

JUNE, 1931

ELECTRIC RAILWAY JOURNAL

McGraw-Hill Publishing Company, Inc.

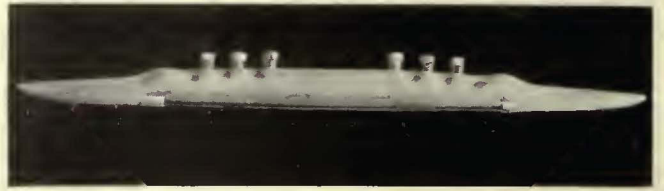
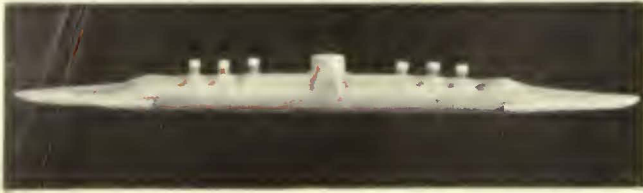
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The most widely copied coach design in America today . . . unchanged through four years of service except for detail refinements. Sales up to June first are fifteen per cent greater than for the same period last year.



NEW Trolley Wire Splicer

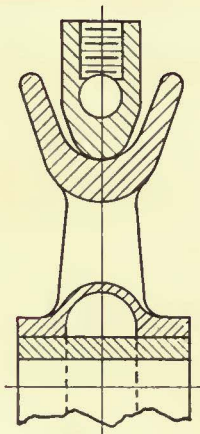


The New Westinghouse type NL Light-weight Trolley Wire Splicer
(left) with boss, (right) without boss.

Light
Weight

Less
Side Wear

Reduced
Arcing



Cross section showing how the new Westinghouse Light-weight Splicer rides in the bottom of groove in the trolley wheel.

AFTER careful engineering study and research, Westinghouse engineers have designed and perfected a new light-weight, six set-screw trolley wire splicer, known as the type NL.

The design of this new splicer permits a width which gives maximum wheel clearance, thereby reducing side wear to a minimum. The narrow body, which comes to a rounded point at the bottom, allows the splicer to ride on the bottom of the groove in the trolley wheel. Wear is confined almost entirely to rolling friction.

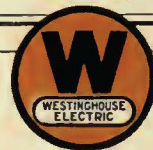
The lips of the splicer are cast in such a way that when peened around the wire, they conform to the shape of the body of the splicer. This eliminates any bumping between the lips and the body. A smooth approach results from the tapered lips and the sides that are ground to a knife edge at the end.

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The new type NL trolley wire splicer is made for all sizes of wire from 2-0 to 4-0, round and grooved. It can be furnished with or without boss.

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Westinghouse



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ELECTRIC RAILWAY JOURNAL

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Publishing Director

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Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOSEPH R. STAUFFER
Chicago
PAUL WOOTON
Washington
W. C. HESTON
Pacific Coast Editor
ALEX McCALLUM
London, England

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What a Banker Thinks About Electric Railway Problems

By
FRANCIS H. SISSON
Vice-President
Guaranty Trust Company
New York, N. Y.

TO APPEAR IN
AN EARLY ISSUE

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by prominent men outside of the
local transportation industry.

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1931

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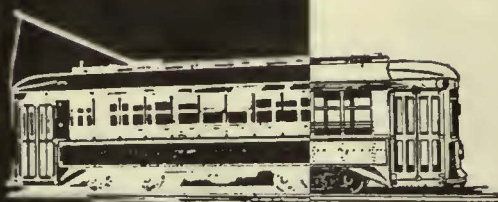
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Making Cars Move in the Tempo of the Times



Present-day transportation vehicles must move with speed and safety. Adequate and effective brake control is vital. In every class of electric railway service air brakes have met the widely-varying needs . . . The flitting street car, the speeding interurban, the clattering elevated, the rushing subway, the nimble trolley bus—are all able to move in the tempo of the times because of effective brakes, modernized and adapted to a specific purpose—air brakes, complete from compressor to brake cylinder, made by the WESTINGHOUSE TRACTION BRAKE CO., General Office and Works, Wilmerding, Pa. » » » » » »



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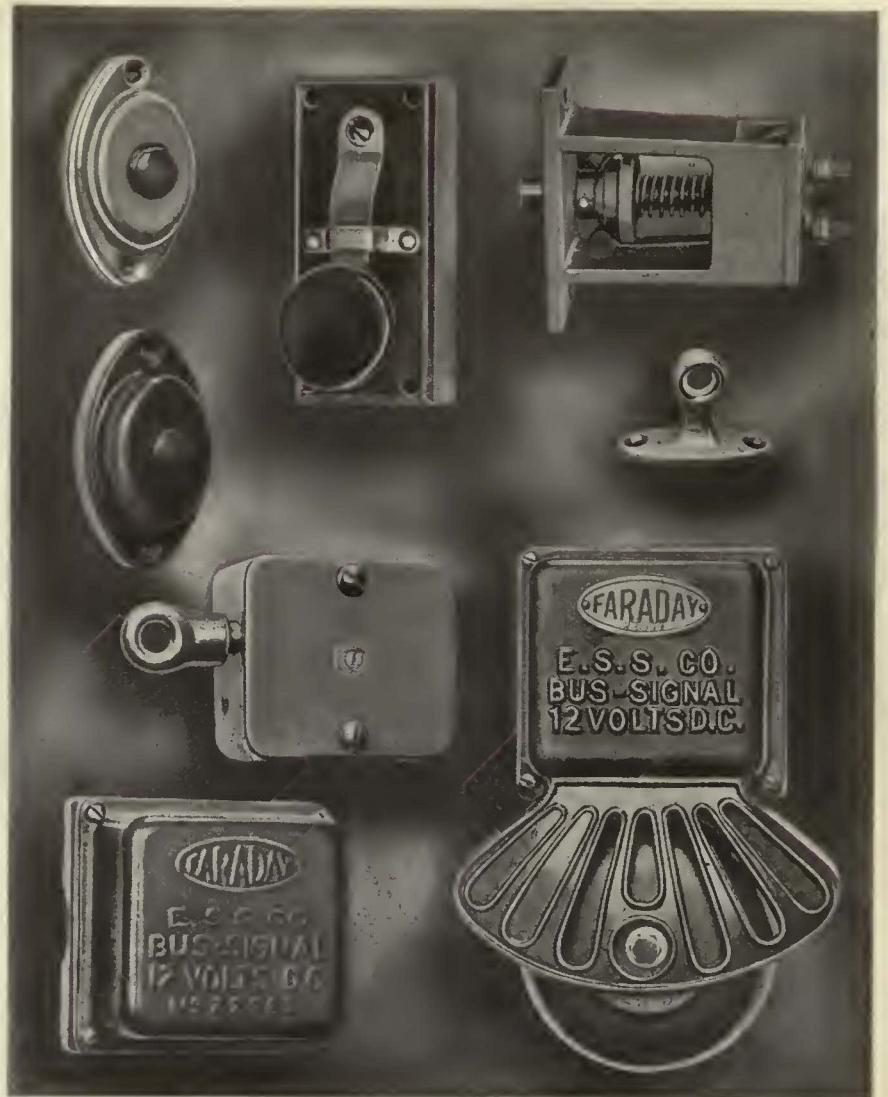


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Faraday Signal Systems are supplied in high and low voltage types for cars and buses. The Faraday line consists of bells, buzzers, pull switches, door switches, pushes, cord guides and other allied material.

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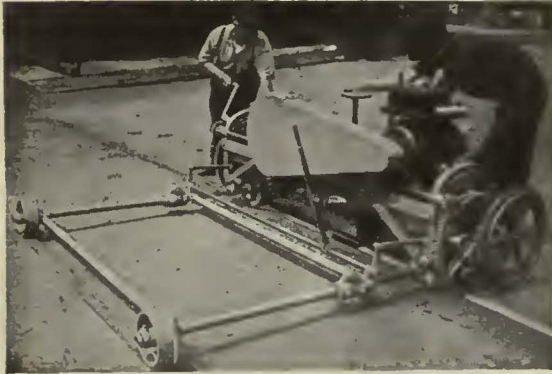
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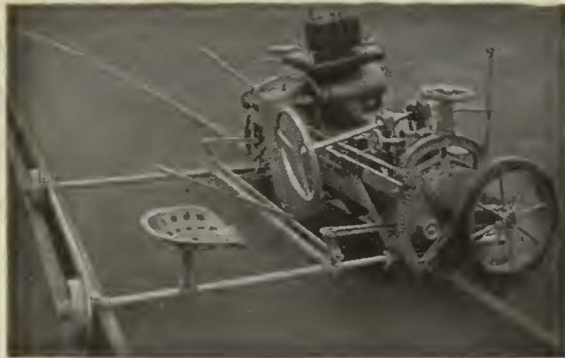
Reelproccating Track Grinder



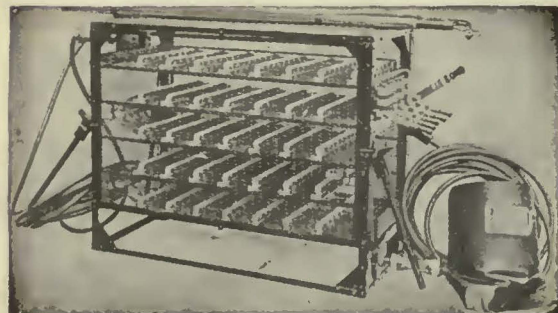
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Ajax Electric Arc Welder

Going to stay in business?

Does your rail look it?

Arc welding and grinding show confidence in the future, build business in the present, save maintenance cost always.

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998 BUSES — 998 TREADLES



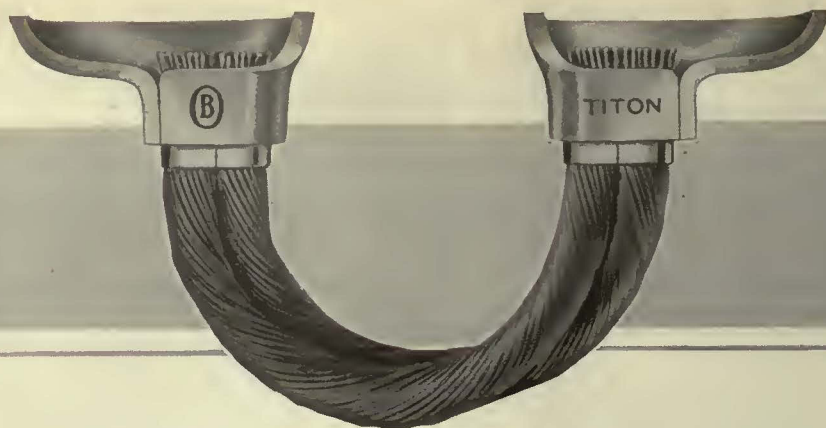
137 TROLLEY BUSES — 137 TREADLES

10,363... **NP** Treadle *Doors in service today*

The large number of National Pneumatic Treadle Doors in service today is indeed a tribute to the efficiency of this device in effecting the circulating load and thus promoting economical, fast and *safe* service in one-man operation. It will pay you to investigate.



NATIONAL PNEUMATIC COMPANY



There is a profitable relation between

QUICKENED CAR SCHEDULES and TRACK RETURN CIRCUITS



O-B Titon Bonds require only a one-inch space alongside the rail for application.

MANY properties have been able to quicken car schedules and patronage by improving track-return circuits. This practice has been profitable because the expense is nearly negligible. Not only does it bring returns in increased public good-will, but it saves power otherwise wasted through current leakage at worn, loose, or improperly applied rail bonds. Furthermore, it saves the expense of re-winding burnt out armatures on the motor equipment.

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Titon Bonds are easily and quickly installed. The terminal construction makes molding equipment unnecessary, and the bonds require only a one-inch space alongside the rail for application. Exceptional welding skill is not required as welding is accomplished by striking the arc and filling the terminals with the molten Duron Rod.

The installation of a few Titon Bonds well demonstrates their low cost of application as well as their high efficiency and durability. Ordering information is given on page 667 of O-B Catalog No. 20.





In your trolley ears, eliminate the

CAUSE of BATTERING and BURNING --- EFFECT NOTICEABLE COST REDUCTIONS

EXCEPT in unusual installations, friction contributes but a small part to the necessity for frequent trolley ear renewals when compared with the battering and burning action involved. When the causes for battering and burning are minimized by proper ear design, the life of the ear is measurably increased and costs are correspondingly reduced.

The long life of the *Improved* Marathon Ear is due to the great improvement in its tapered approach and its smoother underrun. There are no blunt ends for the flanges of the wheel to batter and strike against. The lips of the *Improved* Marathon gradually increase from knife-edge thinness at their ends to generous thickness at the boss-section which provides a smooth, even path for the wheel. Thus have the principal causes for battering and burning been eliminated with a consequent important increase in the number of wheel passes obtained.

The use of *Improved* Marathon ears secures not only a reduction in ear cost but in the cost of trolley wheel and wire maintenance as well. Wheels last longer and wire life is appreciably increased as the natural result of the elimination of excessive battering and burning.



By eliminating the causes of battering and burning, Improved Marathon Ears add appreciably to the life of wheels, wire and ears.

OHIO BRASS COMPANY, MANSFIELD, OHIO
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ANNOUNCING THE NEW

1 1/2 TON REO

By actual comparison the new SPEED WAGONS surpass all commercial vehicles in the lowest price 1 1/2-ton field!

Equipped with heavy, powerful truck type 4 or 6 cylinder engines!—each having *more* bearings and *larger* bearings than any competitive engine! And Reo's maximum piston displacements give abundant power!

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Compare specifications with REO'S. *Drive* the new *SPEED WAGONS*. Load them with

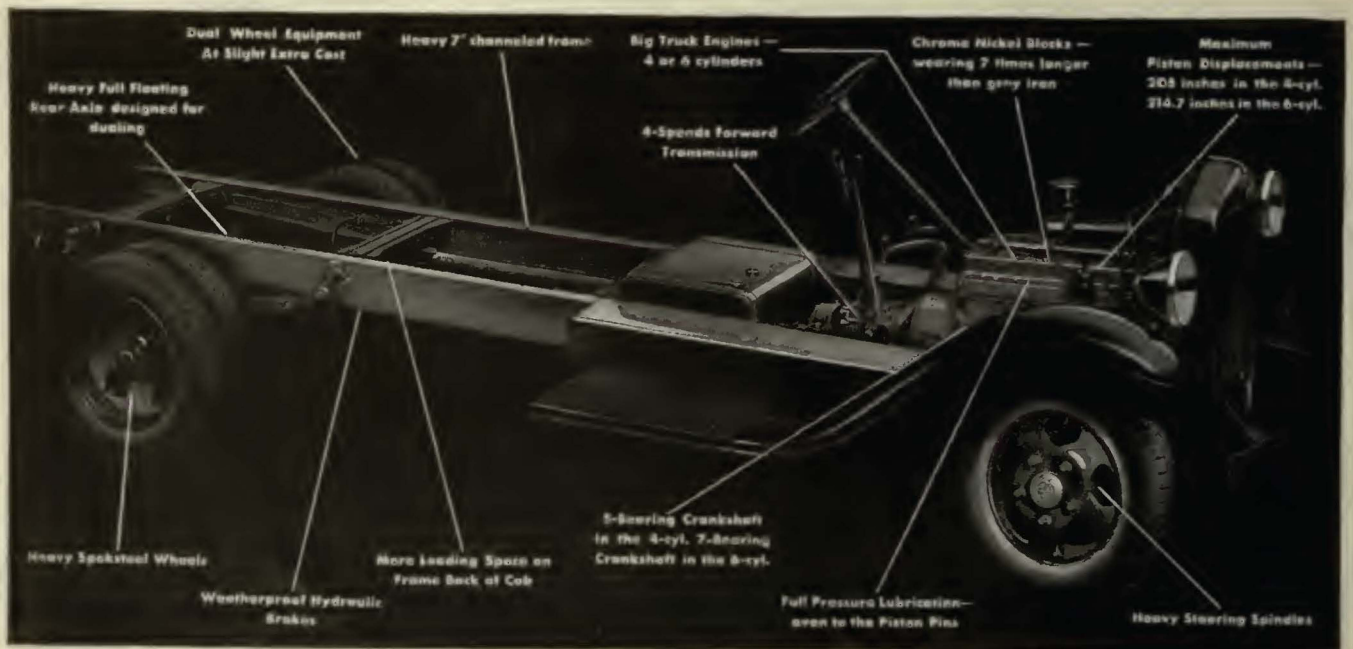
SPEED WAGON

\$ 625

Four-Cylinder \$625, Six-Cylinder \$725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA

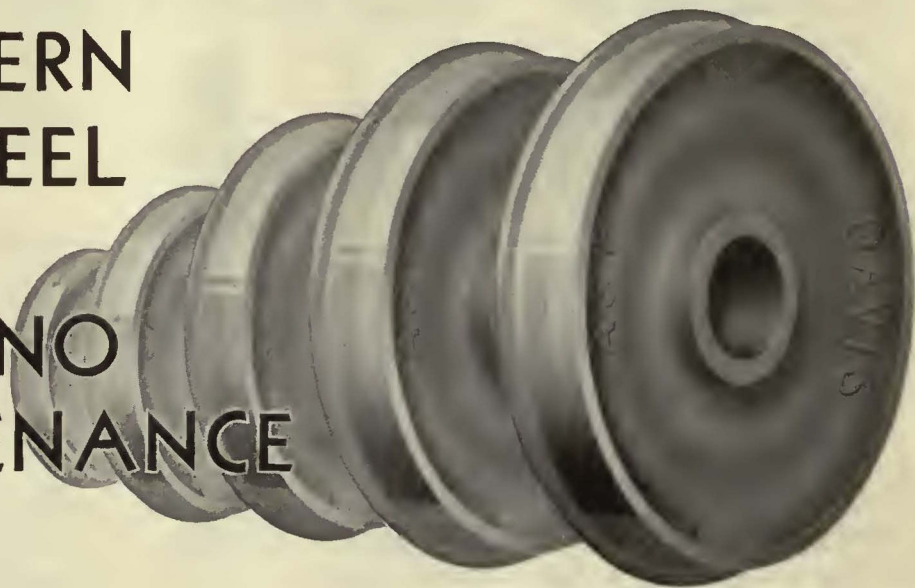
your own loads—test them on your own particular haulage routes. Then you will realize that these remarkable new trucks truly uphold the finest of Reo traditions—*quality throughout.*

REO MOTOR CAR COMPANY, LANSING · TORONTO



DAVIS "ONE-WEAR" STEEL WHEELS

THE MODERN
STEEL WHEEL
THAT
NEEDS NO
MAINTENANCE



LIGHT WEIGHT—

Due to its special composition steel the Davis Wheel can be made lighter in weight without sacrifice of strength.

