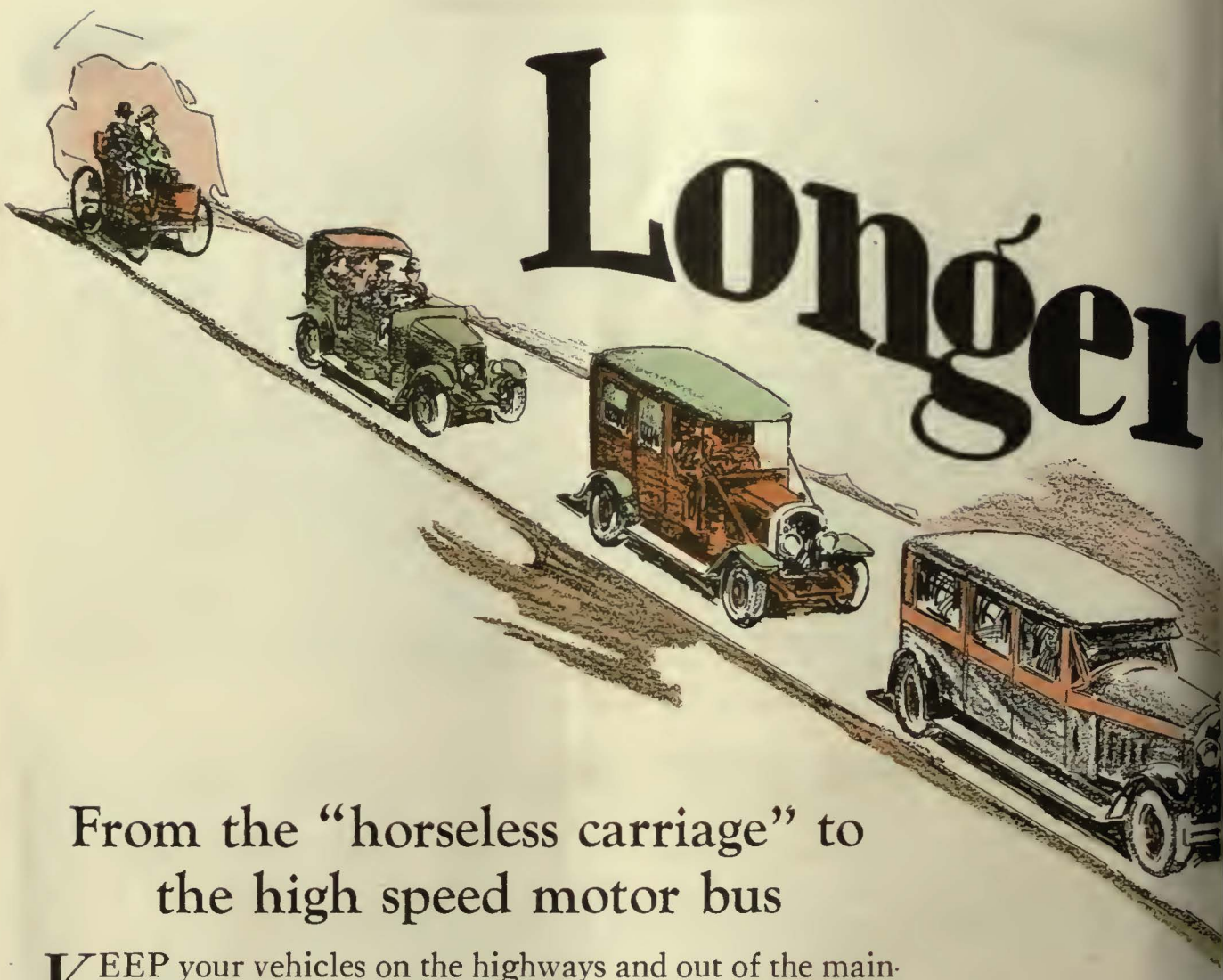
New class of riders wants parlor coach

Dodge Brothers 16-passenger Parlor Coaches continue to build up that new class of riders who want something between the street car and high price transportation. ¶ This class of rider is growing. Dodge Parlor Coach sales are growing. ¶ This service is only one of a score of uses in which Dodge Brothers Parlor Coaches and 12-passenger Club Coaches are operating profitably.

DODGE BROTHERS MOTOR COACHES

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

B-1164 Printed in U. S.



From the "horseless carriage" to the high speed motor bus

KEEP your vehicles on the highways and out of the maintenance shop. Too much time in the shop often causes a motor bus to show a loss instead of a profit.

One way to increase operating hours is to handle your lubrication problem scientifically. Many large bus transportation systems have found the way by adopting Cities Service bus lubrication oils and service.

Back of this service is a group of trained lubrication engineers who have studied motor developments and problems from the earliest days.

Their solution of the bus lubrication question was characteristically scientific. They gained a thorough knowledge of motor bus operation and lubrication through practical work and research on thousands of buses, operated under every conceivable condition. Then they developed a pure petroleum product specially processed to meet the requirements of high speed, heavy duty, bus motors.

Insure "longer mileage life" for your vehicles by lubricating with our recommended grades of Koolmotor Bus Oils.

Mileage Life

Koolmotor Bus Oils are carefully refined from 100% Pennsylvania crude base for the special requirements of heavy duty, high speed motor bus lubrication. The method used in refining them is based on the findings of the highly trained corps of Cities Service lubrication engineers who are always on the alert to change refining formulas or develop new ones to accommodate ever changing lubrication conditions.

OIL DIVISION

CITIES SERVICE COMPANY

60 WALL STREET, NEW YORK, N. Y.

Koolmotor Products

Good Motor Coach Business . . .

Let bright lights bring it

BRIGHT, well-placed interior lights furnish *reading comfort* that attracts fares . . . good motor coach business. And steady driving lights assure safety.

Successful operators make sure of this. They equip their coaches with a capable power plant . . . a generator of the right capacity, backed by a *dependable storage battery.* Their lights never dim. The trip seems shorter . . . the service more friendly. Passengers seek their coaches.

And look at the battery such motor coaches use. Chances are you'll find that it's an Exide Motor Coach Battery expressly planned for this heavy service. The engineers who designed it have a thorough knowledge of motor coach battery needs and forty-one years of battery building experience behind them.

The Exide Motor Coach Battery combines these essential qualities: (1) stamina for long running hours, (2) power for peak lamp loads, (3) sturdiness for constant service, (4) scientific construction that results in lowest operating cost per mile.

Write for information about this battery.

Exide
MOTOR COACH BATTERY

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

projects them forward. It views Today's developments as they will control Tomorrow's new conditions. It searches for the relation of the remote trend to all business affected.