STRENGTH—

Heat treatment develops in each part of the Davis Wheel precisely the characteristics needed to best fit it for work to be done.

ONE-WEAR—

Special composition steel and triple heat treatment provide unique qualities that make the Davis Wheel truly "One-Wear."



AMERICAN STEEL FOUNDRIES

NEW YORK

CHICAGO

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EXPERIENCE



25 YEARS

Any product, or process, no matter how simple, is subject to many problems and difficulties in the early years of its development. Any organization requires time to secure the respect and confidence of its prospective clients. With more than a quarter of a century back of it, the Metal & Thermit Corporation has been able to develop its product, Thermit, and its process of rail welding to the highest possible efficiency. Although basically, the material is the same as introduced in 1905, Thermit has been greatly improved by better control of raw materials and process of manufacture, thus insuring the best possible product with absolute uniformity. Likewise the method of Thermit Welding has been perfected and as well as greatly simplified.

The
METAL & THERMIT
CORPORATION

120 Broadway, New York, N. Y.

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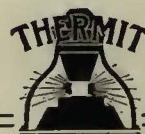
150 PROPERTIES

One hundred and fifty users, including most of the largest and best-known railways, *can't be wrong*. These companies have competent and experienced engineers. They carefully studied the actual performance records of Thermit-welded rail joints, before committing their companies to the investment of money in extensive track reconstruction programs with Thermit welds . . . Name the railway in any one of the larger cities and you will probably name a Thermit-user. Name offhand, any ten medium-sized and small companies you happen to think of and you're sure to include several regular Thermit users. Name the eight electric railways which have won the Annual Coffin Award and you'll name six who weld with Thermit.

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METAL & THERMIT
CORPORATION

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COUNTS!

1,000,000
JOINTS

Approximately a million joints have been made on American electric railway lines by the Thermit process—600,000 of them in the last ten years. The Thermit Insert type of weld has been the standard of the Metal & Thermit Corporation since 1912, that is, for nearly twenty years. It is safe to say that nearly all the Thermit Insert Welds, installed since 1912 are still in service unless the track itself has been worn out or removed for other reasons. Ten years ago the present center-pour method was adopted, making the Thermit Weld better, more economical and easier to install. Recently we have perfected a still further advance in the art—*welding under traffic*,—thereby overcoming one of the last objections to the use of Thermit rail welding.

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50%
LOWER COST

From the very first, most railway men appreciated the inherent merit of the process, but cost was usually the stumbling block in the earlier days. By improvements in methods of installation, by reduction in the amount of Thermit required, and by production of Thermit itself at a lower cost, we have been able to pass along to the consumer progressively lower costs. Today it is actually about 50% less than even ten years ago We think these are significant statistics 25 years in business Selling Thermit to 150 railway companies 1,000,000 joints installed 50% lower cost Statistics which explain the respect and confidence this company enjoys in the industry. Statistics which indicate that *experience counts*.

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* D E S M O I N E S * M I L W A U K E E * D A Y T O N B A L T I M O R E *

To Meet Modern Requirements These Cities Have Recently Selected G-E Equipment

BALTIMORE—The new G-E equipped cars glide away from a stop smoothly at the rate of 3.25 mphs. — just twice as fast as the old-type cars. They are part of the fastest fleet of street cars in city service in the United States.

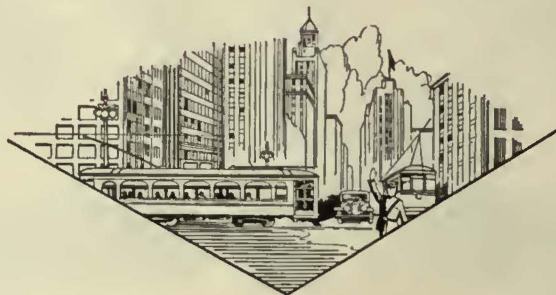
BROOKLYN—In dense traffic, it is almost imperative that street cars be able to accelerate faster than automobiles and trucks. To meet schedule requirements, the new G-E equipped cars in Brooklyn are designed to accelerate at the rate of 3 mphs.

LONG BEACH—Here, and in San Bernardino, (Calif.) car riders have found that the new light-weight street cars move faster in traffic than automobiles and are equally comfortable.

DES MOINES—The new G-E equipped street cars not only permit one-man operation with safety, but they have improved schedule speeds and have made car riding much more attractive.

MILWAUKEE—The new two-car, three-truck articulated units are equipped with six GE-301 motors and modified Type K control. They are thoroughly capable of handling the heavy peak loads in the industrial district.

DAYTON — The fastest light-weight interurban cars in the world are now operating on a 225-mile run between Cincinnati and Toledo. They leave competing buses one hour behind on a route 15 miles longer. The attractiveness of this new service has resulted in increased patronage all along the route.



330-166

GENERAL ELECTRIC

B R O O K L Y N * L O N G B E A C H * D A Y T O N

ELECTRIC RAILWAY JOURNAL

New York,
June, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

Volume 75
Number 6

JOHN A. MILLER, JR., Editor

How Is Business?

FEELING the pulse of business, taking its temperature, and applying a stethoscope to test its heart action, has lately become a great national pastime. That this should be so is not surprising, since the state of business and industry is a matter of vital concern to nearly everyone. All this anxious examination of the invalid's condition increases the general feeling of uncertainty and tends to emphasize every unfavorable symptom, but in spite of that the situation begins to show some signs of getting better.

Marked improvement in the local transportation industry cannot be expected until general business activity becomes more nearly normal. Just when this will occur no one can say. It is significant, however, that recent earnings of electric railway and bus operating companies compare more favorably with the corresponding figures for last year than did the earnings of a few months ago. Nor is this simply because the earnings of a year ago were extremely low. Measured in actual dollars and cents, the latest revenue reports show sign of improvement. Moreover, there seems every reason to expect that this improvement will continue—slowly perhaps, but none the less surely.



New Regime Starts Auspiciously at Philadelphia

PROSPECTS of long-drawn-out litigation over the question of the receivership of the Philadelphia Rapid Transit Company have been removed by the offer of Mitten Management to withdraw. In making this offer, it acted wisely. That it might eventually have been forced out is beside the point. Had it elected to contest the issue, time and attention would have been diverted from the orderly conduct of the affairs of the company. This time and attention can now be applied constructively.

The new regime starts auspiciously. Its responsibilities are great. But the composition of the board gives promise that the members will be equal to the task. Their apparent plan is to leave undisturbed an operating per-

sonnel that has functioned well and has the confidence of the rank and file. To be retained and fostered are those features of the relations with the employees that have made for peace among them as participants in the affairs of the company.

Many intricate matters, however, remain to be considered. So that the board may go into them well informed, surveys are to be made within the organization as a guide to reaching decisions for the future. The new management deserves public support. But it will continue to deserve it only so far as it rises to the stupendous task of meeting the obligation with which it is charged.



Mass Education Concerning Mass Transportation

NOTABLE progress was made at the recent meeting of the United States Chamber of Commerce in directing the attention of business men to the important part which mass transportation plays in the daily life of commerce and industry. Discussion of this subject occurred at a well-attended round-table luncheon conference. Facts that have long been familiar to transportation men were eloquently presented to the assembled merchants and manufacturers, to whom many of these facts were new. It was pointed out that the small decrease which has occurred during recent years in the number of passengers carried on the electric railways has been in non-necessity riding, while necessity riding in the rush hours has increased. In other words, the service is constantly becoming more essential, at the same time that greater difficulties are being experienced in making it pay its way. That sufficient street space can never be provided to accommodate everyone in private automobiles was clearly brought out. If mass transportation service is to be preserved, however, some way must be found to put it on a firm financial basis.

From the remarks of the business men present at this conference, it was evident that they were much impressed with the importance of finding a solution of the community transportation problem. No attempt was made at the meeting to develop any definite program of action. As a preliminary step, however, it was suggested

by one of the business men that the transportation industry should undertake a campaign of mass education. This is easier said than done. It is necessary to proceed carefully with such a plan to avoid the appearance of propaganda.

The frank discussion which took place at the Chamber of Commerce meeting was a step in the right direction. The resolution to appoint a committee for the study of the problem was another important step. Individual railways can profitably adopt the plan of discussing their problems with the business men of their own communities. The leaders of American commerce and industry must be brought to a full realization of what mass transportation means to them in the conduct of their own affairs. This will not be accomplished over night, but it is encouraging to note that real progress is being made toward that goal.



Battle Over One-Man Cars Shifts from Yonkers to Atlanta

DISMISSAL by the New York Public Service Commission of the complaint recently made by the city of Yonkers against the operation of one-man cars is the latest of a number of significant decisions upholding the use of such vehicles. More than a year ago the United States Court for the Western District of Louisiana found that "in the light of proved experience" the refusal of the city of Shreveport to permit the operation of one-man cars was arbitrary and equivalent to taking the railway company's property without due process of law. The court therefore enjoined the enforcement of the ordinance. A few weeks ago a searching investigation by the St. Louis Public Safety Council resulted in emphatic indorsement of one-man operation. Wherever the question has been fairly studied the conclusion has been reached that street cars can be operated as safely with one man as with two.

Curiously enough, the announcement of the decision in the Yonkers case came almost simultaneously with the passage of an ordinance in Atlanta, Ga., forbidding the operation of one-man cars within the fire limits of that city. The usual explanation was made that this was being done in the interest of safety. Since nothing had been brought out to show that one-man operation in Atlanta involved greater hazards than exist elsewhere, this explanation appears extremely thin. One is much more inclined to believe with President Arkwright of the Georgia Power Company that the move was made to force treating with electrical workers of an associated company who are now out on strike.

Whether or not the plea of safety was sincere, it is rank discrimination to require the presence of two men on a street car when thousands of one-man automobiles are allowed to operate on the public streets without hindrance. A street railway has the same right as any one else to conduct its business as economically as possible. To compel it to carry men on its payroll when

they are not necessary is manifestly unjust. As Judge Dawkins pointed out in the Shreveport case, it is equivalent to taking the company's property without due process of law. Equity and common sense may be disregarded by city officials in their desire to harass the street railway, but courts take into account facts that councils frequently ignore in their excess of zeal.



Unique Exhibit Opportunity at 50th A. E. R. A. Convention

SELDOM will manufacturers have such an opportunity for an interesting and instructive convention exhibit as that presented by the golden anniversary gathering of the American Electric Railway Association at Atlantic City next September. Since there was no exhibit at the San Francisco convention last year, the delegates will be unusually keen to look over the new products. Reasonable hope exists that general business conditions will have improved before the end of the summer and a large attendance is expected. During the past eighteen months purchases of equipment have been held down to a minimum. If the sky brightens before September, the railways are likely to be in a buying mood. These facts alone would justify the manufacturers in making special efforts to have a good exhibit.

An additional reason, however, is the unique character of this year's convention—the 50th anniversary of the association. Some of the manufacturers have been exhibitors since the early conventions. Others have come into the fold comparatively recently. But all have played their parts in the industry's development. They may justly take pride in what they have done, and can well afford to emphasize it in their exhibits. Wherever it can be done effectively, it would be desirable to have displays of a historical character. While everyone is concerned primarily with the problems of the present, no one is too busy to give a thought to the long process of development which has placed the industry where it is today. The manufacturer who has an exhibit showing his past contributions to the industry's progress, as well as the products which he has developed to meet the problems of the present and the future, cannot fail to make a deep and lasting impression upon the mind of every delegate.



Profit Sharing as a Means of Encouraging Employee Co-operation

UNUSUAL interest attaches to the plan recently inaugurated by the Kansas City Public Service Company wherein the employees share to the extent of 25 per cent in the net income. Details of the plan are given in an article appearing elsewhere in this issue. Nothing quite like the plan has been tried before in the local transportation industry. While opinions may differ as to its general applicability, it appears to work well in

Kansas City. There the interest of the employees has been aroused in operating the property more efficiently; there the employees have been awakened to the importance of effecting every possible economy. Evidence of this is found in the figures. During the first three months of this year the Kansas City company was able to place nearly \$40,000 to the credit of its employees. At the same time, the amount available for dividends to stockholders was approximately the same as that available during the first three months of last year, before the profit-sharing plan was in effect.

Some economists hold that it is unsound to give the employees a share in the profits when they do not share in the risks of the business. Undoubtedly, there is a certain logic in that contention. But such a view considers only the financial side of the question. In reality, every employee participates to a considerable extent in the risks of the business, even though he has not a cent invested. If a greater measure of employee co-operation can be secured through a profit-sharing scheme of this kind, its adoption would appear to merit careful consideration regardless of academic arguments against the theory upon which it is based. Certainly, the industry will watch with interest the further results of its operation at Kansas City.



Must the Evils of Competition Be Experienced to Be Understood?

CHICKENS are coming home to roost to those newspapers that have given vent to expressions of opinion that competition in transporting is not the dreadful thing the transportation interests have contended. Newspapers do compete among themselves, but the specter that scares them now is the prospect of news broadcasts by radio, to say nothing about the effect of advertising campaigns broadcast by radio.

At the recent convention of newspaper proprietors many had goose flesh at the prospect. Resolutions offered testify to the degree of panic which characterized the meeting. Columns were given to the matter as if it were of great public concern. Attention is called to the matter not to belittle the importance of the daily newspaper, but merely to point out the difference in attitude upon the part of some papers in their handling of a matter in which their own interests appear to be threatened and one in which the interests of others are concerned.

Little cognizance appears to have been taken by the publishers of the fact that both the radio and the newspaper have their distinctive fields, just as in transportation the trucks, the buses, the airplanes, the electric railways, the pipe lines and the railroads have their distinctive fields.

The charge was made that the newspapers have lost \$11,000,000 in advertising to the radio but, according to President Aylesworth of the National Broadcasting Com-

pany, the radio has spent \$31,000,000 in newspaper advertising, "which makes the newspapers ahead by \$20,000,000." If radio stations are usurping the functions of the newspapers and items are being broadcast that tend to destroy the surprise value of the printed page, is that any worse for the newspapers than for the organized transportation agencies, strictly regulated, to have to meet competition that in most cases is not on a basis that makes for fair competition among the carriers? This used to be a purely hypothetical question for the papers. And they didn't always answer it in the way it should be answered. Perhaps, since the problem has now been brought home to them direct, the minds of newspaper editors will be penetrated by rays of reason not set into action by purely academic considerations. Evidence from the newspapers in their future comment on transportation topics of better logic and more light is expectantly awaited.



Advantages of Automatic Schedule Checking

EVERY available means of increasing operating speeds must be used if transportation service is to meet present-day demands. Better mechanical equipment is an important factor in accomplishing this result. Better utilization of the equipment, however, frequently offers an opportunity that is equally as great. In this connection, the use of headway recorders and automatic schedule checkers has proved extremely advantageous on a number of systems. As a result of the information supplied, speed has been increased and the quality of service improved.

Several methods have been developed for this purpose. Toronto has installed headway recorders at seven divisional offices to check the regularity of its service. Pittsburgh has an elaborate system of recording visually and on paper the movements of all cars. Brooklyn recently completed the installation of its "headwaygraph," which records the service at 47 points on its 42 lines giving instantaneous information as to the positions of the cars. And Salt Lake City has developed an arrangement described elsewhere in this issue, which records both the service rendered and the service scheduled, giving an immediate and constant check of each individual car.

Headway recorders and schedule checkers give valuable information for revising schedules, discourage operators from running ahead of schedule, aid in checking causes of delay, disclose trainmen who are not reporting delays, identify operators who are careless about time-tables, eliminate the personal factor in checking the men, and have a valuable psychological effect of encouraging the trainmen to render dependable service. In consideration of these advantages and the fact that the installation usually is paid for in a short period out of the savings effected, it is likely that their use will become increasingly popular.

RETAIL STORES

By

JOSEPH H. APPEL

of John Wanamaker
New York

Must Have

Adequate Transportation

Facilities

ACCESSIBLE
IS THE WORD FOR
WANAMAKER'S

TEN major arteries of transportation leading to Wanamaker's from all parts of the city and from the entire metropolitan area...quickly, surely, comfortably you may come to the store no matter where you live...and once here you can shop quickly...and economically...and satisfactorily.