The Magazine of Business is peculiarly equipped for this task. Other McGraw-Hill publications, each in its prescribed field, penetrate basic industries . . . tap the original sources of new developments.

All these contacts, McGraw-Hill's staff of 128 specialist editors, its records, news-gathering facilities, resources for research and for marketing counsel—the resources of the entire organization aid *The Magazine of Business* to achieve its purpose.

THE MAGAZINE OF BUSINESS

is one of 24 McGraw-Hill publications, all actuated by the same spirit of interpretative purpose. 600,000 industrialists, engineers and business men subscribe regularly to these publications. More than 3,000,000 use McGraw-Hill books and magazines in their business.

The Magazine of Business
System
Harvard Business Review

❖ ❖ ❖

Factory and Industrial Management
Power
Industrial Engineering

❖ ❖ ❖

Electrical Merchandising
Radio Retailing
Construction Methods
Food Industries

American Machinist
Electrical World
Coal Age
Engineering and Mining Journal
Bus Transportation
Electric Railway Journal
Textile World
Chemical & Metallurgical Engineering
Engineering News-Record
Electrical West

Overseas Publications

American Machinist *(European Edition)*
Ingenieria Internacional*
The American Automobile*
El Automovil Americano*

*Published by an associate company, Business Publishers International Corporation

PUBLICATIONS

Philadelphia - St. Louis - Cleveland - San Francisco - Boston - London

Electrical Efficiency and Mechanical Strength Mean

Better Bonds and Bonding

Erico type E A S Bond is brazed to the rail. The large area of terminal contact assures the electrical efficiency of the bonded joint.

Permanent carrying capacity of the bond is guaranteed by the great mechanical strength of the brazed union. That means better bonds and bonding!

Type E A S may be applied to virtually any rail joint—the loop of the bond can be offset at any angle. Bonds are furnished with either flexible concentric stranded or extra flexible rope lay cable. Due to the stranded cable construction rail vibrations are damped—wires do not crystallize and break.

Electric Railways test, order, and then reorder. That's proof for our contention of better bonds and bonding.

Send for a sample of a type E A S Bond. Address—

The Electric Railway Improvement Co.

2070 E. 61st Place, Cleveland, Ohio

ERICO

RAIL BONDS AND BONDING OUTFITS

ANOTHER APPLICATION OF **SKF** BEARINGS
ON THE
Street Railways of America

YOU MAY BUY A BEARING AS A BARGAIN BUT TRY AND GET A BARGAIN OUT OF USING IT *for* Nothing is apt to cost so much as a bearing that cost so little.

SKF Puts the Right Bearing in the Right Place

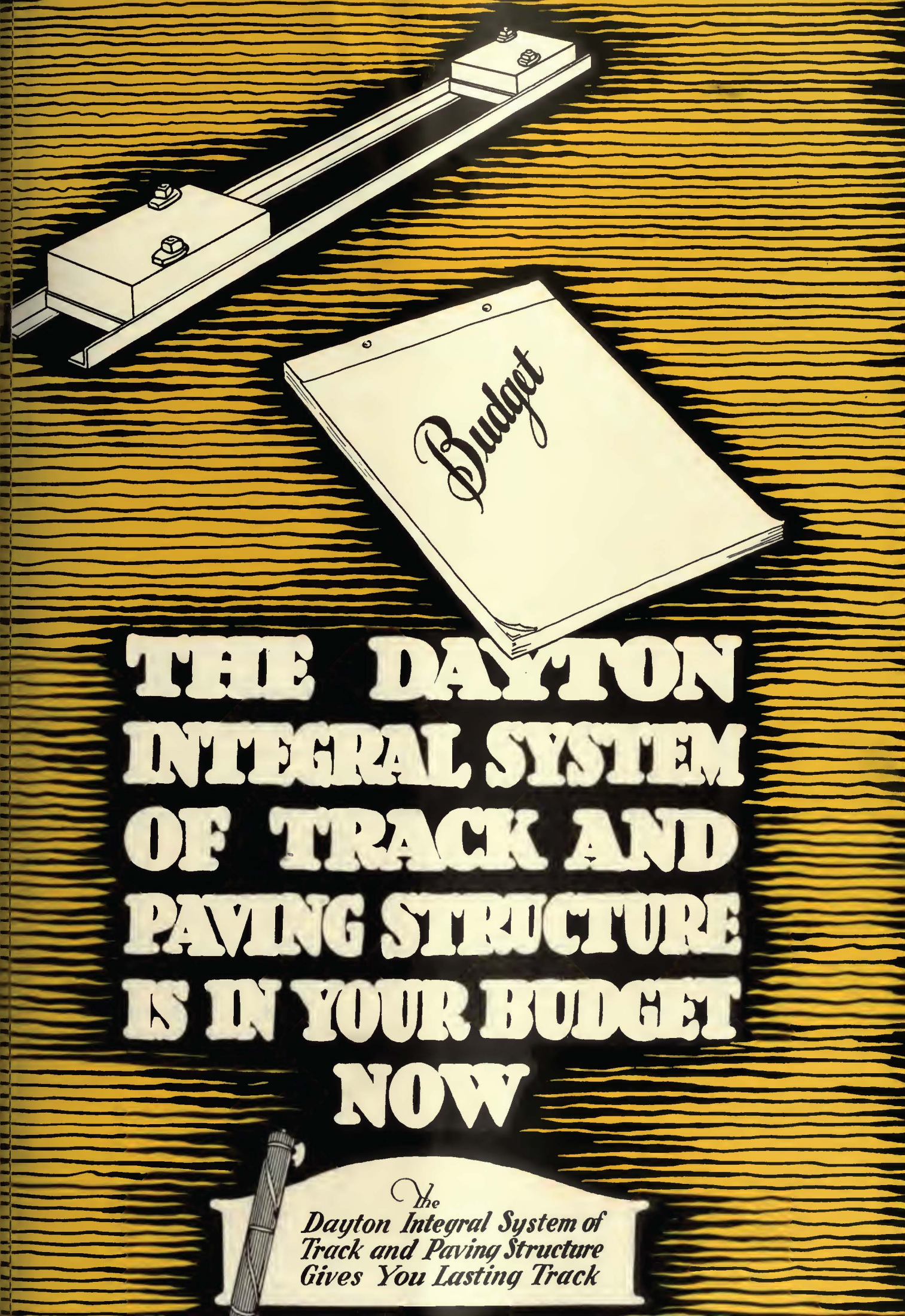
If Your Car Equipment can be Modernized
Give it a chance to earn money—Use SKF

WHERE existing car equipment has possibilities of being modernized to meet the new era in street transportation, SKF Self-Aligning Roller Bearing Journals should certainly be considered as an essential part of such a program. By changing over from plain bearings to SKF, much of the advantages possible in a new design of truck are thus obtained.

SKF Self-Aligning Roller Bearings are rugged, dependable units, which do not require constant inspection and maintenance to keep them on the road. They never require any adjustments initially or while in service. Smooth operation, freedom from hot boxes and pleased passengers make SKF an investment which actually pays for itself in a very short time.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y. 2230

SKF
Ball and Roller Bearings



THE DAYTON INTEGRAL SYSTEM OF TRACK AND PAVING STRUCTURE IS IN YOUR BUDGET NOW

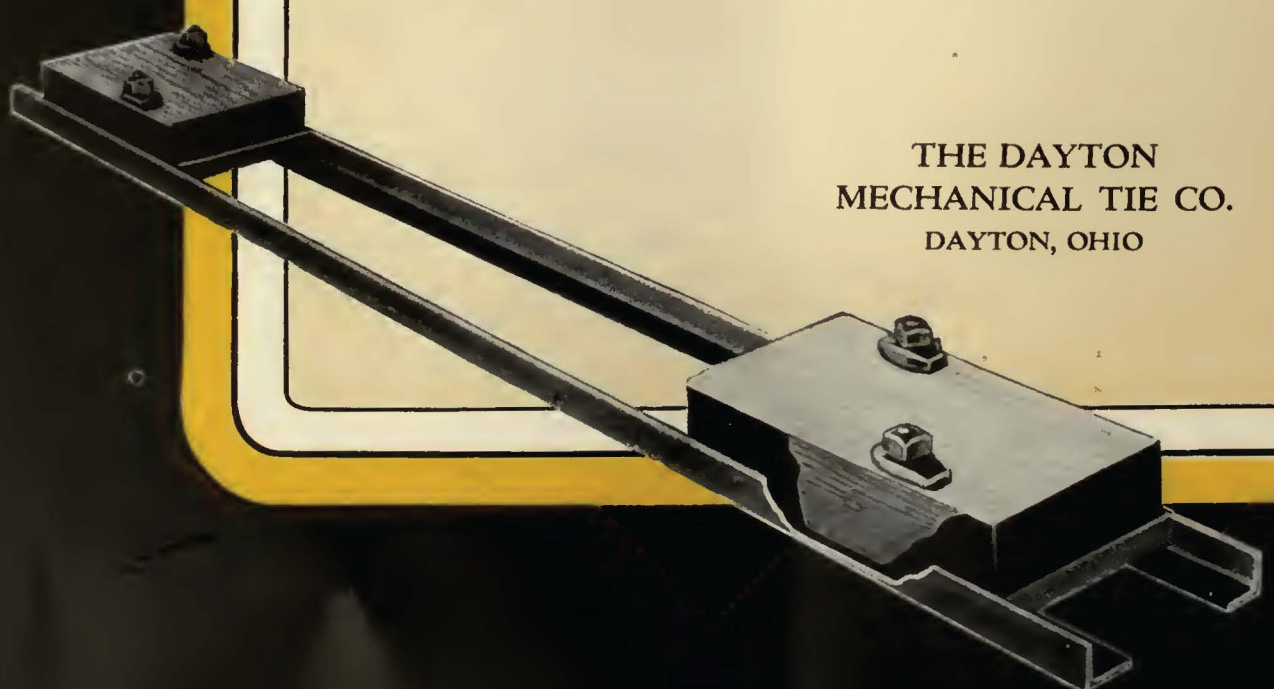
The Dayton Integral System of Track and Paving Structure Gives You Lasting Track

Your Budget Includes The Dayton Integral System of Track and Paving Structure

Engineers who have used the Dayton Integral System of Track and Paving Structure say that it is never more expensive than any other good track construction—often less expensive.

Why not, therefore, have this lasting Track at the same cost as shorter life track. Properties all over the country have solved their track problem in this way.

One base for track and paving—no trouble or maintenance on either for years—track and paving structure unified into a single durable whole—this is the Dayton Integral System of Track and Paving Structure.



THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO

...leadership that goes far beyond mere marketing

IT CAN truthfully be said that The DeVilbiss Company expends a far greater effort in originating, developing, and perfecting spray-painting and spray-finishing systems than it does in merchandising them.

This organization has never ceased to consider that its product is one of the tools used in the craft, business, or industrial operation of the user, and it consistently adheres to the policy that its first obligation is to assure satisfactory results from the use of a DeVilbiss system or any part of it.

A fast-increasing number of DeVilbiss spray systems are being used in finish maintenance by electric railway transportation companies, both for cars and auxiliary bus units. And DeVilbiss systems are bought by these users rather than sold to them, because the resulting definite economies of money, time, and trouble are eagerly sought by the up-to-date electric railway operator.

We will gladly tell you all about specialized DeVilbiss spray systems for electric railway finish maintenance.

DeVilbiss
Spray-PAINTING FINISHING System

Spray guns of various types and sizes
Pressure feed paint tanks and containers
Spray booths, exhaust fans, and approved lighting fixtures
Air compressing equipment
Air transformers and accessories
Air and fluid hose and connections
Complete outfits from the smallest hand-operated units to the largest industrial installations.

THE DEVILBISS COMPANY , 272 PHILLIPS AVENUE , TOLEDO, OHIO

Sales and Service Branches

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO ST. LOUIS
SAN FRANCISCO WINDSOR, ONT.

Direct factory representatives in all other territories

Permanent Poles Provide Better Distribution Service

A PERMANENT institution naturally demands permanent materials for its equipment. Consequently, when the Ohio Public Service Company decided to rebuild their distribution system in the downtown district of Warren, Ohio, they selected Union Metal Poles to replace the old type. The above photographs show the work in progress.

All services now carried on several sets of poles will be combined on the new Fluted Steel Distribution poles. The reduction in the number of poles will do much to improve street appearance. The credit for this improvement, of course, accrues to the benefit of the utility.

Utility companies in dozens of cities are revamping their distribution service through the use of attractive Union Metal Poles. The long life of this type of pole protects the original investment.

Union Metal engineers are ready to help you with your particular problems and show you how this modern equipment can benefit your company.

THE UNION METAL MANUFACTURING CO.

General Offices and Factory, Canton, Ohio

Branches—New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta.