PERNA STATION
GRAND CENTRAL
HUDSON RIVER
HOLLAND TUNNEL
HEMSON TUBES
BATTERY PARK
WILLIAMSBURG BRIDGE
MANHATTAN BRIDGE
BROOKLYN BRIDGE
BROOKLYN
JERSEY
WANAMAKER PLACE
JOHN WANAMAKER NEW YORK
BROADWAY AT 51st STREET

No. 3 of a Series 1
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10 Transportation Facilities

1 East Side Subway	6 L.—2nd, 3rd, 6th, 9th Avenues
2 West Side Subway	7 Grand Central Terminal
3 B.M.T. Subway	8 Pennsylvania Station
4 Fifth Avenue Buses	9 Hudson Tubes
5 Surface Cars—Broadway, Madison, and 3rd Avenues, 11th Street Crosstown	10 Holland Vehicular Tunnel

Convenience of access is most important element in selection of a store site. Since a large majority of customers use public transportation, the best location is that which is best served by these agencies

FORESEEING that some time in the future ships of the air might make port on the tops of high buildings, Wanamaker's successfully launched a balloon from the roof of the New York store as long ago as the summer of 1911. People said it was a publicity stunt, but today there is a mooring mast atop the tallest building in New York—the Empire State—and autogiros are landing on the White House grounds and other small lawns. Delivering parcels by airplane, dropping them on board a departing ship, sending them quickly to remote points, bringing fashions of the day from Paris by airplane to arrive almost at the moment of their creation, bringing a grand piano from Germany by the "Graf Zeppelin," co-operation with Glenn Curtiss in the building of an airplane capable of flying across the Atlantic Ocean—these are some of the recent achievements in air transportation in which Wanamaker's has participated. Yet, probably the greatest achievement of all was the decision of John Wanamaker in 1907 to retain the location of his New York store at Astor Place, where public transportation facilities, both present and contemplated, make the site practically the center of the metropolitan shopping district.

Accessibility, made possible by ten transportation facilities, is stressed in this unusual advertisement

This decision was made with the clear recognition that a store can receive the maximum number of customers only when it is served adequately by mass transportation

agencies. Although many patrons come to a store by private automobile, the great majority arrive by public carriers. This is particularly true in a metropolitan city, such as New York, because of the amount of traffic congestion. Without adequate mass transportation facilities, Wanamaker's, or any other large department store in New York City, would be tremendously handicapped in its endeavor to obtain its rightful share of the retail business. One need only to observe the thousands of persons who every hour leave the subway trains and surface cars at the Wanamaker location and hurry into the store to be convinced of this fact. Adequate public transportation is, without question, one of the merchants' vital necessities for attaining success in storekeeping.

More than a dozen major transportation facilities lead directly to Wanamaker's, tapping the home districts north, east, south and west. These facilities include the two subways—Interborough Rapid Transit (east side and west side) and Brooklyn-Manhattan Transit (including the Fourteenth Street crosstown subway); Pennsylvania Station (under cover all the way to Wanamaker's via the B.-M.T.); Grand Central Terminal (also under cover to Wanamaker's via I.R.T.; and for that matter, under cover all the way from the great number of stations it taps on the Putnam, Hudson and Harlem divisions of the New York Central, and on the New York, New Haven & Hartford railroads); Hudson Tubes from New Jersey; Holland Vehicular Tunnel from New Jersey; Fifth Avenue buses; four elevated lines—the Second, Third, Sixth and Ninth Avenues; and surface cars on Broadway, Fourth Avenue, and on the Eighth Street crosstown line. In addition, there is a Baltimore & Ohio Railroad bus terminal at Wanamaker's, for arriving and departing passengers.

Both New York subways have station entrances within the Wanamaker store, the Interborough since 1904 and the Brooklyn-Manhattan since 1917. Through these stations millions of customers yearly come to the New York Wanamaker's from points as far away as Boston without exposure to rain or snow or cold, no matter how stormy the day—for they travel under cover the whole way.

USE OF AUTOMOBILES BY SHOPPERS GREATLY OVERESTIMATED

Many customers, of course, come to the store by private automobile, but the importance of this factor is not so great as might be thought. Erroneous ideas on this subject are often met. For example, in answer to recent inquiry made by the Better Traffic Committee of Pittsburgh, the merchants of the downtown district estimated that 60 per cent of their business came by private automobile, but a careful survey showed that actually only 15 per cent of the customers used this means of transportation. Two years ago a canvass of merchants in the Fifth Avenue shopping district of New York City indicated their belief that a large part of their trade came by private automobile. When a count was made under the auspices of the Citizens' Street Traffic Committee, however, less than 4 per cent of some 140,000 customers, counted as they entered the stores in this area were found to come by private automobile. While the method of making this count was such that some automobile users who left their cars out of sight of the observers may have been incorrectly classified as pedestrians, the fact stands out clearly that this class of customer does not constitute any considerable part of the total number. A recent survey covering seven department stores in the



Joseph H. Appel

TRAINED first as a lawyer and then as a newspaper man, Joseph H. Appel wrote to John Wanamaker in 1899 suggesting that advertising is the *nerve* of a store, that it should be handled like news copy, and asked for a job. He got the job and he has been associated in an executive position with Wanamaker's ever since. Last year he wrote "The Business Biography of John Wanamaker," and it was immediately chosen by two "Business-Book-of-the-Month Clubs" as presenting the best business life of this pioneering merchant. Mr. Appel is a student and leader of advertising and merchandising and has written much on these subjects. The relationship between transportation facilities and retail trade is a matter to which he has given much thought. He is also interested in mental science and has written two books on this subject as applied to business and life: "Living the Creative Life" and "The Making of a Man." And as a result of his world-wide travels he has written "A World Cruise Log" and "Africa's White Magic." Mr. Appel recently had conferred on him the degree of Doctor of Laws by his alma mater, Franklin & Marshall College, Lancaster, Pa.

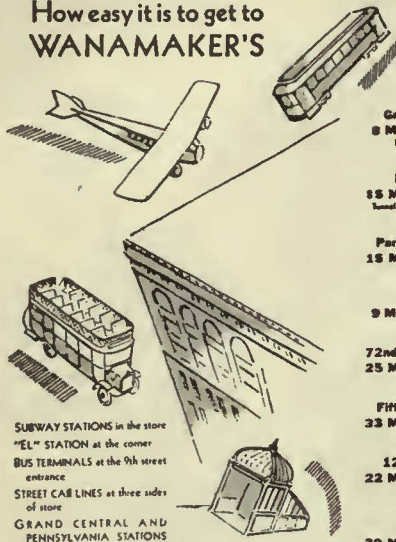
central business district in Washington, a city noted for its wide streets and extensive use of private automobiles, showed a majority of customers using public transportation facilities to reach these stores and also that the purchases of these customers amounted to more than half of the total business done in the stores.

Wanamaker's is fortunate in having a location which is readily accessible to users of private automobiles. Nevertheless, the proportionate number of patrons who come to us in this way is comparatively little. Parking space in the vicinity of our store will accommodate about 200 automobiles. Even when this parking space is used

We Want You to Know

How easy it is to get to
WANAMAKER'S

FROM ALL
POINTS . . .



SUBWAY STATIONS in the store
"EL" STATION at the corner
BUS TERMINALS at the 9th street
entrance
STREET CAR LINES at three sides
of store
GRAND CENTRAL AND
PENNSYLVANIA STATIONS
with direct under-cover routes
in 8 to 15 minutes

THE STORE OF PROGRESS—

steadily growing in volume of business, decreasing expenses though increasing salaries, with stable profits based on efficient operation.

The Store of Individuality—

no leased departments, no sub-mergence with other stores, no stock market interests—concentrating on merchandise of character and real personal service.

The Store of Economies—

low rental, low overhead, 90 per cent cash buying (would be 100 per cent if we could get cash discounts on the remaining 10 per cent), consistently effecting lowest possible prices on merchandise of quality.

- Grand Central Terminal
8 Minutes to Wanamaker's
East Side Subway to Astor Place
(Underway)
- Port Jervis R. R. Station
85 Minutes to Wanamaker's
Trunk to S.M.T. at 12th St.—Lead to 9th St.
(Quaker-Kidderline Trunk)
- Park Avenue and 86th St.
15 Minutes to Wanamaker's
East Side Subway
- Times Square
9 Minutes to Wanamaker's
S.M.T. Subway to 9th St.
- 72nd St. and Columbus Ave.
25 Minutes to Wanamaker's
90 Ave. Elevated to 90 St.
- Fifth Ave. at 42nd Street
35 Minutes to Wanamaker's
F.M. Ave. Bus
- 125th St. and 3rd Ave.
22 Minutes to Wanamaker's
2nd Ave. Elevated to 90 St.
- From the Bronx
(109th St. & 3rd Ave.)
30 Minutes to Wanamaker's
East Side Subway to Astor Place
- Long Island City
(Queensboro Plaza)
24 Minutes to Wanamaker's
S.M.T. Subway to 90 St.
- Wall Street District
10 Minutes to Wanamaker's
East Side Subway to Astor Place
- Staten Island Ferry
("Whitehead Street")
10 Minutes to Wanamaker's
S.M.T. Subway to 90 St.
- Borough Hall, Brooklyn
13 Minutes to Wanamaker's
East Side Subway to Astor Place
- Say Ridge, Brooklyn
(106th St.)
39 Minutes to Wanamaker's
S.M.T. Subway to 90 St.
- Jersey City
(Journal Sq.—Sunset Ave.)
27 Minutes to Wanamaker's
Hudson Station at 90 St.

John Wanamaker New York
WANAMAKER PLACE—BROADWAY AT NINTH STREET

Another advertisement, indicating how easy it is to reach the store from any point by using public transportation agencies

to capacity, the number of customers involved is but a small fraction of the total. Actual counts have shown that in all more than 2,000 people entered the store during a single half hour, and more than 50,000 between 5:30 and 9 in the evening when the store was open for Christmas shopping.

The ability of public transportation means to bring to a store a great number of people in a short interval of time is an extremely important factor. Just as the transportation companies experience a crowding of their facilities during the morning and evening rush hours, so do the department stores have their peak periods. There are certain times of the day when a great many people can shop conveniently, and who must either buy at this particular time or not at all. Subways, surface cars and bus lines can deliver thousands of patrons at Wanamaker's doorstep within the course of a half hour. If these same people were all to drive to the store in private automobiles, it would actually take more than a day for them all to find a place to park.

A mistaken idea that is sometimes encountered is that

the best location for a store is where the largest number of people pass the corner. That is not always true, by any means. There may be too many people—too much congestion, especially if the people are merely passing, hurrying to get somewhere else. When foot traffic past a store is merely on its way to some other place it may dis-serve and not serve the store. A store directly on a through route is not so apt to get customers as one near to such a route, or at the end of the route.

Wanamaker's has had experience of this kind. The direct motor route from the financial district downtown to the uptown residence districts passes directly by the store. Thousands of automobiles pass up and down in front of the store every day, but while they are on this through traffic route, it is difficult to get their passengers to stop at the store for shopping, even though a direct advertising appeal is made to them.

Another example: thousands of people pass through the station at Bridgeport of the New York, New Haven & Hartford Railroad, but a lunchroom and a paper stand make up practically all of its business activity, because the people pass through, and do not stop. On the other hand, the Grand Central Terminal in New York is dotted with hundreds of small shops all paying a high rental and all apparently doing a healthy business, because it is a traffic terminal. All this seems to show that the best store location in large cities is where the best public transportation facilities are to be found, and at traffic terminals rather than on through-traffic routes.

That Wanamaker's believes in the importance of mass travel facilities is demonstrated by the emphasis placed on the means of reaching its store in all of its newspaper advertisements. This point is always stressed, and to advantage. The fact that both the Interborough and B.-M.T. subway systems have stations at the store, and that they are connected directly with the buildings is stated on every possible occasion. Not long ago, the company sponsored a long series of advertisements, showing how people residing in any particular spot of the entire metropolitan area could reach the store by mass transportation means conveniently. In other words, Wanamaker's realizes the importance of public means for bringing customers to its store and does not hesitate to express its faith in these facilities.

This is the fourth of a series of articles by prominent men outside the electric railway industry, expressing their views on transportation subjects. The fifth will appear in the next issue.

The Parking Problem

DISCUSSING the opposition which has been voiced to the proposed plan for stricter parking regulations in Philadelphia, the *Public Ledger* says:

There are marked differences of opinion among business men concerning the actual effect upon trade of parking restrictions. A survey in Chicago and in other cities has shown that only a small proportion of the customers of the large retail stores come and go in private automobiles, and a test of strict no-parking rules in the Illinois city has confirmed the accuracy of that finding. It would seem that the part of wisdom for Philadelphia would be to give the traffic engineer a fairly free hand in his effort to find a solution to a problem that grows daily in seriousness. Only by actual trial and count can there be any hope of ascertaining the effect of restricted parking. But no rule will be of the slightest value if it is impossible of enforcement.

PROFIT SHARING PLAN

Adopted at Kansas City

By

F. G. BUFFE

Vice-President in Charge of Operations
Kansas City Public Service Company

Twenty-five per cent of net income invested in securities of the company for employees. The plan became effective on Jan. 1, 1931. First quarter share to employees was \$38,628

IN RECOGNITION of the loyalty, efficiency, interest and co-operation of its 2,250 employees, the Kansas City Public Service Company has made them partners in its enterprise to the extent of 25 per cent of the net income. This plan became effective on Jan. 1 and for the first quarter the amount of the employees' participation was \$38,628. Every employee and official, who has been in the service for one year, shares in the fund with the exception of the chairman of the board, chairman of the executive committee, the president, and the two vice-presidents.

Payment is not made in cash. The fund is kept intact under a trust agreement and invested in the securities of the company for the benefit of the participants. Each eligible employee receives a participation certificate at the end of each quarter showing his share for the quarter in the trust holdings. This share is based upon the proportion which his earnings for the quarter bear to the total payroll of all eligible employees.

When the plan was first announced it was stated that payments would be made in cash. Later the benefits of employee ownership and the opportunity for the employees to share in any enhancement in value of the securities were so apparent that the investment plan was worked out. The question of cash payment or security investment was submitted to a vote of the employees, the majority to prevail, and this vote was 2,206 for securities against 32 for cash. There were thirteen employees not voting due to sickness or absence. The two plans were carefully explained in detail at a series of group meetings, and the officers and officials frankly recommended the investment plan. The almost unanimous vote that followed indicated the confidence of the organization in the property and in their officials.

The participation plan sets aside every quarter 25 per cent of the net income for the fund. Net income is defined as follows: From the total gross revenue the following deductions are made:

All operating expenses, including wages, materials and supplies for operation and maintenance, depreciation and other operating

reserves, cost of injuries and damages, insurance, etc.

Taxes or reserves for taxes of every nature—city, county, state and federal.

Interest on bonds or notes, or other funded debts or obligations, fixed charges or reserves for fixed charges.

The remainder or net income is divided 25 per cent to the participation fund and 75 per cent to the stockholders, but the employees receive their share whether or not a dividend is declared.

Every employee, with the exception of the corporate officers noted above, who has been in service one year and who does not violate the provisions of the contract of employment, or who does not violate the principles expressed in the constitution of the Kansas City Public Service Employees' Brotherhood, shares in the fund. Employees in service for less than one year will participate beginning with the first quarter after they become eligible.

The fund and its investment, eligibility, and all details and regulations are covered by a "Trust Agreement" between the company, the trustees and the employees. The board of trustees is composed of the following officers and employees:

Chairman of the executive committee, president of the company, vice-president, vice-president in charge of operations, employee's representative on the board of directors, president of the Kansas City Public Service Employees' Brotherhood, and an additional employee to be elected by employees.

Under the plan the interest and dividends on securities owned may either be paid out to certificate holders or reinvested at the option of the trustees. The certificates of participation are transferable to other employees only, and then only on the approval of the trustees. This approval is required to protect employees against selling their certificates at less than their value and to prevent groups or pools among the employees for speculative purposes. At least twice a year the trustees shall issue a statement showing the kinds of securities in the trust and the average price at which they were bought. Whenever any employee has units equaling the lowest denomi-

nation of securities he can exchange his certificates for the securities themselves. In such instance he draws out his proportionate share of all securities. In the event of an employee leaving the service his certificates can be cashed at the market price of the equivalent securities.

Had this plan been in effect during the past four years, the employees would have received amounts as follows:

1927	\$129,524
1928	113,680
1929	102,517
1930	112,236

The company's budget estimate for 1931 shows a total of \$125,190 for the fund.

For the first quarter of 1931 there were 2,155 eligible employees. The fund was \$38,628. The total payroll of eligible employees for the quarter was \$815,207. Therefore, each eligible employee will receive 4.735 per cent of his quarter's earnings.

The board of trustees invested the first quarter's participation in the 6 per cent first mortgage bonds of the company. It bought \$80,000 of these bonds, the average price being \$45.52. The yearly income, therefore, from the first quarter's investment will be \$4,800, or more than 13 per cent.

There can be no question of the beneficial effects of this plan on the organization as a group. The Kansas City Public Service Company for the past ten years has had an extremely satisfactory situation from the standpoint of employee relations. It has a highly intelligent group of employees. They have co-operated to the utmost with the management. This has been shown in many ways, especially in the change-over to 100 per cent one-man operation. This was begun in June of 1927 and completed by September of 1928. There was not only no protest from the employees; on the contrary, they gave their best efforts to sell the idea to the public. As a result there was no public protest or criticism.

It was hardly believed possible that the organization as a whole could show more interest or co-operate more harmoniously than it had, yet the installation of the profit sharing plan and employee investment has shown otherwise. The entire organization is on its toes. In accident reduction, courtesy, careful operation, efficiency, economy—in fact, in every possible direction—the effects are seen. Individual cases are constantly being related. Bulletins on earnings and participation are published monthly, and are eagerly read and discussed.