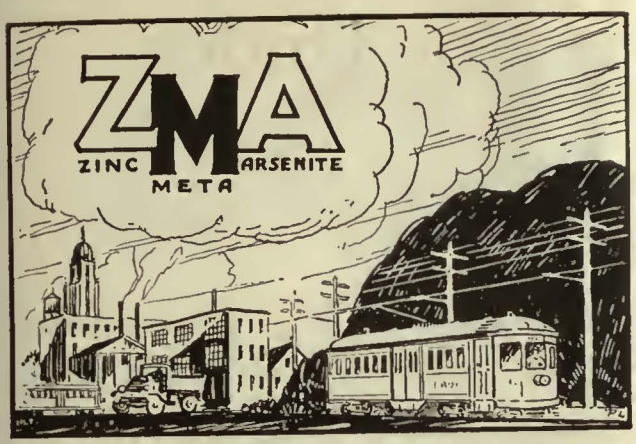
Distributors:

Graybar Electric Company, Incorporated G-E Merchandise Distributors Association

Offices in all principal cities

UNION METAL

DISTRIBUTION AND TRANSMISSION POLES



POLES

Signal — Power — Telegraph — Telephone

ZMA poles are the most modern. They are permanently preserved. Termites and other insects will not attack them.

ZMA Poles are clean and may be painted. They meet with approval by municipalities which require poles to be attractive in appearance.

DISTRIBUTED BY

Canada Creosoting Company, Ltd.
Montreal, Canada

Eppinger & Russell Co.
New York City, N. Y.

Gulf States Creosoting Co.
Hattiesburg, Miss.

Joyce-Watkins Co.
Chicago, Ill.

New England Wood Preserving Co.
Boston, Mass.

Norfolk Creosoting Co.
Norfolk, Va.

Pendleton-Gilkey Co.
Minneapolis, Minn.

Piedmont Wood Preserving Co.
Augusta, Ga.

CURTIN-HOWE CORPORATION
Timber Preservation Engineers
11 PARK PLACE
New York City

Crozer B'dg.
Philadelphia, Pa.

New Orleans Bank Bldg.
New Orleans, La.

CURTIN - HOWE CORPORATION, Ltd.
McGill Building, Montreal, Canada

Sullivan Spader Wins in "blindfold test"

Hoag and Rollins were tunneling under the Maumee River at Toledo. They knew air clay diggers could beat hand labor. They didn't know which diggers were speediest.

So they tried a "blindfold test." Four men in the heading got four different clay spades. Clay spattered over the names. The men exchanged tools. When the shift came out of the hole—the superintendent asked which spade they wanted.

All voted for the same tool. The superintendent scraped off the clay and recorded the name, "SULLIVAN." After one week of testing, the contractors standardized on Sullivan Spaders.

Sullivan Spaders are hard on clay, but easy on men. They are balanced, smooth-running, and powerful. Your men will like them, too.

Send for Catalog 3281-N.

The "DH-361" Spader is part of the complete new Sullivan Line of Drills. New Sullivan Hammer Drills, Drifters, Sinkers, and Concrete Breakers are making records, too. *Send for the Catalogs.*

SULLIVAN
MACHINERY COMPANY
150 S. Michigan Ave.
CHICAGO

SULLIVAN

Bankers and Engineers

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches.....$4.50 an inch
4 to 7 inches..... 4.30 an inch
8 to 14 inches..... 4.10 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

R.J.

POSITIONS WANTED

EXECUTIVE engineer. I am in the best years of my life. Have had 20 years' experience with a large Eastern property as cadet engineer, track foreman, roadmaster, superintendent M. of N., and division manager. Now employed, but desire to make a change for personal reasons. PW-168, Electric Railway Journal, Tenth Ave. at 36th St., New York.

RESEARCH ENGINEER with technical training and background of railway experience, particularly fitting him to organize and co-ordinate your research and statistical activities, or head existing department. PW-166, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT transportation, qualified by wide experience, proven successful record, every phase of transportation. Successful in employe and public relations, increasing revenue, decreasing operating costs. Available short notice. Fine references. PW-167, Electric Railway Journal, Tenth Ave. at 36th St., New York.

OFFICIAL PROPOSAL

Bids: March 22.

Signal System

New York, N. Y.

Notice is hereby given that a public hearing will be held at the Office of the Board of Transportation of the City of New York, at No. 49 Lafayette Street, Borough of Manhattan, on the 22nd day of March, 1929, at 11:30 a.m., on the proposed terms and conditions of the draft form of contract for furnishing and installing signal and interlocking equipment on New York City's New Subway System, along Church Street, Sixth Avenue Extension, Central Park West, 8th Avenue, St. Nicholas Avenue, Broadway, Fort Washington Avenue and Broadway, and 207th Street, from Vesey Street to 207th Street, including the 207th Street Yard, at the Harlem River, in the Borough of Manhattan, City of New York.

Copies of said draft form of proposed contract may be obtained at the Office of the Board of Transportation, at One Dollar each.

JOHN H. DELANEY,
Chairman.

FRANCIS J. SINNOTT,
Secretary.

March 5, 1929.

FOR SALE

D. C.—550 Volt Units

1—Hamilton Corliss Cross Compound Engine, size 20x40x42 in. direct connected to Crocker-Wheeler Generator—400 kw., 728 amp. Has an extra new Armature mounted on shaft that has never been used. Complete with self-feed, oiling and filtering system.
1—Deane Vacuum Pump 12x14x14x12.
1—Wheeler Condenser, surface type.
1—150 hp. Motor, 400 r.p.m.
1—130 hp. Motor, 340 r.p.m.
1—75 hp. Motor, 775 r.p.m.
2—60 hp. Motor, 1,200 r.p.m.
1—35 hp. Motor, 730 r.p.m.
1—25 hp. Motor, 665 r.p.m.
1—25 hp. Motor, 1,800 r.p.m.
1—20 hp. Motor, 925 r.p.m.
1—10 hp. Motor, 1,350 r.p.m.
1—7½ hp. Motor, 750 r.p.m.
4—5 hp. Motor, 1,300 r.p.m.
2—3 hp. Motor, 1,375 r.p.m.
1—3 hp. Motor, 2,100 r.p.m.
1—2 hp. Motor, 1,200 r.p.m.
2—1 hp. Motor, 1,375 r.p.m.

Can be inspected at Wedron, Ill.

Wedron Silica Company
38 So. Dearborn St., Chicago, Ill.

WANTED

WANTED
BRILL TRUCKS
4—Second hand Brill Trucks Model 79-E-1.
GARY RAILWAYS COMPANY
1085 Broadway, Gary, Indiana

For Sale

The following Sangamo Economy Watt Meters:
34—600 volts, 300 amp. Meters, 120 watthours per disk revolution.
28—600 volts, 100 amp. Meters, 40 watthours per disk revolution. Above meters in A-1 condition.