The result of the first three-months' operations have been very satisfactory, in spite of business conditions and the decrease in passengers. The total operating revenue was \$2,068,529, or \$115,355 less than the same period in 1930. However, operating expenses were reduced \$177,189, and the increase in net income was \$66,532. The company is convinced that the participation plan had much to do with this showing. When discussing efficiency and proper operation, the employee now feels that over and above his wages he is financially interested in the company and the results. For every dollar he helps save and for every extra dollar his efforts help bring in the fund he gets 25 cents.

The following extracts are from the booklet describing the plan and recommending the investment feature, prior to the vote and adoption by the employees.

The officers believe the present situation, through security investment, offers a splendid opportunity for the employees in a few years to build up substantial savings out of the extra money they receive from this plan. The securities of the company can

now be bought at a low price. Further economies and operating efficiency, coupled with a betterment of general business, should show substantial improvement and increased earnings.

The alternative method of paying the participation in cash is not recommended. An employee would receive a comparatively small amount each quarter, at least under present business conditions. He would lose the opportunity of co-operative buying of securities and of sharing in a savings and investment plan that over a period of years would give him a substantial sum. The savings feature is one that should be carefully considered. This extra money will be saved and invested. With interest added, it will soon grow into a sizable amount. It will form the nest egg of a savings account and its speculative feature may, if conditions prove favorable, greatly enhance the principal. Cash payments would not permit the employee to become a part owner in the property. Both methods will be thoroughly discussed at meetings and every employee will vote on the method of distributing the fund. The method designated by the majority will be adopted.

To a large extent this plan of employee participation makes it possible for the employees to determine to some degree the amount of their share. Careful operation, economies, accident prevention, courtesy, neatness, and every phase of operation will have an effect in earnings. By this plan everyone will share directly from careful and proper operation, from courtesy and economy, from accident reduction, and from individual and combined efficiency.

This plan is different from any now known. In many such savings and investment plans the employee is required to contribute cash. This participation is additional compensation, something actually taken from the stockholders' share. In many such plans the employee participates only when the stockholders get dividends. In this plan the employee gets his share regardless of whether or not earnings are actually paid out in dividends or invested in the property. In many plans the preferred stockholders come first and the employees only share with the common stockholders, or after something has been paid to the common stockholders. Many such plans fix an amount which must be earned before the employees participate, which amount often is never reached. This plan is different from any of these. In it the employee absolutely shares in *any* net income, in everything over and above operating expenses, depreciation, taxes and fixed charges. It is a splendid opportunity for the organization to increase income, secure savings and profit from investment.

The profit-sharing plan represents the culmination of more than ten years of intensive education and application of industrial democracy. There is no welfare work connected with it, in the ordinary sense of the term. While the employees have life insurance, health and accident insurance, free medical attention, free nursing service, free legal aid, a building and loan association, a band, and carry on a year-round program of social activities, these things are all done by the Kansas City Public Service Employees' Brotherhood as a co-operative enterprise. There is no compulsion and no employee is required to join. In other words, there is no paternalism. Each employee pays \$1.75 a month, and while the company pays \$1.40 a month per member, this feature is not emphasized. No employee is forced to accept these benefits unless he desires them. However, 99 per cent of them belong to it.

Through the Kansas City representation plan, employees are elected to committees in every division and department, and at the regular and frequent meetings of these committees every matter affecting the employees and their interests is worked out. Definite and complete information of the company's policies and financial results are given to these committees and to the entire group. The Kansas City Public Service Company's policy positively maintains that interference or dictation by outsiders is neither advisable nor desirable.

The company is convinced that the last step in the program of giving the employees a share above wages in profits, and making them actual investors in and part owners of the property, is a step in the right direction. It makes interest, enthusiasm, harmony and co-operation pay actual dividends and adds a tangible incentive.

Attractoscope Tells Railway Story at Progress Exposition



MUCH interest was aroused at the recent Progress Exposition in New Haven by the display in the booth of the Connecticut Company of an "attractoscope," or automatic lantern slide exhibitor, which showed a program of 50 slides and then repeated without requiring attention. It was expected that the shifting pictures would attract interest, but the result was far above expectations. The exposition was of seven days' duration, opening at 1 o'clock and remaining continuously open until 10:30. In the entire period there was practically no time when the booth was empty, and frequently the audience completely blocked the aisle, as well as crowding the booth.

The program started with the statement and explanation: "The Connecticut Company carries you swiftly, surely, safely, smoothly. Ride in its cars and buses." Then followed an illustrated history of city transportation in New Haven, beginning with the reproduction of an interesting old print of Yale College in 1786, when everyone used "Shanks Mare." This was followed by some street views of old New Haven with ox cart, private carriage and stage coach in use, while interurban traffic was represented by the old Northampton Canal. It was the next group, however, that of the horse cars, which received the greatest attention, those who had ridden them often seeing the program through several times and then bringing in youngsters to see a means of travel they "would never see except in pictures."

Pictures of the first electric railways in Connecticut followed. It was pointed out that in less than nine months from the date of the operation of the first successful electric car in Richmond, Va., in 1888, "Little Old Connecticut" had in operation three lines: Derby, Meriden and Hartford. Then was shown the safety car "with automatic controls offering the public every possible protection against carelessness."

To show "why the cars are sometimes late" there was a series of views starting with a horse car buried

in the drifts of the great blizzard of 1888, then "electrics" in later storms, and finally trucks and autos blocking the tracks; while slides of welders, grinders, snow cleaners, derricks, electric shovels and similar equipment told how much auxiliary machinery is necessary to keep the lines in operation. Safety and service control by the Connecticut Public Utilities Commission, which has received little publicity and is known to comparatively few car riders, was pointed out by the title, "Believe it or not, the Public Utilities Commission inspects every foot of track every year," followed by a view of the car used and the inspection party of a previous year. Finally, the bus operation was covered by pictures of both old and modern vehicles.

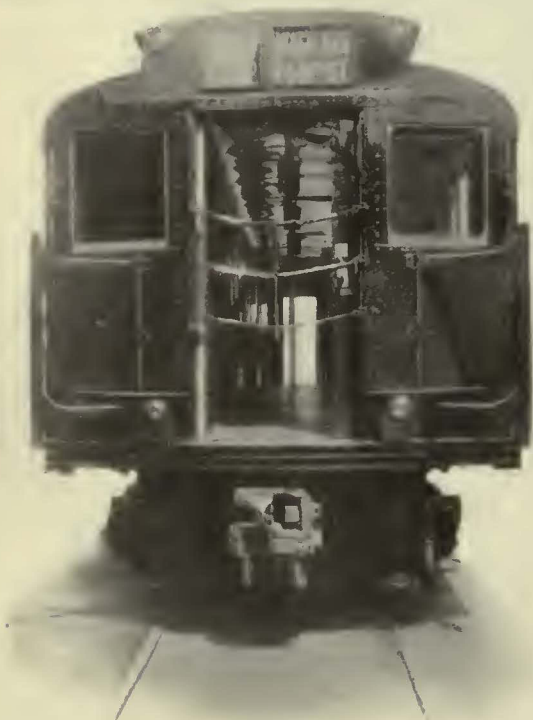
Scattered among the other slides, a series of statements pointed out the advantages of the services offered by trolley, by bus and by trolley express, reminding the public that cars and buses could be chartered for private parties. Co-operation in relieving the congestion in the business district was urged, and the condition shown by the street view of one trolley car and the 36 automobiles carrying as an average the same number as can the trolley.

Not the least interesting feature was the reaction of the company employees. It was thought that in view of the pressure of their own work it would be necessary to assign men to attend, but as a first step volunteers were called for on the basis of two shifts per day. The response was so enthusiastic, however, that the work was divided into three shifts per day, and then more men volunteered than there were shifts available.

The reaction of the public was extremely satisfactory. Whether or not any individual was persuaded to increase his or her riding, as a result of the display and the "sales talks," it is impossible to determine. It is fair to assume, however, that some of the facts "went home," and the Connecticut Company feels satisfied that its small expenditure was at least reasonably justified.



Four wide double doors on each side make for quick passenger interchange in this 60-ft. car designed by the Board of Transportation



A clear passageway through the entire train can be obtained without danger to the passengers. Illuminated route signs are an innovation

Loading Speed

Board of Transportation develops rapid transit car of improved type for use on new city-owned lines. Many advances have been made over existing designs

& Foundry Company, and W. H. Mussey of the Pullman Company, along with H. N. Latey and J. O. Madison, served as a committee regarding the best type of car for the subway service. During the six months this committee deliberated some 75 different arrangements were considered and analyzed. While it was not possible to obtain a unanimous opinion in favor of any one type of car, it was agreed that the car decided on by the board will be an effective transportation unit.

Three distinct types of rolling stock are in use on the existing rapid transit subway lines in New York City. The cars of the Interborough subway are approximately 51 ft. long and 9 ft. wide, while the standard B.-M.T. subway cars are 67 ft. long and 10 ft. wide. The three-unit articulated cars of the B.-M.T. are 137 ft. long and 10 ft. wide. The clearances adopted in the new subways make them suitable for the B.-M.T. cars. Accordingly, in most of the principal dimensions those of the latter were followed in the design of the new cars. The two types can use the same tracks and the same station platforms. While the differences in control and electrical equipment prevent operating them interchangeably, they can be coupled together in emergencies.

It was decided that better service could be rendered by making the maximum length of the new car 60 ft. instead of 67 ft. as in the B.-M.T. car. This made it possible to

WHEN the Board of Transportation perfected its plans for the new subway system authorized for New York City, a change from the previous procedure was deemed necessary. In the former contracts the operating companies leased the bare subways built by the city and themselves provided the necessary equipment, including cars, power and miscellaneous apparatus. On account of uncertainty as to the arrangement under which the new lines will be operated, it became necessary for the city to provide the complete equipment in order to avoid serious delay in starting service.

Accordingly, the design of the cars was undertaken by the Board of Transportation. At the request of the board, J. S. Doyle of the Interborough Rapid Transit Company, W. G. Gove of the Brooklyn-Manhattan Transit Corporation, W. B. Potter of the General Electric Company, A. E. Ostrander of the American Car

place the truck centers nearer the ends of the cars, reducing overhang and end swing and permitting a somewhat lighter framing. It also allows passengers to pass from one car to the next without danger, even on curves. It was decided to build single units, each with two motors on one truck, making all the cars interchangeable, in order to obtain maximum flexibility of service.

In selecting the type of car a study was made of the various elements limiting the number of trains per hour, as this determines the capacity of the line. Accelerating and braking rates were set at 1.75 m.p.h.p.s., which with the present type of control was believed to be as high as possible without discomfort to the passengers. Closing-in signals are provided at all congested points, so that no further material saving could be made in the time of entering or leaving stations. Hence, the limiting condition in the passenger capacity of the subway was determined to be the length of station stop.

The new car was so designed that one-fourth of the load will be in the zone of each of the four side doors provided. The seat arrangement also was selected with a view to directing passengers toward the nearest door. Though it would be possible to increase the number of doors on each side of the car beyond the four actually adopted, it would result in a serious reduction in the number of seats if a normal arrangement is used. As a compromise between maximum track capacity and number of seats the four-door unit 60 ft. long and seating 60 passengers was adopted.

Double doors will open or close in about half the time needed with a single 4-ft. door. The lighter door will reduce the blow should it strike a passenger standing in the doorway. Flexible edges have been installed on the doors, and their width at the bottom is increased by notching out the door sufficiently that a man's foot may be withdrawn after the door is fully closed. This feature

a Major Factor in Design of

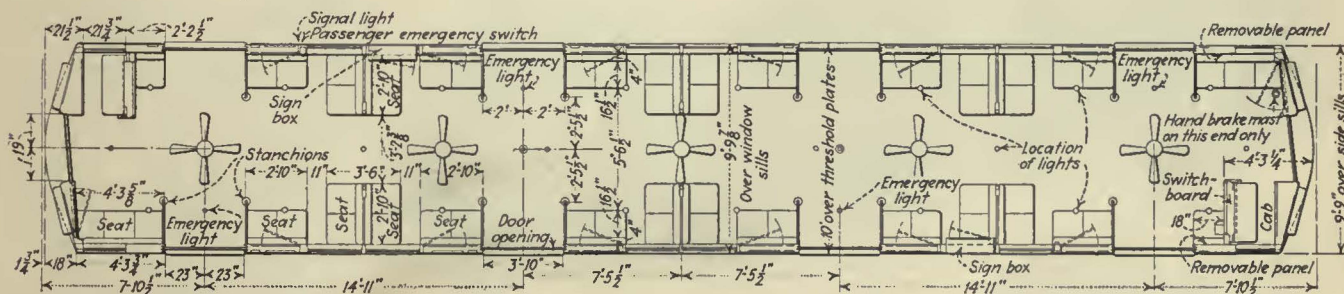
NEW YORK SUBWAY CARS

With operation of about 30 trains per hour, which is approximately the maximum in the existing subways, it is evident that the saving of four seconds per train in the time of stop increases the capacity of the track by one train per hour. In order to determine how the maximum saving in stopping time can be obtained, studies of station stops were made at the most congested subway stations in New York, and many observations were made of the speed of loading and unloading. It was found that all of the present cars have their doors so located that the natural distribution of traffic between them is unequal. In the Interborough cars more passengers use the center doors than either of the end doors. In the long B.-M.T. cars the end doors have the heavier traffic. By equalizing the door zones the number of passengers boarding and leaving should be about the same at all doors, and the time of interchange reduced.

obviates the need for the "sensitive edges" used on some of the subway car doors. It also was decided to keep the door openings free of posts or divisions of any kind, as these reduce the capacity of the door.

The multiple-unit control practically removes any limitation as to train length. The public, however, demands stations fairly close together, which makes operation of long trains difficult. It was decided that all interests would be served best by the use of trains of ten 60-ft. cars, and the station platforms were designed accordingly, with provisions for lengthening them to accommodate eleven cars if that becomes desirable in the future.

Comparing the standard trains for subway service, ten cars of the Interborough type, eight cars of the B.-M.T. 67-ft. type, or ten cars of the new Board of Transportation type, it was found that the number of trains per hour which can be moved through the most congested stations,



The car body is divided by the seats into four equal sections, each served by a pair of doors on either side



Seats for 60 passengers are so placed that it is easy to reach the nearest doors



Control equipment is grouped in a permanent cab at each end of the car



Interior signs show route and destination in clear characters

General Specifications, Board of Transportation Subway Cars

Name of Railway... Board of Transportation, City of New York	Armature bearings..... Bronze	Headlining in upper deck..... Agasote
Number of units..... 300	Anticlimbers..... Waugh Equipment Co.	Journal bearings..... Bronze, 5x9
Type of unit, Motor, passenger, subway, double end, double truck	Axles..... Heat-treated carbon steel	Journal boxes..... Symington
Number of seats..... 60	Car signal system..... National Pneumatic Co.	Lamp fixtures..... Adams & Westlake Co.
Builder of car body... American Car & Foundry Co., Berwick, Pa.	Compressors..... Westinghouse D-3-F	Motors... Two Westinghouse No. 570-D-5, inside bung
Date of delivery..... 1931	Conduit light-weight steel..... Steel & Tubes, Inc.	Painting scheme..... Dark green
Weights: car body..... 48,300 lb.	Conduit fittings..... Appleton Electric Co.	Roof type..... Monitor
Motor truck with gears and shoe beams... 14,100 lb.	Control..... Westinghouse ABF, UP Type	Roof material..... Steel
Two motors, less gears..... 10,000 lb.	Couplers..... Westinghouse Traction Brake Co., H-2-A	Seash..... O. M. Edwards Co. brass
Trailer truck, complete..... 11,900 lb.	Destination signs..... Hunter	Seats..... Hale & Kilburn stationary
Total..... 84,300 lb.	Door mechanism..... National Pneumatic Co.	Seating material..... Rattan
	Doors, double, sliding	Signal system..... National Pneumatic Co.
	Four on each side of car, made of aluminum	Slack adjusters..... Sauvage
	Draft gear..... Waugh Equipment Co.	Stanchions..... Elleon Co., porcelain enameled
	Energy saving device..... Coasting clock	Switchboards..... Consolidated Car Heating Co.
	Fans..... Westinghouse Elec. & Mfg. Co.	Trucks..... American Car & Foundry Co.
	Finish, paint, 100 cars each Murphy, Dupont and Sherwin-Williams	Ventilators..... Monitor sash
	Floor covering..... Teco	Wainscoting..... Thermasote
	Floor sheets..... Johns-Manville Co. truss plate	Wheels, type... Carnegie rolled steel, diameter 34 1/2 in. motor and 31 1/2 in. trailer
	Gears and pinions..... Westinghouse-Nuttall	Wire and cable... Standard Underground Cable Co.
	Glass..... 1/4-in. and 3/8-in. plate	Springs... Chrome-vanadium elliptic and high silicon coils... Pittsburgh Spring & Steel Co.
	Hand straps..... Waugh Equipment Co.	Motor leads, shoe leads and truck trolleys... Okocord and Rockbestos.
	Heat insulating material..... Johns-Manville Co. Salamander	
	Heaters..... Consolidated Car Heating Co.	

and the resultant passenger capacity are, respectively:

	I.R.T. Subway Car	B.-M.T. Car	New City Car
Trains per hour.....	29.7	30.7	32.2
Maximum passengers per car.....	200	300	280
Maximum cars per train.....	10	8	10
Passengers per train.....	2,000	2,400	2,800
Passengers per hour.....	59,400	73,400	90,160

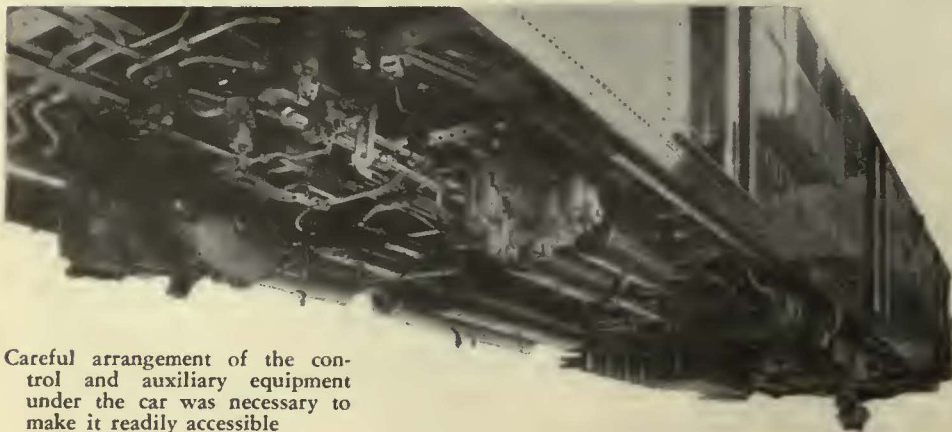
Thus the new car will permit an increase in train capacity above the I.R.T. equipment, due to the door arrangement, and an increase in hourly capacity from all causes that in the aggregate amounts to about 50 per cent.

Since car weight affects operating costs directly, every effort has been made to hold it down. The final scale

weight for the car is 84,300 lb., as compared with the 85,000 lb. specified. This weight is relatively low for a 60-ft. long, 10-ft. wide car with two 190-hp. motors, automatic car, air and electric couplers, air brakes, and four double doors on each side of the car.

Each specialty manufacturer contributed to the weight reduction. A portion of the saving in weight was made by the use of aluminum, which is found in the doors, door devices, seat boxes, parts of the headlining, trim, cab construction, and some of the junction boxes and miscellaneous parts. The total saving in weight amounts to some 2,700 lb. per car. A comparatively new weight-saving feature was the use of thin wall conduit. Its internal diameter is the same as that of standard conduit, but the walls are only 1/16 in. thick. Threadless fittings facilitate installation. This was particularly true with bent sections, and some lengths of conduit could be placed in locations that would have been practically out of the question with screw fittings.

The complete car weighs 1,395 lb. per running foot when empty. With a full load of 280 passengers (39,200 lb.) the weight is 2,041 lb. per run-



Careful arrangement of the control and auxiliary equipment under the car was necessary to make it readily accessible

ing foot. The weight per seated passenger is 1,545 lb., and per total passenger at full load it is 441 lb.

The trucks are of the A.C.F. pedestal type. All members except the pedestals, journal boxes, transom gussets, side frame and bolster center castings, which are cast steel, are rolled bar or structural shapes and plates. Coil springs mounted on the journal boxes are high silicon steel and elliptic springs are chrome vanadium. The motor truck has a wheel-base of 7 ft. and the trailer truck 6 ft. 3 in.

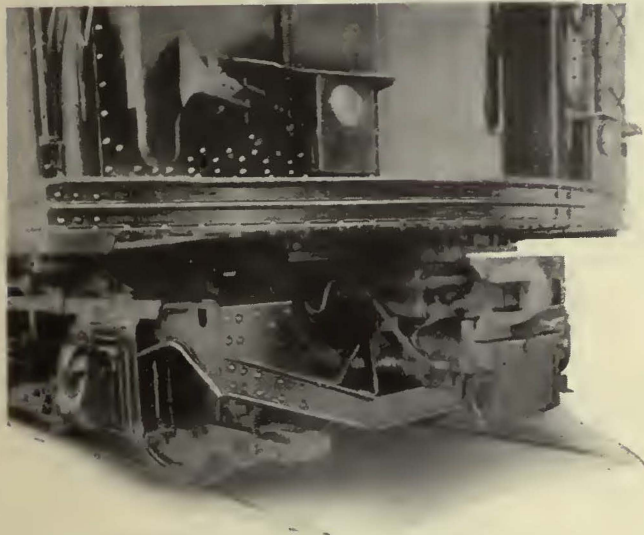
Westinghouse Traction Brake Company H-2-A couplers are used, as are Westinghouse air brakes, with 18 x 12-in. cylinders. Variable load mechanism provides for a standard rate of retardation and acceleration irrespective



Each car has one trailer truck of the type shown. All wheels have clasp brakes



The motor truck, while light, is of exceptionally rugged construction



Connections between cars, including air and electric circuits, are made automatically through Westinghouse couplers

of the number of passengers on the car. The cars have automatic slack adjusters on the brake cylinders, and the motor trucks have shim slack adjusters. Both motor and trailer trucks have Simplex clasp brakes and Diamond S brakeshoes.

Each car is driven by two Westinghouse No. 570-D-5, 190-hp. field control motors. Westinghouse ABF electropneumatic control makes it possible to run a train of from one to eleven cars from a single position. Control is of the automatic battery field type, with acceleration set at the rate of 1.75 m.p.h.p.s. There also is a variable load feature for the accelerating relays, so that the rate of acceleration is maintained regardless of load. The operating coils of the line switch are actuated with trolley current, so that the main motor circuit is opened immediately on loss of power, but the multiple-unit control is operated from a low-voltage storage battery. This simplified the design of the control apparatus, provided a means for easy testing of the control without the use of power from the line and causes all the high-voltage circuits to be interrupted under the floor of the car.

Good lighting of the car interior is obtained from 22 Mazda C Type A-21 automatic cutout lamps in series,

each lamp taking 1.6 amp. at 30 volts. These are set in short-circuiting sockets. White enameled stanchions are so placed as to support standing passengers who cannot reach the enameled hand straps.

Four battery emergency lights per car go on if the power is off the line. Each car has an Edison 24-cell Type B-4-H battery, regulated automatically by a charging panel, which allows the battery to charge in series with the compressor motor, or, if this rate is not sufficient, directly from the third rail through a resistance.

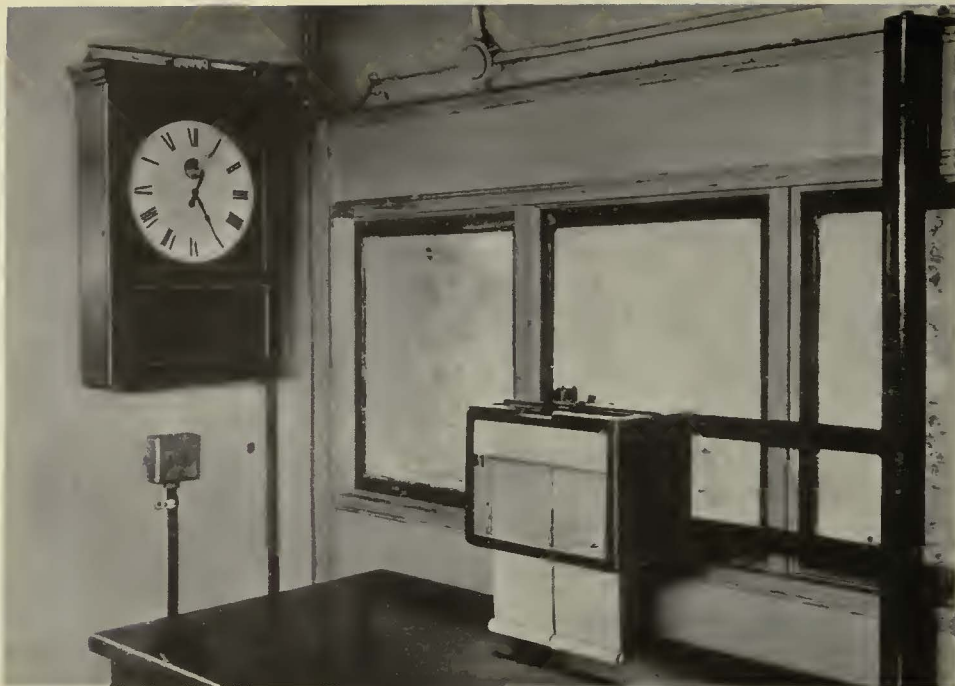
The car lamps, heaters, ventilating fans and destination signs have their circuits so arranged that they can be controlled from the motorman's position at the head of the train, for all eleven cars, the maximum number contemplated, or less. The destination signs on the ends of the trains are adjusted by the motorman and once set for a particular line are not changed during the run. Side destination signs are set for the particular run, but the designation of the terminal toward which the train is proceeding is illuminated in color and is changed from one direction to the other by the setting of the motorman's reverser key. Besides the end destination signs which give the route number and destination in large illuminated characters, red and green illuminated signs on each side of the end of the train show whether it is a local or an express.

The door control is arranged for multiple-unit operation, the front half of the train, up to a maximum of six cars, being controlled by the conductor, and the rear half, of five cars or less, by the guard.

A safety feature embodied in the door control consists in having the electropneumatic door locks controlled by a separate circuit from that of the door opening and closing mechanism.

Twenty-six train line wires through the electric couplers carry battery current for control of motors, brakes, door engines, lamps, fans, heaters and destination signs.

The design, inspection and tests of the cars and their equipment have been done in the engineering department of the Board of Transportation, of which Robert Ridgway is chief engineer, J. R. Slattery, deputy chief engineer, H. N. Lathey chief electrical engineer, and John O. Madison engineer of cars and shops. The latter was in direct charge of the work.



Master clock and the recording instrument, located in the dispatcher's office. Note the availability of charts for ready inspection

Service Improved

with AUTOMATIC SCHEDULE CHECKER

DESIGNED to show the actual service rendered and at the same time the service scheduled, an automatic checking system, recently installed by the Utah Light & Traction Company, Salt Lake City, Utah, informs the dispatcher immediately of any deviations by car operators. Although the system has been in operation only a short time, a remarkable improvement has been made in regularizing service and maintaining proper headway.

Use of the device has made it possible to identify operators, who, inbound, run away from business on the outlying sections of the run and then waste time on the close-in section in order to pass the business district time points on schedule. Some of the first records obtained in tests showed that a number of operators had this tendency, and that it was responsible for improper spacing of following cars. Because of this, more stress has been placed on the inbound service, any variation greater than one minute from schedule being investigated and the operator cautioned to observe his schedule more closely. Each morning, supervisors look over the records being made on the routes under their individual charge,

By *J. F. Woolley, Jr.*

Chief Engineer Utah Light & Traction Company,
Salt Lake City, Utah

and very considerable rivalry has developed among them.

The instrument has furnished reliable information for the revision of schedules and running times. The record is valuable in case of questions arising concerning delays to service as well. It also furnishes a check on trainmen not reporting delays. Trainmen, setting their watches by a master clock that controls the recording system, soon learn that the system is reliable and registers without error or prejudice all failures to maintain schedules. The psychological effect of such a system on the operating personnel is a big factor in rendering dependable, regular service to the riding public. The annual saving already made possible by this installation practically equals the total investment in apparatus and outside circuits.

The entire checking system is controlled by a Strom-

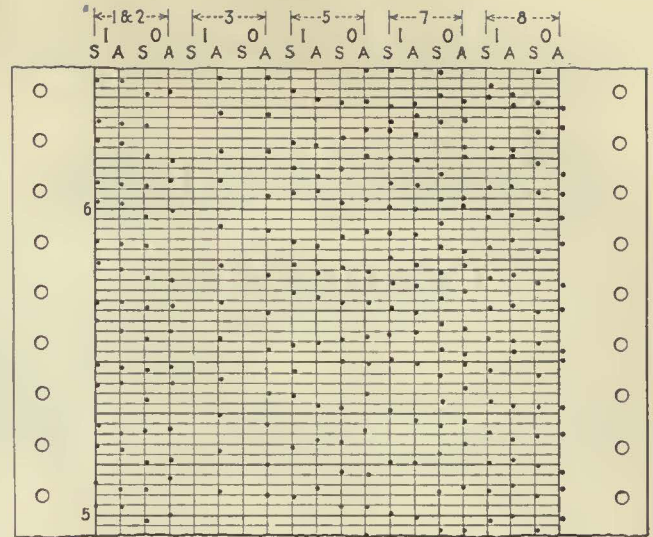
berg electrically operated master clock, located in the dispatcher's office. Once each minute this clock closes a circuit, energizing all of the electromagnets driving the secondary clocks on the program instruments and on the recording mechanism. In this way, the entire system is electrically interlocked and kept in synchronism.

Schedules, both inbound and outbound, are laid off on program tapes for each route and mounted on standard Stromberg program instruments. These tapes are continuous bands of transparent, non-inflammable material, representing the 24 hours of the day graduated in minutes. The schedules are laid off by punching holes in the margin of the tape for each minute, the position of the hole representing the schedule time that a car should pass a time point. The tape is driven over two guide wheels at minute intervals by means of an electromagnetically operated secondary clock which receives its impulse at the closing of the contactors on the master clock. It is so placed that at a given minute the point on the tape representing that minute falls under the projecting end of a spring contact finger. If there is a hole in the margin of the tape the finger passes through and makes contact, closing a relay, which, in turn, closes the recording circuit. Thus the schedule time for the passage of a car is permanently recorded.

In the trolley wire at the time point is located a contactor, so constructed that the passage of a trolley wheel automatically closes a circuit, energizing a relay in the control room. The time the car is scheduled to pass and the time it does pass are recorded on the chart on adjacent vertical lines, the vertical space between the two records indicating the number of minutes off time, early or late. The charts used travel at the rate of 3 in. per hour and are graduated by horizontal lines into divisions representing two minutes. Charts used are 90 ft. long, limiting renewals to about once every two weeks.

A standard switchboard-type twin Esterline-Angus recorder case, rolls and a secondary clock with a capacity for two 6-in. charts, each with twenty vertical lines, are used as the recording instrument. The clock is spring driven with electro-magnetic release, the magnet being energized by a master relay, operated at minute intervals by the master clock. Recording is accomplished in a novel manner, the ordinary pen with ink being replaced by 40 pairs of stationary points (positive and negative), so spaced that each of the 40 vertical lines on the chart passes directly between a positive and a negative point. When a recording relay is closed, either by the program instrument or the passage of a car, a high tension spark passes between the points, burning a hole in the chart and making a distinct, ineradicable record. There are no pens to refill or wet ink to smear the record with this system.

The recording instrument is mounted on a revolving bracket of original design, permitting a supporting arm to be turned 180 deg. about a vertical axis. The recorder itself may be revolved 180 deg. on the bearings at the end of each supporting arm. This system permits either the dispatcher himself or an assistant who is seated at an adjacent desk to

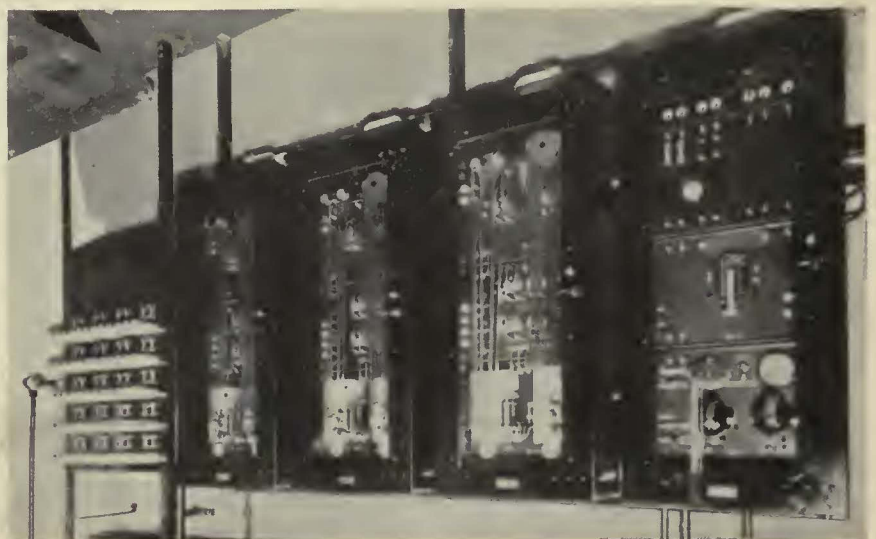


Sample chart from actual record, covering five lines from 4:46 to 6:28 p.m. Numbers at top indicate routes—letters I and O, inbound and outbound; letters S and A, schedule and actual. Figures in left margin represent the hour of the day

attend the machine during the rush period. These men perform regular duties in the office, so that no additional help is required for the operation of the schedule checking instruments.

The master clock and recording instrument with brackets are the only parts of the mechanism which are installed in the dispatcher's office. The battery, charging panel, program instruments, relay panel and coils are all located in a room in the basement of the office building.

Lock switches are provided in the dispatcher's office, one controlling the recording circuits on the "actual," and another the circuit on the "schedule" side. On Sundays and holidays, when the regular schedule is not operated, the schedule circuits can be opened, permitting the actual recording to continue. The instrument then becomes merely a headway recorder. It is restored to its function of schedule checker immediately by reclosing the switch.



Control panels, the left one being for the master relay, the three in the center for the program instruments, and the right one for the closing and limiting relays

Fort Dodge Interurban Gets

75-Ton Freight Locomotive

By T. F. PERKINSON

Transportation Engineering Department
General Electric Company



This new locomotive has been purchased to handle increasing freight business in Central Iowa

INTERURBAN freight haulage increased to such an extent on the Fort Dodge, Des Moines & Southern Railroad, operating approximately 147 miles of line between Fort Dodge, Des Moines, Boone and other Iowa cities, that some time ago it placed in service a 75-ton, 1,200-volt road freight locomotive which was built at the Erie works of the General Electric Company.

The running gear is articulated, permitting a somewhat lighter platform construction than would be required were the stresses transmitted through the cab underframing. The trucks are of the built-up type, each side frame being made from a single rolled-steel slab.

The cab is of the steeple type. All auxiliaries and control equipment except master controllers, switches, etc., are housed in two end compartments.