For Sale or Exchange

8—Westinghouse 506 Motors complete and and in good running condition, less pinions and gear cases, in exchange for Westinghouse 508 Motors.

Monongahela West Penn Public Service Co.
Purchasing Department
Fairmont, West Virginia

FOR SALE
Center Entrance Trailers
5—Kuhlman Car Co., mounted on Brill 67-F trucks with 24-in. steel wheels; equipped with G. E. air brakes. Seating capacity 58. Length over-all 47 ft. Very good condition. Low price for quick sale.
Erie Railways Co., 231 State St., Erie, Pa.

SOME one wants to buy the equipment you are not using. Sell it before depreciation scraps it.

Write today to SEARCHLIGHT DEPARTMENT, 10th Ave. at 36th St., New York City.

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

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Advertising, Street Car
Collier Inc., Barron G.

Air Brakes
General Electric Co.
Westinghouse Air Brake Co

Anchors, Guy
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Columbia Machine Wks.
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Cincinnati Car Corp.
Standard Steel Works Co.
Westinghouse E. & M. Co.

Axles, Front
Shuler Axle Co.

Axles (Front & Rear) Motor Truck & Passenger Car
Timken-Detroit Axle Co.

Axles, Steel
Bethlehem Steel Co.

Axles Trailer & Motor Bus
Timken-Detroit Axle Co.

Babbit Metal
National Bearing Metals Co.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co.

Batteries, Dry
National Carbon Co.
Nichols-Lintern Co.

Batteries, Storage
Electric Storage Battery Co.

Bearings, Anti-Friction
Timken Roller Bearing Co.

Bearings, Ball
S. K. F. Industries, Inc.

Bearings and Bearing Metals
Bemis Car Truck Co.
Cincinnati Car Corp.
Columbia Machine Wks.
Nat'l Bearing Metals Corp.
Westinghouse E. & M. Co.

Bearings, Bronze
Johnson Bronze Co.

Bearings, Center and Roller Side
Cincinnati Car Co.
Stucki Co., A.

Bearings, Roller
S. K. F. Industries, Inc.
Timken Roller Bearing Co.

Bearings, Thrust
Timken Roller Bearing Co.

Bells & Buzzers
Consolidated Car Heating Co.

Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Corp.
Columbia Machine Wks.
Elec. Service Supplies Co.

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Bender Body Co.
Brill Co., The J. G.
Dodge Bros.

Body Material, Haskelite & Plymetl
Haskelite Mfg. Co.

Bolts, Case Hardened
American Steel Foundries
Bemis Car Truck Co.

Bond Testers
American Steel & Wire Co.
Elec. Service Supplies Co.

Bonding Apparatus
American Steel & Wire Co.
Electric Rlwy. Improve. Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Bonds, Rail
American Steel & Wire Co.
Electric Rlwy. Improve. Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
Columbia Machine Wks.
Electric Rlwy. Equip. Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Brake Adjusters
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Corp.
Nat'l Rlwy. Appliance Co.
Westinghouse Tr. Brake Co.

Brake Material
American Brake Materials Corp.

Brake Shoes
Bemis Car Truck Co.
Brill Co., The J. G.

Brake Testers
Nat'l. Rlwy. Appliance Co.

Brakes, Brake Systems and Brake Parts
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Corp.
Columbia Machine Wks.
General Electric Co.
National Brake Co.
Westinghouse Tr. Brake Co.

Brakes, Magnetic Rail
Cincinnati Car Corp.

Brushes, Carbon
General Electric Co.
National Carbon Co.
Westinghouse E. & M. Co.

Brushes, Graphite
National Carbon Co.

Brushes, Metal Graphite
National Carbon Co.

Brushholders
Columbia Machine Wks.
General Electric Co.

Bulkheads
Haskelite Mfg. Co.

Bus Lighting
Nat'l Railway Appliance Co.

Buses
Cincinnati Car Corp.
Dodge Bros.

Buses, Gas, Electric
General Electric Co.

Bushings, Bronze
Johnson Bronze Co.

Bushings, Case Hardened and Manganese
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Corp.
Columbia Machine Wks

Cables (See Wires and Cables)

Cambric Tapes, Yellow and Black Varnished
General Electric Co.
Mica Insulator Co.

Carbon Brushes (See Brushes, Carbon)

Carbon Paste, Welding
National Carbon Co.

Carbon Plates, Welding
National Carbon Co.

Carbon Rods, Welding
National Carbon Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Htg. Co.
Westinghouse E. & M. Co.

Car Steps, Safety
Cincinnati Car Corp.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse Elec. & Mfg.

Cars, Gas, Rail
Brill Co., The J. G.

Cars, Passenger, Freight, Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Corp.
Kuhlman Car Co., G. C.
Wason Mfg. Co.

Cars, Self-Propelled
Brill Co., The J. G.

Castings, Brass Composition or Copper
Anderson Mfg. Co., A. & J.
Cincinnati Car Corp.
Columbia Machine Wks.
Nat'l Bearing Metals Corp.

Castings, Gray Iron and Steel
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works & Standard Steel Works Co.
Wm. Wharton, Jr. & Co.,

Castings, Malleable & Brass
Bemis Car Truck Co.
Columbia Machine Wks.
Timken Roller Bearing Co.

Catchers and Retrievers, Trolley
Earll, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.

Ceiling, Car
Haskelite Mfg. Co.

Ceilings, Plywood Panels
Haskelite Mfg. Co.

Chairs, Parlor Car
Heywood-Wakefield Co.

Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co

Change Trays
Cincinnati Car Corp.

Circuit-Breakers
Anderson Mfg. Co., A. & J.
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Columbia Machine Wks.
Electric Rlwy. Equip. Co.
Electric Rlwy. Improve. Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers, Track (See also Snow-Plows Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Columbia Machine Wks.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Coils, Armature and Field
Columbia Machine Wks.
Elliott-Thompson Elect. Co.
General Electric Co.
Westinghouse E. & M. Co

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Changers
Johnson Fare Box Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutators, Parts
General Electric Co.

Commutator Slotters
Columbia Machine Wks.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Commutators or Parts
Columbia Machine Wks.
General Electric Co.
Westinghouse E. & M. Co.

Compressors, Air
General Electric Co.
Sullivan Machinery Co.
Westinghouse Tr. Brake Co.

Compressors, Portable
Sullivan Machinery Co.

Compressors, Gas
Sullivan Machinery Co.

Condensers
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Wks.
Consolidated Car Heating Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Columbia Machine Wks.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining Co.

Copper Wire Instrumeots Measuring, Testing and Recording
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining Co

Cord, Bell, Trolley, Register
American Steel & Wire Co.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebling's Sons Co., J. A.

Cord Connectors and Couplers
Elec. Service Supplies Co.

Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Cowl Ventilators
Nichols Lintern Co.

Cranes, Hoist and Lift
Electric Service Sup. Co.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossing, Frog and Switch
Ramapo Ajax Corp.
Wm. Wharton,Jr.& Co., Inc.

Crossing Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton,Jr.& Co., Inc.

Crossings
Wm. Wharton Jr. & Co.,
Ramapo Ajax Corp.

Crossings, Track (See Track Special Work)

Crossings, Trolley
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.

Cutting Apparatus
Electric Rlwy. Improve. Co.
General Electric Co.
Railway Track Work Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Dealer's Machinery & Second Hand Equipment
Erie Railway Co.
Monongahela, West Penn. Public Service
Wedron Silica Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Wks
Electric Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G.
Cincinnati Car Corp.
Consolidated Car Heating Co.
National Pneumatic Co.,

Doors and Door Fixtures
Brill Co., The J. G.
Cincinnati Car Corp.
Hale-Kilburn Co.

Doors, Folding Vestibule
National Pneumatic Co.

Drills, Rock
Sullivan Machinery Co.

Drills, Track
American Steel & Wire Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Drum Truing Lathes
Nat'l Railway Appliance Co.

Dryers, Sand
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Ears
Columbia Machine Wks.
Electric Service Supplies
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Electric Grinders
Railway Trackwork Co.

Electrical Wires and Cables
American Steel & Wire Co.
Roebling's Sons Co., John

Electrodes, Carbon
Railway Trackwork Co.
Una Welding & Bonding Co.

Electrodes, Steel
Railway Trackwork Co.
Una Welding & Bonding Co.

Engineers, Consulting, Contracting and Operating
Beeler, John A.
Buchanan & Layng Corp.
Byllesby Co., H. M.
Faile & Co., E. H.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelker & DeLeuw
McClellan & Junkersfeld
Richey, Albert S.
Sanderson & Porter
Stevens & Wood, Inc.
Stone & Webster
White Eng. Corp., The J. G.

Engines, Gas, Oil or Steam
Westinghouse E. & M. Co.

Exterior Side Panels
Haskelite Mfg. Co.

Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Railway Appliance Co.
Perey Mfg. Co., Inc.

Fare Registers
Electric Service Sup. Co.
Johnson Fare Box Co.

Fences, Woven Posts & Fence Posts
American Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G
Cincinnati Car Corp.
Star Brass Works

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Flashlights
National Carbon Co.

Floodlights
Elec. Service Supplies Co.
General Electric Co.

Floor, Sub
Haskelite Mfg. Co.

Floors
Haskelite Mfg. Co.

Forgings
American Steel Foundries
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Corp.
Columbia Machine Works
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Lorain Steel Co.

Continued on page 64

Ramapo Ajax Corp.
Wm. Wharton,Jr.& Co., Inc.

Frogs, Track (See Track Work)

Frogs, Trolley
Electric Service Supplies Co
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Funnel Castings
Wm. Wharton, Jr. & Co.

Fuses and Fuse Boxes
Columbia Machine Wks.
Consolidated Car Htg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Garage Equipment
Columbia Machine Works & M. I. Co.
Westinghouse Tr. Br. Co.

Gas Electric Drive for Buses & Trucks
General Electric Co.
Nat'l Railway Appliance Co.

Gasoline
Cities Service Co.
Standard Oil Co. (Indiana)
Texas Co., The

Gas Producers
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
Cincinnati Car Co.

Gear Blanks
Bethlehem Steel Co.
Carnegie Steel Co.
Brill Co., The J. G.
Standard Steel Works Co.

Gear Cases
Columbia Machine Wks.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Columbia Machine Wks.
Electric Service Supplies
General Electric Co.
Nat'l R'lw'y Appliance Co.

Generators
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gongs (See Bells and Gongs)

Grease
Texas Co., The

Grinders and Grinding Supplies
Metal & Thermit Corp.
Railway Trackwork Co.

Grinders, Portable
Railway Trackwork Co.

Grinders, Portable Electric
Railway Trackwork Co.

Grinding Bricks and Wheels
Railway Trackwork Co.

Guard Rail Clamps
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.,Inc.

Guard Rails, Tee Rail and Manganese
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.,Inc.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Hangers
S. K. F. Industries, Inc.

Harps, Trolley
Columbia Mach. Wks.& M.I.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Bearing Metals Corp.
Ohio Brass Co.
Star Brass Works

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Headlining
Columbia Machine Wks.
Haskelite Mfg. Co.

Heaters, Bus
Nichols-Lintern Co.

Heaters, Car (Electric)
Consolidated Car Htg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Smith Heater Co., Peter

Heaters, Car, Stove
Smith Heater Co., Peter

Helmets—Welding
Railway Trackwork Co.
Una Welding & Bonding Co.

Hoists, Portable
Sullivan Machinery Co.

Hose, Bridges
Ohio Brass Co.

Hose, Pneumatic
Westinghouse Tr. Br. Co.

Instruments, Measuring, Testing and Recording
American Steel & Wire Co.
General Electric Co.
Nat'l R'lw'y Appliance Co.
Westinghouse E. & M. Co.

Insulating Cloth, Paper and Tape
General Electric Co.
Mica Insulator Co.
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.

Insulation (See also Paints)
Electric Railway Equipt. Co.
Electric Service Sup. Co.
Mica Insulator Co:
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Ohio Brass Co.

Insulators (See also Line Material)
Electric Railway Equpt. Co.
Elec. Service Supplies Co.
General Electric Co.
Hemingray Glass Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Interior Side Linings
Haskelite Mfg. Co.

Interurban Cars (See Cars Passenger, Freight Express etc.)

Jacks (See also Cranes, Hoists and Lifts)
Columbia Machine Wks.
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Corp.

Lamps, Guards and Fixtures
Elec. Service Sup. Co.
Westinghouse E. & M. Co.

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

Lamps, Signal and Marker
Elec. Service Supplies Co.
Nichols-Lintern Co.

Lanterns, Classification
Nichols-Lintern Co.

Letter Boards
Nichols-Lintern Co.
Cincinnati Car Corp.
Haskelite Mfg. Co.

Lighting Fixtures, Interior
Electric Service Supplies

Lightning Protection
Electric Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.
Electric Railway Equipt. Co.
Electric Service Sup. Co.
General Electric Co.
Nat'l. Bearing Metals Corp.
Ohio Brass Co.
Westinghouse E. & M. Co.

Line Shaft
S. K. F. Industries, Inc.