The four direct-current series motors with single reduction gearing are grouped in pairs connected permanently in series. The motors are rated on reduced field at 270 hp. continuously and 300 hp. for one hour at the driving wheel treads. A gear ratio of 68/18 on 47 in. wheels and 73.5 per cent field strength results in a continuous speed of 19.6 m.p.h. and a speed of 18.6 m.p.h. at the hourly rating.

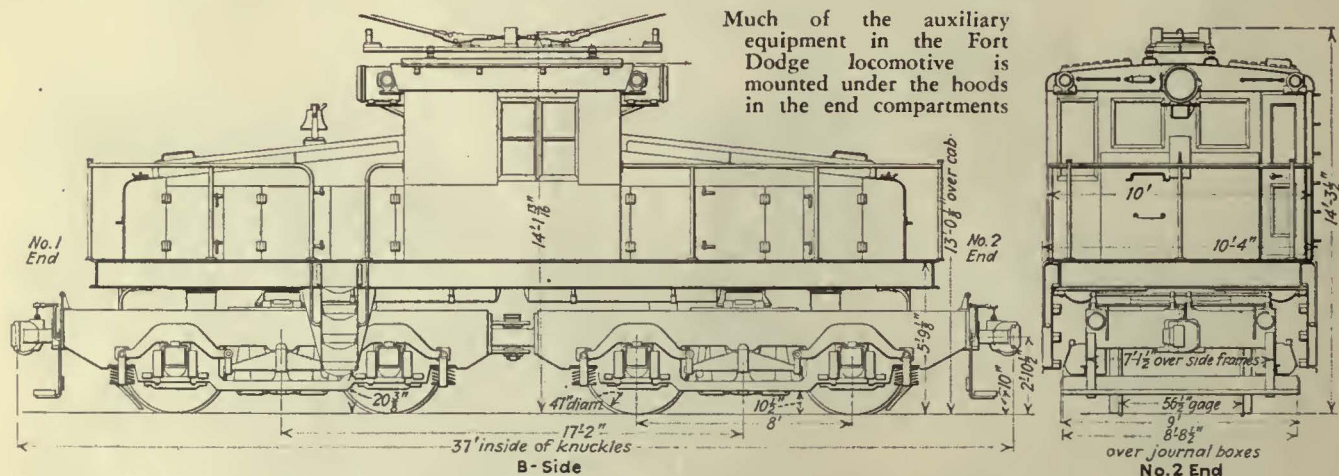
The control equipment is of the non-automatic, electro-pneumatic type arranged for single unit operation through two master controllers, giving eighteen steps, ten for the full series and eight for the series-parallel connections of the motors, two on shunted field.

Control and lighting energy is furnished by a 1,200/600-volt dynamotor. There is no battery.

The customary type of series overload relay prevents excessive overloading of the motors. Flashing studs located near the brushholders in each motor, in conjunction with a flashover relay, cut off power in the event of flashing at the commutators. Additional overload protection is afforded by a newly developed type of inclosed expulsion fuse, connected in the circuit ahead of the main switch.

Two CP-130-600/1,200-volt single-stage air compressors are connected in series across the line with the mid-point connected to the mid-point of the dynamotor for stability. They furnish 96 cu. ft. of air per minute at 90 lb.

Each pair of motors has a blower set consisting of a No. 2½ Sirocco blower driven by a 600-volt motor, pairs being connected in series on the 1,200-volt line.



Principal Data, Fort Dodge, Des Moines & Southern R.R. Locomotive

Class of service.....	Road freight and switching	Width over all.....	10 ft. 4 in.	Electrical Characteristics	Continuous	One-Hour
Trolley volts.....	1,200	Height, trolley locked down	14 ft. 3½ in.	Tractive effort, lb.....	20,600	Rating
Track gage.....	56½ in.	Wheelbase, rigid.....	8 ft. 0 in.	Speed, m.p.h.....	19.6	24.240
Driving wheels.....	Eight, 47 in. diameter	Wheelbase, total.....	25 ft. 2 in.	Current, amp.....	740	18.6
Weight, total (all on drivers)	150,000 lb.	Type of control.....	PCL single unit	Output, hp.....	1,075	1,200
Weight per axle.....	37,500 lb.	Propulsion motors.....	Four HMI-818-B-1, 600/1,200 volt	Starting tractive effort, 25 per cent adhesion,	37,500 lb	
Length inside knuckles.....	37 ft. 0 in.	Gear ratio.....	68:18			

Note—Ratings at 1,200 volts on trolley and motor fields shunted.

Industry Statistics for 1930

Reflect Business Situation

WHILE the year 1930 is now a matter of history, it is interesting to look back and see the excellent manner in which the electric railway industry weathered the storm, which was by far the most serious that has overtaken it in its history. The results are given in considerable detail in statistics prepared by the staff of the American Electric Railway Association under the supervision of Edmund J. Murphy, director of in-

Electric railways engaged in city service made best showing, but all groups had a recession from the high marks of 1929. Figures compiled by A.E.R.A. show results of operation for the year by 86 per cent of the industry

Table I—Combined Operations of 282 Electric Railway Companies and 193 Controlled Bus Undertakings*

	1930	1929	Increase or Total	Decrease† Per Cent
Operating revenue.....	\$791,835,096	\$858,479,822	\$66,644,726	7.76
Operating expense†.....	605,067,830	634,627,120	29,559,290	4.66
Net operating revenue.....	\$186,767,266	\$223,852,702	\$37,085,436	16.57
Operating ratio, per cent.....	76.41	73.92	2.49	3.37
Miles of single track.....	28,501.25	29,367.45	866.20	2.95
One-way miles of separate roads traversed by buses.....	12,284.93	11,620.65	664.28	5.72
Revenue passengers.....	10,575,729,055	11,496,509,893	920,780,838	8.01
Total passengers.....	13,126,441,081	14,286,283,847	1,159,842,766	8.05
Revenue car- and bus-miles.....	2,129,224,002	2,182,442,601	53,218,599	2.44
Total car- and bus-miles.....	2,139,940,727	2,194,843,265	54,902,538	2.50

*These preliminary tables include the reports of all companies received up to May 1, 1931. The income statement is not carried beyond "net operating revenue" because many of the companies included are combination railway, light and power companies that do not make any segregation of their railway taxes or fixed charges.

†Decreases are indicated by *italic figures*.

‡Includes depreciation to the extent that reporting companies included it in their operating expenses.

§Not equivalent to miles of single track and therefore they cannot be added together.

Table II—Combined Operations of 282 Electric Railways

	1930	1929	Increase or Total	Decrease† Per Cent
Railway operating revenue.....	\$715,835,821	\$780,282,234	\$64,446,413	8.26
Railway oper. expense†.....	534,735,682	565,207,608	30,471,926	5.39
Net operating revenue.....	\$181,100,139	\$215,074,626	\$33,974,487	15.80
Operating ratio, per cent.....	74.70	72.44	2.26	3.12
Miles of single track.....	28,501.25	29,367.45	866.20	2.95
Revenue passengers.....	9,691,895,543	10,584,091,654	892,286,111	8.43
Total passengers.....	12,112,527,557	13,249,711,269	1,137,183,712	8.58
Revenue car-miles.....	1,830,015,893	1,899,658,550	69,642,657	3.67
Total car-miles.....	1,838,229,749	1,908,559,609	70,329,860	3.69

†Decreases are indicated by *italic figures*.

‡Includes depreciation to the extent that the reporting companies included it in their operating expenses.

Table III—Combined Operations of 193 Bus Undertakings Controlled by Electric Railways

	1930	1929	Increase or Total	Decrease† Per Cent
Bus operating revenue.....	\$75,999,275	\$78,197,588	\$2,198,313	2.81
Bus operating expense†.....	70,332,148	69,419,512	912,636	1.31
Net operating revenue.....	\$5,667,127	\$8,778,076	\$3,110,949	35.44
Operating ratio, per cent.....	92.54	88.77	3.77	4.25
One-way miles of separate roads traversed by buses.....	12,284.93	11,620.65	664.28	5.72
Revenue passengers.....	883,923,512	912,418,239	28,494,727	3.12
Total passengers.....	1,023,913,524	1,036,572,578	12,659,054	1.22
Revenue bus-miles.....	299,208,109	282,784,051	16,424,058	5.81
Total bus-miles.....	301,710,978	286,283,656	15,427,322	5.39

†Decreases are indicated by *italic figures*.

‡Includes depreciation to the extent that reporting companies included it in their operating expenses.

formation service. The tables published in this article, which have been furnished by Mr. Murphy, are similar in form to those presented in this paper for the past several years. They show strikingly the effects of the business situation on the various accounts, and make it possible to analyze accurately the situation up to the end of 1930.

Taking the industry as a whole, general figures have been obtained from 282 electric railways and 193 controlled bus undertakings. These include more than 86 per cent of the railway revenues of the entire electric railway industry, while the bus revenues represent about 76 per cent of the total revenue of bus lines affiliated with electric railways. Practically all of the principal operating companies are included in the totals. The results are, therefore, entirely representative.

Combined operations of the industry's rail and bus lines showed total revenues of \$791,835,096, which was a decline of 7.76 per cent from the \$858,479,822 taken in for 1929. Viewed in the light of the recession in business generally, this is a remarkable showing, and reflects clearly the stability of the industry in the face of the most trying situation in a generation.

On the expense side of the statement the combined figure was \$605,067,830, which is 4.66 per cent less than the cost of \$634,627,120 for 1929. That this saving was not made at the expense of the service is seen from the statistics in Tables II and III, for the revenue car-miles were reduced only 3.67 per cent, and the revenue bus-miles actually were increased 5.81 per cent.

Despite the reduction in operating expenses, the net operating revenue fell to \$186,767,266 from \$223,852,702 for 1929, or 16.57 per cent. This brought the operating ratio up to 76.41 as compared with 73.92 for the year before, or 2.49 points.

Passing to the segregated figures for electric railways, Table II shows for 1930 a total gross revenue of \$715,835,821, a reduction of \$64,446,413, or 8.26 per cent. The revenues from bus undertakings, shown in Table III, were \$75,999,275, which was a reduction from 1929 of \$2,198,313, or 2.81 per cent. As to expenses, the rail lines decreased to \$534,735,682 from \$565,207,608, or 5.39 per cent, while the bus ex-

(Text Continued on Page 304)

Part I—Combined Operating Reports of 201 Electric Railways for the Calendar Year 1930 Compared With 1929

Table IV—Combined Income Statement*

	1930		1929		Increase or Decrease†		Cents per Car-Mile			
					Total	Per Cent	1930	1929	Increase or Total	Decrease† Per Cent
Railway operating revenue.....	\$467,265,926	\$518,438,682	\$51,172,756	9.87	41.79	43.98	2.19	4.98		
Railway operating expense, excluding depreciation.....	333,529,798	357,847,426	24,317,628	6.80	29.83	30.36	0.53	1.75		
Net operating revenue.....	\$133,736,128	\$160,591,256	\$26,855,128	16.73	11.96	13.62	1.66	12.19		
Net revenue, auxiliary operations.....	4,582,322	4,739,022	156,700	3.31	0.41	0.40	0.01	2.50		
Taxes.....	30,695,864	32,681,699	1,986,835	6.08	2.75	2.77	0.02	0.72		
Operating income.....	\$107,622,586	\$132,648,579	\$25,025,993	18.87	9.62	11.25	1.62	14.49		
Non-operating income.....	12,149,757	12,473,728	323,971	2.60	1.09	1.06	0.03	2.83		
Gross income.....	\$119,772,343	\$145,122,307	\$25,349,964	17.47	10.71	12.31	1.60	13.00		
Deductions from gross income.....	88,194,522	87,276,569	917,953	1.05	7.89	7.40	0.49	6.62		
Net income before depreciation.....	\$31,577,821	\$57,845,738	\$26,267,917	45.41	2.82	4.91	2.09	42.57		
Depreciation.....	30,941,137	32,202,562	3,261,425	3.92	2.77	2.73	0.04	1.47		
Net income after depreciation.....	\$636,684	\$25,643,176	\$25,006,492	97.52	0.05	2.18	2.13	97.71		
Operating ratio before depreciation, per cent.....	71.83	69.02	2.36	3.42						
Ratio, net income to operating revenue, per cent.....	0.14	4.95	4.81	98.17						

*The 201 companies included in Table IV and subsequent tables either operate railways only or if they do a joint railway, power and light business make a complete separation of their railway taxes and charges. Complete information on these companies, therefore, is given. †Decreases are indicated by *italic figures*.

Table V—Operating Revenues by Primary Accounts

	201 Companies		Increase or Decrease†	
	1930	1929	Total	Per Cent
Transportation (total)...	\$454,400,884	\$504,608,166	\$50,207,282	9.95
Passenger.....	434,242,968	481,109,234	46,866,266	9.74
Mail.....	357,608	408,333	50,725	12.42
Express.....	1,519,825	1,825,595	305,770	16.75
Milk.....	66,649	96,912	30,263	31.23
Freight.....	16,764,059	19,576,584	2,812,525	14.37
Switching.....	654,228	790,111	135,883	17.20
Other transportation revenue.....	795,547	801,397	5,850	0.73
Other railway operations.....	12,865,042	13,830,516	965,474	6.98
Total railway operating revenue.....	\$467,265,926	\$518,438,682	\$51,172,756	9.87

†Decreases are indicated by *italic figures*.

Table VII—Operating Statistics

	201 Companies		Increase or Decrease†	
	1930	1929	Total	Per Cent
Passenger car-miles.....	1,073,643,980	1,130,947,187	57,303,207	5.07
Revenue car-miles.....	1,111,320,417	1,171,243,656	59,923,239	5.12
Total car-miles.....	1,118,072,583	1,178,824,805	60,752,222	5.15
Revenue passengers.....	5,605,874,725	6,316,638,721	710,763,996	11.25
Revenue transfer passengers.....	245,810,843	292,390,880	46,580,037	16.93
Free transfer passengers.....	1,260,965,307	1,370,358,310	109,393,003	7.93
Total passengers.....	7,168,069,947	8,040,873,482	872,803,535	10.86
Passenger revenue.....	\$434,242,968	\$481,109,234	\$46,866,266	9.74
Passenger car-hours ¹	97,519,382	103,606,544	6,087,162	5.83
Revenue car-hours ¹	98,920,758	105,127,626	6,206,868	5.91
Total car-hours ¹	99,386,330	105,697,213	6,310,883	5.97
Miles of single track.....	21,163,750	21,701,399	537,649	2.48
Passenger cars operated ²	23,601	24,895	1,294	5.20

†Decreases are indicated by *italic figures*. ¹Reported by 183 companies. ²Average maximum number of passenger cars in service daily: Reported by 168 companies.

Table VIII—Significant Ratios Derived from Tables IV—VII

	201 Companies		Increase or Decrease† Per Cent
	1930	1929	
Railway operating revenue.....	\$467,265,926	\$518,438,682	9.87
Per mile of single track.....	22,079	23,890	7.58
Gross income.....	\$119,772,343	\$145,122,307	17.47
Per mile of single track.....	5,659	6,687	15.37
Passenger revenue.....	\$434,242,968	\$481,109,234	9.74
Per revenue passenger, cents.....	7.75	7.62	1.71
Per total passenger, cents.....	6.06	5.98	1.34
Per mile of single track.....	\$20,518	\$22,170	7.45
Per passenger car-mile.....	40.45c	42.54c	4.91
Per car operated ¹	\$15,424	\$16,088	4.13
Per passenger car-hour ²	\$3.83	\$4.00	4.25
Revenue passengers.....	5,605,874,725	6,316,638,721	11.25
Per mile of single track.....	264,856	291,070	9.01
Per passenger car-mile.....	5.22	5.59	6.62
Per car operated ¹	192,691	205,098	6.05
Per passenger car-hour.....	52	55	5.46
Total passengers.....	7,168,069,947	8,040,873,482	10.86
Per mile of single track.....	338,696	370,523	8.59
Per passenger car-mile.....	6.68	7.11	6.05
Ratio, transfer passengers to revenue passengers, per cent.....	26.88	26.32	2.13
Revenue car-miles.....	1,111,320,417	1,171,243,656	5.12
Per mile of single track.....	52,511	53,971	2.71
Per car operated ¹	39,523	39,245	0.71
Per car-hour.....	9.53	9.44	0.95
Car-hours ²	98,920,758	105,127,626	5.91
Per car operated ¹	4,066	4,039	0.67

†Decreases are indicated by *italic figures*. ¹Reported by 168 companies. ²Reported by 183 companies. ³Reported by 155 companies.