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

Locomotives, Electric
Electric R'lw'y Equip. Co.
Cincinnati Car Corp.
General Electric Co.
St. Louis Car Co.
Westinghouse E. & M. Co

Lubricants
Texas Co., The

Lubricating Engineers
Standard Oil Co. (Indiana)
Universal Lubricating Co.

Lubricants, Oil and Grease
Cities Service Co.
Standard Oil Co. (Indiana)
Texas Co., The
Universal Lubricating Co.

Machinery, Insulating
Amer. Insulating Mach. Co.

Manganese Steel Castings
Bemis Car Truck Co.
Lorain Steel Co.
Wm. Wharton, Jr. & Co.

Manganese Steel Guard Rails
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Manganese Steel, Special Track Works
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Manganese Steel Switches, Frogs and Crossings
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Mica
Mica Insulator Co.

Mirrors, Inside and Outside
Cincinnati Car Corp.

Motor Buses (See Buses)

Motors, Generators & Controls for Gas Electric Busses.
General Electric Co.

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

Motorman's Seats
Brill Co., The J. G.
Cincinnati Car Corp.
Electric Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Nuts and Bolts
American Steel Foundries
Bemis Car Truck Co.
Bethlehem Steel Co.
Cincinnati Car Corp.

Oil
Cities Service Co.
Texas Co., The

Omnibuses (See Buses)

Oxy-Acetylene (See Cutting Apparatus)

Packing
Westinghouse Tr. Br. Co.

Paint Guns
De Vilbiss Co.

Paint Spraying Equipment
De Vilbiss Co.

Paints and Varnishes (Insulating)
Electric Service Sup. Co.

Paints & Varnishes, Railway
National Ry. Appliance Co.

Panels, Outside & Inside
Haskelite Mfg. Co.

Pavement Breakers
Sullivan Machinery Co.

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

Pinion Pullers
Elec. Service Supplies Co.

Pinions (See Gears)

Pins, Case Hardened
American Steel Foundries
Bemis Car Truck Co.

Pins, Case Hardened, Wood and Iron
American Steel Foundries
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Standard Steel Works Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Electric Service Sup. Co.

Plywood, Roofs, Headlinings, Floors, Interior Panels, etc.
Haskelite Mfg. Co.

Pole Line Hardware
Bethlehem Steel Co.
Electric Service Sup. Co.
General Electric Co.
Ohio Brass Co.

Poles, Metal Street
Electric R'lw'y Equip. Co.
Union Metal Mfg. Co.

Poles, Ties, Posts, Piling and Lumber
Bell Lumber & Pole Co.

Poles & Ties, Treated
Bell Lumber & Pole Co.

Poles, Trolley
Bell Lumber & Pole Co.
Electric Service Sup. Co.

Poles, Tubular Steel
Electric Railway Equipment Co.
Electric Service Sup. Co.

Potheads
Okonite Co.
Okonite-Callender Cable Co. Inc.

Power Saving Devices
Nat'l R'lw'y Appliance Co.

Pressings, Special Steel
Cincinnati Car Corp.

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

Pumps, Air, Lift
Sullivan Machinery Co.

Pumps, Vacuum
Sullivan Machinery Co.

Punches, Ticket
International Register Co.

Rail Braces and Fastenings
Ramapo Ajax Corp.

Rail Filler
Carey Co., Philip

Rail Grinders (See Grinders)

Rail Joints
Rail Joint Co., The

Rail Joints—Welded
Lorain Steel Co.
Metal & Thermit Corp.

Rails, Steel
Bethlehem Steel Co.

Rail Welding
Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.

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

Rattan
Brill Co., The J. G.
Electric Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Registers and Fittings
Brill Co., The J. G.
Cincinnati Car Co.
Electric Service Sup. Co.
International Register Co.

Reinforcement, Concrete
American Steel & Wire Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co.

Repair Work (See also Coils)
Westinghouse E. & M. Co.

Replacers, Car
Cincinnati Car Corp.
Electric Service Sup. Co.

Resistances
Consolidated Car Heating Co
General Electric Co.

Resistance, Wire and Tube
American Steel & Wire Co
Westinghouse E. & M. Co

Retrievers, Trolley (See Catchers and Retrievers, Trolley)

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

Roller Bearings
Hyatt Roller Bearing Co.

Roofing, Car
Haskelite Mfg. Co.

Roofs, Car & Bus
Haskelite Mfg. Co.

Sanders, Track.
Brill Co., The J. G.
Electric Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.

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

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers, Track)

Screw Drivers, Rubber Insulated
Electric Service Sup. Co.

Seating Materials
Brill Co., The J. G.
Hale-Kilburn Co.
Haskelite Mfg. Co.
Heywood-Wakefield Co.

Seats, Bus
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Cincinnati Car Corp.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Second Hand Equipment
Erie Railway Co.
Monongahela, West Penn. Public Service
Wedron Silica Co.

Shades, Vestibule
Brill Co., The J. G.
Cincinnati Car Corp.

Shovels
Brill Co., The J. G.

Shovels, Power
Brill Co., The J. G.

Side Bearings (See Bearing Center and Side)

Signals, Car Starting
Consolidated Car Heating Co
Electric Service Sup. Co.
National Pneumatic Co.

Signals, Indicating
Nichols-Lintern Co

Signal Systems, Block
Electric Service Sup. Co.
Nachod & U. S. Signal Co.
Union Switch & Signal Co.

Signal Systems, Highway Crossing
Nachod & U. S. Signal Co.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A. & J.
Columbia Machine Wks.
Cincinnati Car Corp.
Electric Railway Equip. Co.
Electric Rlwy. Improve. Co.
Electric Service Supplies Co.
Nat'l. Bearing Metals Corp.

Smokestacks, Car
Nichols-Lintern Co.

Snow Plows
Nat'l. Railway Appliance Co.

Snow-Plows, Sweepers and Brooms
Brill Co., J. G.
Columbia Machine Wks.

Snow Sweeper, Rattan
Brill Co., J. G.
Heywood-Wakefield Co.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)

Special Trackwork
Bethlehem Steel Co.
Wm. Wharton, Jr. & Co., Inc.
Lorain Steel Co.

Spikes
American Steel & Wire Co.

Splicing Compounds
United States Rubber Co.
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Spray Booths
Mahon Co., R. C.

Springs
Nat'l. Railway Appliance Co.

Springs, Car and Truck
American Steel & Wire Co.
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Corp.
Standard Steel Works Co.

Sprinklers, Track and Road
Brill Co., The J. G.

Steel, Electric Furnace
American Steel Foundries
Timken Roller Bearing Co.

Steel, Open Hearth
American Steel Foundries
Timken Roller Bearing Co.

Steel and Steel Products
American Steel Foundries
American Steel & Wire Co.

Steps, Car
Brill Co., The J. G.
Cincinnati Car Corp.

Stokers, Mechanical
Westinghouse E. & M. Co.

Stop Signals
Nichols-Lintern Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Anderson Mfg. Co., A. & J.
Electric Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Strand
American Steel & Wire Co.
Roeblings Sons Co., J. A.

Street Cars (See Cars, Passenger, Freight, Express, etc.)

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

Switch Stands and Fixtures
Ramapo Ajax Corp.

Switches
General Electric Co.

Switches and Switchboards
Consolidated Car Htg. Co.
Electric Service Sup. Co.
Westinghouse E. & M. Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track Special Work)

Tampers, Tie
Railway Trackwork Co.

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

Tee Rail Special Track Work
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

Telephones and Parts
Electric Service Sup. Co.

Telephone & Telegraph Wire
American Steel & Wire Co.
Roebling's Sons Co., J. A.

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

Thermostats
Consolidated Car Heating Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Electric Service Sup. Co.

Continued on page 66

ALPHABETICAL INDEX TO ADVERTISEMENTS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

SEARCHLIGHT SECTION

Classified Advertising

WHAT AND WHERE TO BUY—Continued from page 64

Ties, Mechanical
Dayton Mechanical Tie Co.

Ties and Tie Rods, Steel
American Bridge Co.
International Steel Tie Co.

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

Tires
Fisk Tire Co., The
General Tire & R. Co.
Goodyear Tire & R. Co.

Tokens
Johnson Fare Box Co.

Tongue Switches
Wm. Wharton, Jr. & Co.

Tool Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Tools, Track, Line & Miscellaneous
American Steel & Wire Co.
Columbia Machine Wks.
Electric Service Sup. Co.
Railway Trackwork Co.

Torches, Acetylene (See Cutting Apparatus)

Tower Wagons & Auto Trucks
McArdell Co. J. R.

Towers and Transmission Structures
Westinghouse E. & M. Co.

Track Expansion Joints
Wm. Wharton, Jr & Co.

Track Grinders
Metal & Thermit Corp.
Railway Trackwork Co.
Ramapo Ajax Corp.
Una Welding & Bonding Co.

Track, Special Work
Bethlehem Steel Co.
Columbia Machine Wks.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Trackless Trolley Cars
Brill Co., The J. G.

Transfers (See Tickets)

Transformers
General Electric Co.
Westinghouse E. & M. Co.

Transmission
S. K. F. Industries, Inc.

Treads, Safety Stair, Car Step
Cincinnati Car Corp.

Tree, Wire
Okonite Co.
Okonite-Callender Cable Co.

Trolley Bases
Nat'l Bearing Metals Corp.
Ohio Brass Co.

Trolley Bases, Retrieving
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
Westinghouse E. & M. Co.

Trolley Material (Overhead)
Anderson Mfg. Co., A. & J.
Electric Service Sup. Co.
General Electric Co.
Nat'l Bearing Metals Corp.
Ohio Brass Co.
Westinghouse E. & M. Co.

Trolley Pins
Bemis Car Truck Co.

Trolley Wheel Bushings
Nat'l Bearing Metals Corp.
Star Brass Works

Trolley Wheels (See Wheels, Trolley)

Trolley Wire
American Brass Co.
American Steel & Wire Co.
American Steel Foundries
Anaconda Copper Min. Co.
Roeblings Sons Co., J. A.

Trucks, Car
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Corp.

Truss Planks
Haskelite Mfg. Co.

Tubing, Steel
Timken Roller Bearing Co.

Turbine, Steam
General Electric Co.
Westinghouse E. & M. Co.

Turnstiles
Electric Service Sup. Co.
Perey Mfg. Co., Inc.

Turntables
Electric Service Supplies Co.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Ventilators
National Ry. Appliance Co.

Ventilators, Car
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
Nichols-Lintern Co.
Railway Utility Co.

Vestibule Linings
Haskelite Mfg. Co.

Welded Rail Joints
Electric Rlwy. Improve. Co.
Lorain Steel Co., The
Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welders, Portable Electric
Electric Rlwy. Improve. Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welders, Rail Joint
General Electric Co.
Railway Trackwork Co.

Welding Processes and Apparatus
Electric Rlwy. Improve. Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welding Steel
Electric Rlwy. Improve. Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welding Wire
American Steel & Wire Co.
Railway Trackwork Co.
Roebling's Sons Co., J. A.

Welding Wire and Rods
Railway Trackwork Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Presses (See Machine Tools)

Wheels, Car Steel & Steel Tire
American Steel Foundries
Bemis Car Truck Co.
Standard Steel Works Co.

Wheels, Trolley
Columbia Machine Wks.
Electric Rlwy Equip. Co.
Electric Service Supplies Co
Nat'l Bearing Metals Corp.
Ohio Brass Co.
Star Brass Works

Whistles, Air
Ohio Brass Co.
Westinghouse E. & M. Co.
Westinghouse Tr. Brake Co.

Window Guards & Fittings
Cincinnati Car Corp.

Wire Rope
American Steel & Wire Co.
Roebling's Sons Co., J. A.

Wires and Cables
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Okonite Co.
Okonite-Callender Cable Co
Roebling's Sons Co., J. A.
Westinghouse E. & M. Co

Wood Preservatives
Curtin Howe Corp.

More HASKELITE Roofs
On Chicago's Surface Lines Cars

HASKELITE is specified for roofs and other applications on another 100 cars for the Chicago Surface Lines. The J. G. Brill Company will build 33 cars, Cummings Car & Coach Company will build 33 cars and 34 will be built in the company's own shops.

This is the fourth big order from this operator in which HASKELITE products figured prominently. Previous orders included:

FIRST ORDER—HASKELITE for roofs of 45 one-man cars.

SECOND ORDER—100 cars with HASKELITE roofs, headers, and corner panels. 50 built in own shops and 50 by the Light Weight Noiseless Electric Street Car Co.

THIRD ORDER—100 cars with HASKELITE roofs, headers, and corner panels. 33 from the St. Louis Car Co., 33 from J. G. Brill Co., and 34 from Cummings Car & Coach Company.

Repeat orders are the surest proof of satisfaction.

Haskelite Manufacturing Corporation

120 South LaSalle Street
Chicago, Illinois

PLYWOOD
HASKELITE
PLYMETL

Railway Representatives:

Economy Electric Devices Co., 37 W. Van Buren St., Chicago
Grayson Bros., 600 LaSalle Bldg., St. Louis, Mo.
Railway & Power Engineering Corp., Ltd., Montreal, Toronto, Winnipeg, New Glasgow

PLYWOOD
HASKELITE
PLYMETL

ERJ3-10Gras