Table VI—Operating Expenses by Primary Accounts

Expenses	201 Companies		Increase or Decrease†		Cents per Car Mile			
	1930	1929	Total	Per Cent	1930	1929	Increase or Total	Decrease† Per Cent
Way and structures, excluding depreciation.....	\$38,375,968	\$42,234,803	\$3,858,835	9.14	3.43	3.58	0.15	4.19
Equipment, excluding depreciation.....	34,113,721	36,958,436	2,844,715	7.70	3.05	3.14	0.09	2.87
Power, excluding depreciation.....	46,357,033	48,672,438	2,315,405	4.76	4.15	4.13	0.02	0.48
Conducting transportation.....	154,851,690	166,763,798	11,912,108	7.14	13.85	14.15	0.30	2.12
Traffic.....	2,486,858	2,580,932	94,074	3.65	0.22	0.22	.....	.....
General and miscellaneous.....	57,399,568	60,761,084	3,361,516	5.63	5.13	5.15	0.02	0.39
Transportation for investment—credit.....	—249,297	—268,332	19,035	7.09	—0.02	—0.02	.....	.....
Total operating expense, excluding depreciation.....	\$333,529,798 ¹	\$357,847,426 ²	\$24,317,628	6.80	29.83 ³	30.36 ³	0.53	1.75
Depreciation								
Way and structures.....	\$8,689,818	\$9,816,033	\$1,126,215	11.47	0.78	0.83	0.05	6.03
Equipment.....	8,720,866	8,865,785	144,919	1.64	0.78	0.75	0.03	4.00
Power.....	2,034,046	1,949,944	84,102	4.31	0.18	0.17	0.01	5.88
Undistributed depreciation reported in operating expense.....	3,409,378	3,488,520	79,142	2.27	0.30	0.30	.....	.....
Total depreciation reported in operating expense.....	\$22,854,108	\$24,120,282	\$1,266,174	5.25	2.04	2.05	0.01	0.49
Depreciation reported as a deduction from net income.....	8,087,029	8,082,280	4,749	0.06	0.72	0.68	0.04	5.88
Total depreciation.....	\$30,941,137	\$32,202,562	\$1,261,425	3.92	2.76	2.73	0.03	1.10

†Decreases are indicated by *italic figures*. ¹Includes \$194,257 undistributed expense. ²Includes \$144,267 undistributed expense. ³Includes 0.02 cent undistributed expense. ⁴Includes 0.01 cent undistributed expense.

Part II—Combined Reports of 201 Electric Railway Companies Segregated by Type of Territory Served

Table IX—Income Statement

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
	1930		1929		1930		1929		1930		1929	
	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†
Railway operating revenue.....	\$341,250,334	\$371,704,170	\$30,453,836	8.19	\$30,771,295	\$35,751,746	\$4,980,451	15.93	\$95,244,297	\$110,982,766	\$15,738,469	14.18
Railway operating expense, excluding depreciation.....	235,873,049	251,338,422	15,465,373	6.15	26,711,087	28,226,672	1,515,585	5.37	70,945,662	78,282,332	7,336,670	9.37
Net operating revenue.....	\$105,377,285	\$120,365,748	\$14,988,463	12.45	\$4,060,208	\$7,525,074	\$3,464,866	46.05	\$24,298,635	\$32,700,434	\$8,401,799	25.89
Net revenue, auxiliary operations...	294,217	52,926	241,291	455.90	225,184	217,057	8,127	3.74	4,062,921	4,469,039	406,118	8.09
Taxes.....	22,894,008	23,976,311	1,082,303	4.62	1,661,487	1,868,983	207,496	11.10	6,140,369	6,836,405	696,036	10.18
Operating income.....	\$82,777,494	\$96,442,363	\$13,664,869	14.17	\$2,623,905	\$5,873,148	\$3,249,243	55.32	\$22,221,187	\$30,333,068	\$8,111,881	26.74
Non operating income.....	6,806,242	6,831,669	25,427	0.37	1,976,324	1,036,987	939,337	90.58	3,367,191	4,605,072	1,237,881	26.88
Gross income.....	\$89,583,736	\$103,274,032	\$13,690,296	13.26	4,600,229	\$6,910,135	\$2,309,906	33.43	\$25,588,378	\$34,938,140	\$9,349,762	26.78
Deductions from gross income.....	56,738,578	56,806,673	68,095	0.12	9,135,294	8,542,561	592,733	6.94	22,320,650	21,927,335	393,315	1.79
Net income before depreciation..	\$32,845,158	\$46,467,359	\$13,622,201	29.32	\$4,555,065	\$1,632,426	\$2,902,639	.....	\$3,267,728	\$13,010,805	\$9,743,077	74.89
Depreciation.....	22,121,628	22,892,896	771,268	3.37	1,492,053	1,522,798	30,745	2.02	7,327,456	7,786,868	459,412	6.90
Net income after depreciation....	\$10,723,530	\$23,574,463	\$12,850,933	54.51	\$6,027,118	\$3,155,234	\$2,871,894	.....	\$4,059,728	\$5,223,937	\$9,883,665	.....
Operating ratio before depreciation per cent.....	69.12	67.62	1.50	0.01	86.81	78.95	7.86	9.96	74.49	70.54	3.95	5.60
Ratio, net income to operating revenue, per cent.....	3.14	6.34	3.20	50.47	.....	.....	.....	.....	.....	4.71	.....	.....

†Decreases or deficits are indicated by italic figures.

Table X—Operating Revenues by Primary Accounts

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
	1930		1929		1930		1929		1930		1929	
	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†
Transportation, total.....	\$333,196,278	\$363,062,097	\$29,865,819	8.23	\$29,066,323	\$33,903,328	\$4,837,005	14.27	\$92,138,283	\$107,642,741	\$15,504,458	14.40
Passenger.....	332,095,351	361,871,713	29,776,362	8.23	18,683,049	22,226,777	3,543,728	15.94	83,464,568	97,010,743	13,546,175	13.96
Mail.....	63,578	120,672	57,094	47.31	85,035	80,756	4,279	5.30	208,995	206,905	2,090	1.01
Express.....	36,927	43,581	6,654	16.27	639,835	766,518	126,683	16.53	843,063	1,015,496	172,433	16.98
Milk.....	422	753	331	43.96	44,605	71,107	26,502	37.27	21,622	25,052	3,430	13.69
Freight.....	460,795	546,597	85,802	16.70	9,272,596	10,356,023	1,083,427	10.46	7,030,668	8,673,964	1,643,296	18.96
Switching.....	124,375	145,297	20,922	14.40	111,369	125,934	14,565	11.57	418,484	518,880	100,396	19.35
Other transportation revenue....	414,830	333,484	81,346	24.39	229,834	276,213	46,379	16.79	150,883	191,701	40,818	21.29
Other railway operations.....	8,054,056	8,642,073	588,017	6.80	1,704,972	1,848,418	143,446	7.76	3,106,014	3,340,025	234,011	7.01
Total railway operating revenue....	\$341,250,334	\$371,704,170	\$30,453,836	8.19	\$30,771,295	\$35,751,746	\$4,980,451	15.93	\$95,244,297	\$110,982,766	\$15,738,469	14.18

†Decreases are indicated by italic figures.

Table XI—Operating Expenses by Primary Accounts

Expenses	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
	1930		1929		1930		1929		1930		1929	
	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†
Way and structures, excluding depreciation.....	\$24,273,951	\$26,542,436	\$2,268,485	8.55	\$4,107,864	\$4,150,470	\$42,606	1.03	\$9,994,153	\$11,541,897	\$1,547,744	15.41
Equipment, excluding depreciation..	24,139,267	26,161,712	2,022,445	7.73	2,247,742	2,297,885	50,143	2.18	7,726,712	8,498,839	772,127	9.09
Power, excluding depreciation.....	32,549,314	33,821,993	1,272,679	3.78	3,687,854	3,787,580	99,726	2.63	10,119,865	11,062,865	943,000	8.52
Conducting transportation.....	116,483,168	124,637,063	8,153,895	6.54	9,636,176	10,449,648	813,472	7.79	28,732,346	31,677,087	2,944,741	9.50
Traffic.....	962,480	992,236	29,756	3.00	866,342	936,778	70,436	7.62	658,036	651,918	6,118	0.94
General and miscellaneous.....	37,413,237	39,154,475	1,741,238	4.45	6,239,189	6,695,982	456,793	6.82	13,747,142	14,910,627	1,163,485	7.80
Transportation for investment, credit	-142,625	-115,760	-26,865	23.21	-74,080	-91,671	-17,591	19.19	-32,592	-60,901	-28,309	48.48
Total operating expense, excluding depreciation.....	\$235,873,049	\$251,338,422	\$15,465,373	6.15	\$26,711,087	\$28,226,672	\$1,515,585	5.37	\$70,945,662	\$78,282,332	\$7,336,670	9.37
Way and structures.....	\$5,229,808	\$6,209,232	979,424	15.77	202,682	232,534	\$29,852	12.84	\$3,257,328	\$3,374,267	\$116,939	3.47
Equipment.....	5,792,887	5,821,738	28,851	0.50	808,419	834,423	26,004	3.12	2,119,560	2,209,624	90,064	4.08
Power.....	1,086,301	1,010,057	76,244	7.55	30,137	26,981	3,156	11.70	917,608	912,906	4,702	0.52
Undistributed depreciation reported in operating expense.....	3,409,378	3,488,520	79,142	2.27	.....	.....	.....	.....	.....	.....	.....	.....
Total depreciation reported in operating expense.....	\$15,518,374	\$16,529,547	\$1,011,173	6.12	\$1,041,238	\$1,093,938	\$52,700	4.82	\$6,294,496	\$64,96,777	\$202,301	3.11
Depreciation reported as a reduction from net income.....	6,603,254	6,363,349	239,905	3.77	450,815	428,860	21,955	5.12	1,032,960	1,290,071	257,111	19.93
Total depreciation.....	\$22,121,628	\$22,892,896	771,268	3.37	\$1,492,053	\$1,522,798	\$30,745	2.02	\$7,327,456	\$7,786,868	\$459,412	6.90

†Decreases are indicated by italic figures. ¹Includes "Undistributed Expense" \$194,257. ²Includes "Undistributed Expense" \$144,267.

Table XII—Operating Statistics

	City Lines, 112 Companies				Interurban Lines, 40 Companies				Combined City and Interurban Lines, 49 Companies			
	1930		1929		1930		1929		1930		1929	
	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†	Total	Increase or Decrease†
Passenger car-miles.....	798,708,196	836,738,150	38,029,954	4.56	50,853,110	55,091,732	4,238,622	7.69	224,082,674	239,117,305	15,034,631	6.29
Revenue car-miles.....	800,892,499	839,504,697	38,612,198	4.60	72,303,218	76,527,870	4,224,652	5.52	238,124,700	255,211,089	17,086,389	6.70
Total car-miles.....	804,134,089	843,019,286	38,885,197	4.61	74,025,997	78,386,558	4,360,561	5.66	239,912,497	257,418,961	17,506,464	6.80
Revenue passengers.....	4,474,695,644	4,987,388,771	512,693,127	10.28	72,314,515	83,504,544	11,190,029	13.40	1,058,864,566	1,245,745,406	186,880,840	15.00
Revenue transfer passengers.....	232,847,467	277,292,221	44,444,754	16.03	74,770	75,413	643	0.85	12,888,606	15,023,246	2,134,640	14.21
Free transfer passengers.....	1,133,291,824	1,230,594,178	97,302,354	7.91	2,156,273	2,269,552	113,279	4.99	125,517,210	137,494,580	11,977,370	8.71
Total passengers.....	5,873,260,262	6,531,195,329	657,935,067	10.07	77,957,269	89,403,896	11,446,627	12.80	1,216,852,416	1,420,274,257	203,421,841	14.52
Passenger revenue.....	\$332,095,351	\$361,871,713	\$29,776,362	8.23	\$18,683,049	\$22,226,777	\$3,543,728	16.94	\$83,464,568	\$97,010,743	\$13,546,175	13.96
Passenger car-hours.....	75,913,693 ¹	80,211,066 ¹	4,297,373	5.36	1,192,332 ²	1,321,658 ²	129,326	9.79	20,413,357 ³	22,073,880 ³	1,660,523	7.62
Revenue car-hours.....	75,972,803 ¹	80,321,388 ¹	4,348,585	5.41	2,064,382 ²	2,238,086 ²	173,704	7.76	20,883,573 ³	22,568,152 ³	1,684,579	7.47
Total car-hours.....	76,291,525 ¹	80,730,000 ¹	4,438,475	6.50	2,082,290 ²	2,258,401 ²	176,111	7.80	21,012,515 ³	22,708,812 ³	1,696,297	7.47
Miles of single track.....	10,574.51	10,688.72	114.21	1.07	3,278.66	3,400.55	121.89	3.59	7,310.58	7,612.12	301.54	3.86
Passenger cars operated.....	18,554 ⁴	19,306 ⁴	752	3.90	560 ⁴	624 ⁴	64	10.26	4,487 ⁵	4,965 ⁵	478	9.63

†Decreases are indicated by italic figures. ¹Reported by 108 companies. ²Average maximum number of passenger cars in service daily: Reported by 98 companies. ³Reported by 29 companies. ⁴Average maximum number of passenger cars in service daily: Reported by 29 companies. ⁵Reported by 46 companies. ⁶Average maximum number of passenger cars in service daily: Reported by 41 companies.

penses increased to \$70,332,148, or 1.31 per cent. The principal reason for this increase was the expansion of bus service referred to in a previous paragraph. The lines were extended to cover 644 additional miles of roadway, or 5.72 per cent. A certain portion of this expansion was for the replacement of rail lines which for one reason or another were abandoned.

It was not found possible to carry the combined oper-

ating statements farther than the determination of net revenue. Many of the properties are operated in conjunction with other utilities and the net revenues from the various departments are consolidated. These general statements, however, show the principal results of operation for the year and indicate clearly the situation confronting the properties.

For the purpose of following through the distribution

Table XIII—Income Statements in Cents Per Car-mile

	City Lines 112 Companies			Interurban Lines 40 Companies			Combination Lines 49 Companies		
	1930	1929	Increase or Decrease† Per Cent	1930	1929	Increase or Decrease† Per Cent	1930	1929	Increase or Decrease† Per Cent
Railway operating revenue.....	42.43	44.09	3.77	41.56	45.61	8.88	39.70	43.11	7.91
Railway operating expense, excluding depreciation.....	29.33	29.81	1.61	36.08	36.01	0.19	29.57	30.41	2.76
Net operating revenue.....	13.10	14.28	8.26	5.48	9.60	42.92	10.13	12.70	20.24
Net revenue, auxiliary operations.....	0.04	0.01	300.00	0.30	0.28	7.14	1.69	1.74	2.87
Taxes.....	2.85	2.83	0.71	2.24	2.39	6.28	2.56	2.66	3.76
Operating income.....	10.29	11.44	10.05	3.54	7.49	52.74	9.26	11.78	21.59
Non operating income.....	0.85	0.81	4.94	2.67	1.33	100.75	1.41	1.79	21.23
Gross income.....	11.14	12.25	9.06	6.21	8.82	29.59	10.67	13.57	21.37
Deductions from gross income.....	7.06	6.74	4.75	12.34	10.90	13.21	9.31	8.52	9.27
Net income before depreciation.....	4.08	5.51	25.95	6.13	2.08	.....	1.36	5.05	73.07
Depreciation.....	2.75	2.71	1.48	2.01	1.95	3.08	3.05	3.02	0.99
Net income after depreciation.....	1.33	2.80	52.50	8.14	4.03	.....	1.69	2.03	.....

†Decreases or deficits are indicated by italic figures.

Table XIV—Operating Expenses in Cents Per Car-mile

Expenses—	City Lines 112 Companies			Interurban Lines 40 Companies			Combination Lines 49 Companies		
	1930	1929	Increase or Decrease† Per Cent	1930	1929	Increase or Decrease† Per Cent	1930	1929	Increase or Decrease† Per Cent
Way and structures, excluding depreciation.....	3.02	3.15	4.13	5.54	5.29	4.73	4.17	4.48	6.92
Equipment, excluding depreciation.....	3.00	3.10	3.23	3.04	2.93	3.75	3.22	3.30	2.44
Power, excluding depreciation.....	4.05	4.01	1.00	4.98	4.83	3.11	4.22	4.30	1.86
Conducting transportation.....	14.49	14.78	1.96	13.02	13.33	2.33	11.98	12.31	2.68
Traffic.....	0.12	0.12	.....	1.17	1.21	3.31	0.27	0.25	8.00
General and miscellaneous.....	4.65	4.64	0.22	8.43	8.54	1.29	5.72	5.79	1.21
Transportation for investment-credit.....	-0.02	-0.01	100.00	-0.10	-0.12	16.67	-0.01	-0.02	0.50
Total operating expenses, excluding depreciation.....	29.33 ¹	29.81 ²	1.61	36.08	36.01	0.19	29.57	30.41	2.76
Depreciation—									
Way and structures.....	0.65	0.74	12.16	0.27	0.30	10.00	1.36	1.31	3.82
Equipment.....	0.72	0.69	4.35	1.09	1.07	1.87	0.88	0.86	2.33
Power.....	0.14	0.12	16.67	0.04	0.03	33.33	0.38	0.35	8.57
Undistributed depreciation reported in operating expense.....	0.42	0.41	2.44	.....	.....	.....	.....	.....	.....
Total depreciation reported in operating expense.....	1.93	1.96	1.53	1.41	1.40	0.71	2.62	2.52	3.97
Depreciation reported as a deduction from net income.....	0.82	0.76	7.89	0.61	0.54	12.96	0.43	0.50	14.00
Total depreciation.....	2.75	2.72	1.10	2.02	1.94	4.12	3.05	3.02	0.99

† Decreases are indicated by italic figures. ¹ Includes 0.02 cent undistributed expense. ² Includes 0.02 cent undistributed expense.

Table XV—Significant Ratios Derived from Tables IX—XIV

	City Lines, 112 Companies			Interurban Lines, 40 Companies			Combination Lines, 49 Companies		
	1930	1929	Increase or Decrease† Per Cent	1930	1929	Increase or Decrease† Per Cent	1930	1929	Increase or Decrease† Per Cent
Railway operating revenue.....	\$341,250,334	\$371,704,170	8.19	\$30,771,295	\$35,751,746	13.93	\$95,244,297	\$110,982,766	14.18
Per mile of single track.....	32,271	34,775	7.20	9,385	10,514	10.74	13,028	14,580	10.65
Gross income.....	\$89,583,736	\$103,274,032	13.26	\$4,600,229	\$6,910,135	33.43	\$25,588,378	\$34,938,140	26.76
Per mile of single track.....	8,472	9,662	12.32	1,403	2,032	30.96	3,500	4,590	23.75
Passenger revenue.....	\$332,095,351	\$361,871,713	8.23	\$18,683,047	\$22,226,778	15.94	\$83,464,568	\$97,010,743	13.96
Per revenue passenger, cents.....	7.42	7.26	2.20	25.84	26.62	2.93	7.88	7.79	1.16
Per total passenger, cents.....	5.65	5.54	1.99	23.97	24.86	3.58	6.86	6.83	0.44
Per mile of single track.....	\$31,405	\$33,855	7.24	\$5,698	\$6,536	12.82	\$11,417	\$12,744	10.41
Per passenger car-mile, cents.....	41.58	43.25	3.86	36.74	40.35	8.95	37.25	40.57	8.18
Per car operated.....	\$15,118	\$15,681	3.59	\$24,102	\$26,230	8.11	\$15,609	\$16,397	4.81
Per passenger car-hour.....	\$3.92	\$4.05	3.21	\$6.26	\$6.75	7.26	\$3.62	\$3.92	7.65
Revenue passengers.....	4,474,695,644	4,987,388,771	10.28	72,314,515	83,504,544	13.40	1,058,864,566	1,245,745,406	15.00
Per mile of single track.....	423,159	466,603	9.31	22,056	24,556	10.18	144,840	163,653	11.50
Per passenger car-mile.....	5.60	5.96	6.04	1.42	1.52	6.58	4.73	5.21	9.21
Per car operated.....	\$194,275	\$206,646	5.99	\$83,554	\$90,955	8.14	\$199,762	\$213,428	6.40
Per passenger car-hour.....	54	57	5.26	20	21	4.76	57	51	7.84
Total passengers.....	5,873,260,262	6,531,195,329	10.07	77,957,269	89,403,896	12.80	1,216,852,416	1,420,274,257	4.32
Per mile of single track.....	555,417	611,036	9.10	23,777	26,291	9.56	166,451	186,581	10.79
Per passenger car-mile.....	7.35	7.81	5.89	1.53	1.62	5.56	5.43	5.94	8.59
Ratio, transfer passengers to revenue passengers, per cent.....	30.53	30.23	0.99	3.09	2.81	9.96	13.07	12.24	6.78
Revenue car-miles.....	800,892,499	839,504,697	4.60	72,303,218	76,527,870	5.52	238,124,700	255,211,089	6.70
Per mile of single track.....	75,738	78,541	3.57	22,053	22,505	2.01	32,573	33,528	2.85
Per car operated.....	136,379	136,307	0.20	\$95,900	\$91,396	4.93	\$45,486	\$44,118	3.10
Per car-hour.....	49.35	49.27	0.86	\$13.17	\$13.14	0.23	\$9.80	\$9.69	1.14
Revenue car-hours.....	\$75,972,803	\$80,321,388	5.41	\$2,064,382	\$2,238,086	7.76	\$20,883,573	\$22,568,152	7.37
Per car operated.....	\$3,923	\$3,915	0.20	\$7,377	\$6,666	10.67	\$4,504	\$4,395	2.48

†Decreases are indicated by italic figures. ¹Reported by 98 companies. ²Reported by 29 companies. ³Reported by 41 companies. ⁴Reported by 108 companies. ⁵Reported by 46 companies. ⁶Reported by 94 companies. ⁷Reported by 23 companies. ⁸Reported by 38 companies.

of the various accounts where it is possible, Tables IV-VIII, constituting Part I of the statistics, were prepared from the statements of 201 electric railways. These companies either operate electric railways exclusively, or else separate the electric railway departments, so that the figures reflect the operations of rail lines alone. The New York rapid transit companies were excluded from these tables, since they furnish a special form of service, and the magnitude of the figures is such that they would overshadow all the others and so distort the results for the remainder of the industry.

Revenues of these 201 companies fell by \$51,172,756 to \$467,265,926, or 9.87 per cent below 1929. The analysis of the revenues by primary accounts given in Table V indicates that the miscellaneous sources of revenue, such as mail, express and freight, suffered more than the passenger business. This again is a measure of the recession of industrial activity, and indicates that the fundamental business of the electric lines, that of hauling passengers, suffered considerably less than the other departments.

Retrenchments amounting to \$24,317,628 brought the total operating expense of this group down to \$333,529,798, a decrease of 6.80 per cent. In other words, the savings accounted for almost one-half of the loss of revenue, so that the net was off only \$26,855,128, or 16.73 per cent. While this was a serious loss, it must be remembered that operating expense had been reduced to some extent in 1929 and previous years.

Referring to Table VI, it will be seen that the greatest reduction was made in the conducting transportation account. The saving of \$11,912,108 accounts for nearly half of the total. Other substantial savings of varying amounts were made in every department.

Operating statistics are given in Table VII, and significant ratios derived from them are shown in Table VIII. It will be noted that there was a gain of 1.71 in the revenue received from each paying passenger, the average fare being 7.75 cents. While there was a reduction of 5.12 per cent in revenue car-miles, the reduction in revenue car-hours was greater, being 5.91 per cent. This is equivalent to an increase in schedule speed, the car-miles per car-hour going up to 9.53 for the year. Greater use was made of the equipment actually operated, as both the car-miles and the car-hours per revenue car were increased for the year. This is remarkable in view of the reduction in car-hours and car-miles. It means that the companies were able to make greater use of the best of the equipment, and so retire the older and slower cars.

Part II of the survey is a further segregation of the accounts of the 201 companies by type of road. In this are included 112 companies operating city lines exclusively, 40 companies operating interurbans exclusively, and 49 companies with a combination of city and interurban or suburban lines which could not be separated. The city lines, which formed the largest group by far, made a much better showing than the others, revenues being down only 8.19 per cent as compared with a loss of 13.93 per cent for the interurban group and 14.18 per cent for the combination group. This difference must be taken in connection with the reduction in expense, which was 6.15 per cent for the city group, 5.97 per cent for the interurban group, and 9.37 per cent for the combination group. In net revenue the interurbans made by far the poorest showing, with a reduction of 46.05 per cent. As a group they showed

a net deficit after depreciation amounting to \$6,027,118, whereas the city group showed a net income of \$10,723,530 after depreciation.

Further analysis of the accounts of the three groups of properties is made in Tables X to XV. In general, it will be seen that the figures are approximately parallel. Expenses per car-mile for the city properties amounted to 29.33 cents, for the interurbans 36.08, and for the combination systems 29.57. The car-mile costs varied but little from those for the preceding year. It is noteworthy that the amounts charged to depreciation were increased for all types of properties, showing that there was no tendency to skimp in this account in order to make a favorable showing.

London Underground Tests Passengers' Honesty

LONDON subway passengers, on the whole, are an honest lot. As a result of one day's special observation at one of the biggest subway stations, Trafalgar Square Station, only five persons were caught trying to avoid payment of the proper fare. The Underground has been seeking to save time at a number of the busiest stations, including Trafalgar Square, by making them "open" stations. Passengers take their own tickets at automatic machines, and pass through without any examination being made at the barriers. Hitherto inspectors at the barriers punched all tickets as the passengers passed through.

On the day of the test several inspectors were placed on special duty at the bottom of the escalators examining tickets. The five passengers caught cheating showed season tickets or return workmen's tickets entitling them to start their journey from the next station, and they should have taken another penny (2-cent) ticket on entering the station. At the bottom of the escalator they were given the choice of returning to the entrance and booking the penny ticket, or promising to pay the penny at the end of their journeys. All chose the latter alternative. They were followed and each left the station at the other end without paying. They were arrested and fined.

In commenting on the results of this experiment, an Underground official said:

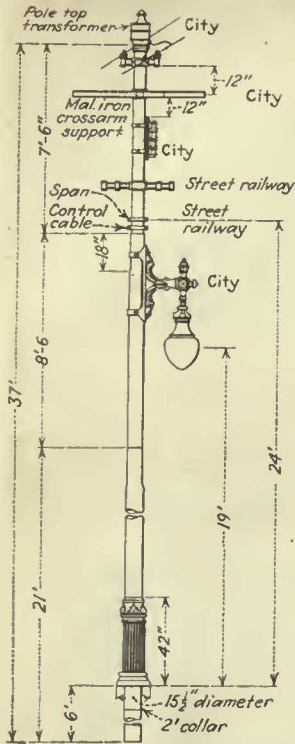
There is a tradition of fair-dealing among passengers, and this becomes obvious when you deal with millions of them, as we do every day. Of course there are always a few who won't play the game. But we have a system of inspection that quickly finds them out, and it would be absurd to do away with the automatic ticket machines because of those few people.

The open-station system was first introduced with the starting of the escalators. The escalators made it simple for the passenger to get straight from the street to the platform level. They did not have to wait for the elevators. The ticket machines helped to solve the other difficulties—the difficulties of the heavy traffic at rush hours, the difficulties of handling the queues at the booking offices and of handing out change to thousands of people. The machines eased this situation. Regular travelers knew how much their tickets cost. It was simple for them to put their pennies into the slot and get the tickets for themselves. Then they could go straight down the escalator without queuing up at the booking offices.

Even now, however, the stations are not really "open" ones. The tickets are still examined at the barrier, except on certain occasions when the ticket man is called away. And in addition to that we have our own methods of detecting frauds. The "open" system has been a success. More than 100,000,000 passengers per annum get their tickets from the machines. We could hardly stop the thing now because of a few black sheep.

Cincinnati Eliminates Unnecessary Poles

Co-operative planning by the city and various utilities has resulted in marked improvement in appearance of streets



Standard 7-6-5-in. pole used jointly by Cincinnati Street Railway and city of St. Bernard

CO-OPERATION between the city, the street railway, and other public utilities has made notable progress in Cincinnati in recent years. Instead of each tenant of the street constructing its service lines independently

of the city and of other companies, work of this character has been effectively co-ordinated. Engineers representing the various interests have been specially interested in ways to improve the appearance of the streets as well as their efficiency. This was particularly manifest in an effort to eliminate unnecessary poles. Under the sponsorship of Edgar Dow Gilman, director of public utilities, and R. J. Stock, electrical engineer of the department of public utilities, this has been done in many locations.

One of the most notable examples of this work was on Reading Road, one of the city's principal thoroughfares, extending northwardly connecting the downtown portion of the city with Avondale and Bond Hill, a portion of

U. S. Highways 25 and 42. Previous to the improvement, there was a multiplicity of poles of various shapes and sizes, and uneven spacing along both sides of the thoroughfare. Some of the poles were iron, and some were wood. They were of different heights and diameters. There were also some boulevard light standards, and some traffic light standards. In many instances the boulevard lights were only 18 in. from a large diameter pole, which materially cut down the illumination to the street. Crossing the street overhead, were hundreds of service wires for house connections, as the secondary power and light wires were only on one side of the street.

When repaving was undertaken a short time ago, the plans called for the widening of the street, which meant that all the poles, boulevard light ducts, foundations, and cables had to be moved back to clear the new curbing. This involved the expenditure of a considerable amount of money on the part of the utility companies, as ordinances and contracts provide that the expense of such work be borne by them. It was felt that the appearance of the street could be improved by eliminating all of the unnecessary poles. The joint use of poles seemed to be the most satisfactory solution of the problem.

The plan adopted resulted in a single pole line on each side of the street, reducing by more than half the original number of poles along the thoroughfare. Iron poles were placed on one side of the street and wooden poles of "Black Jack" type opposite the iron poles on the other side. The railway feeders, a boulevard light wire, trolley span wires, and a three-insulator rack supporting secondary power and light conductors and an ornamental bracket equipped with an inverted boulevard light are carried on the iron poles.



Reading Road, Cincinnati, as it formerly appeared with separate poles for various purposes

Three-phase, 4,300-volt power lines, a boulevard light wire, a three-insulator rack supporting secondary power and light conductors, trolley span wires, and an ornamental bracket supporting an inverted boulevard light are carried on the wooden poles. Secondary power and light conductors on both sides of the street eliminate all conductors crossing the thoroughfare overhead for house connections.

Instead of using the same boulevard light glassware, which was a 16-in. diameter ball type and not very efficient, the lamps were equipped with Holophane dome refractors. The lighting fixture consists of an ornamental 36-in. cast-iron bracket, a cast-iron fixture with 6.6-amp. 2,500-lumen series lamp and dome refractor. The mounting height of the lamps is 16 ft. as against 12 ft. in the original installation. Practically all the light given from the lamps, neglecting that absorbed by glassware, etc., is used to light the street, whereas in the original installation, which consisted of the lamp and round glass mounted upon standards, much of the light was directed upward.

Other important streets improved in a manner identical to Reading Road included McMillan Street, principal crosstown artery, from May Street to Peebles Corner, and Montgomery Road, highway leading from Walnut Hills through Norwood, Pleasant Ridge and Silvertown to Deer Park, a part of the State Route No. 3. on which unnecessary poles were eliminated from Lester Road to Woodmont Avenue. Another pole elimination was accomplished on Erkenbrecker Avenue, a crosstown street which connects the Cincinnati Zoological Garden with Burnet Avenue. The construction here differs from that on Reading Road, McMillan Street and Montgomery Road in that iron poles are used on both sides of the thoroughfares. This was possible because there were no 4,300-volt three-phase lines to be accommodated. In this installation the poles are all the same and, of course, present a somewhat better appearance than the other installations.

St. Bernard, Ohio, a thriving little city with a population of about 8,000, which is entirely surrounded by the City of Cincinnati, accomplished an excellent job of pole elimination on its principal thoroughfare at which time hundreds of useless poles were removed. Through contract and lease with the Cincinnati Street Railway, ornamental steel poles 37 ft. long, each pole having a cast iron ornamental base 42 in. high, were installed with equipment for all forms of service on the one pole line. This includes the boulevard lighting system, numerous electric service lines, high-tension wires, trolley and feed wires, fire alarm circuits and signal circuits. Telephone lines in St. Bernard are underground as in Cincinnati.

Each pole carries a 1,000 cp. lighting unit, spaced 100 ft. apart. This illumination, together with the elimination of the forest of poles and maze of overhead wires has transformed a dismal street into a white-



Section of East Fifth Street where span wires are attached directly to the walls of the Hotel Gibson

way thoroughfare. The special poles and equipment were designed by the Electric Railway Equipment Company. Each pole has a pole top current transformer and a four pin crossarm for the series boulevard light circuit. In order that every other lamp may be extinguished at midnight, the lamps are arranged on two different circuits. Directly below this crossarm is a four-spool Hubbard rack for distribution service. Below the Hubbard rack on one side of the street is a four-pin pressed-steel crossarm for the railway feeders, and directly below this crossarm is the span-wire collar, 24 ft. above the curb.

On some of the city's most important downtown streets, such as Fourth Street, poles have been entirely eliminated except for street lighting, as trolley supporting span wires are attached direct to buildings. For example, the new 48-story Carew Tower at Fifth and Vine, just completed, uses the span wire attachment plan.

Because railway operation in Cincinnati utilizes two trolley wires, the overhead construction must be more rugged than would otherwise be required. Despite the problem thus created, the program of pole elimination is progressing steadily and satisfactorily.



Improved appearance of Reading Road after installation of joint poles and elimination of those no longer needed

Condensed Financial Reports of Electric Railway Properties, 1930-1929

All Figures Are In Dollars, Unless Otherwise Indicated

	Auburn & Northern Electric R.R., Syracuse, N. Y.		Bamberger Electric Railroad, Salt Lake City, Utah.		Beaver Valley Motor Coach Co., New Brighton, Pa.		Beaver Valley Traction Co., New Brighton, Pa.		Boston, Worcester & New York Street Ry., Frammingham, Mass.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	23,655	25,522	511,474	567,224	99,692	108,618	476,824	540,440	786,763	741,028
Railway operating expenses	25,725	27,427	450,221	453,392 ¹	77,942	85,381	322,610	359,220	661,792	609,028
Net revenue, railway oper..	9,070	1,905	61,253	113,831	21,750	23,237	154,214	181,220	124,971	132,000
Taxes	2,187	2,225	36,500	.....	1,010	577	3,724	4,303	18,320	18,294
Operating income.....	4,957	4,189	24,753	.....	20,740	22,660	150,490	176,917	43,271 ⁶	71,408 ⁸
Non-operating income.....	47	54	4,249	.....	4	6	2,709	2,905	.....	12,816
Gross income.....	4,909	4,075	29,002	.....	20,744	22,666	153,200	179,822	47,447	84,224
Deduct. from gross income.	.....	.....	95,420	.....	14,243	14,852	177,169	175,801	37,537	55,408
Net income.....	.....	.....	66,418	.....	6,500	7,814	25,969	4,021	9,909	18,816
Operating ratio.....	1,087	1,075	0.880	0.799	0.782	0.786	0.676	0.665	0.841	0.822

	California Street Cable R.R., San Francisco, Cal.		Chicago, Aurora & Elgin R.R., Chicago, Ill.		Chicago Motor Coach Co., Chicago, Ill.		Connecticut Co., New Haven, Conn.		Des Moines & Central Iowa R.R., Des Moines, Iowa	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	456,661	494,344	2,661,062	2,807,829	5,806,178	6,870,136	11,956,815	13,399,101	391,839	465,072
Railway operating expenses	426,696	432,936	2,390,834 ¹	2,550,531 ¹	4,088,032	5,373,967	9,086,521	10,546,907	392,261 ¹	435,896 ¹
Net revenue, railway oper..	29,965	61,408	.....	.....	1,718,146	1,496,169	2,870,294	2,852,194	.....	.....
Taxes	29,329	34,561	.....	.....	471,708	398,542	554,094	678,173	.....	.....
Operating income.....	635	26,846	270,228	257,298	744,587 ⁸	480,828 ⁸	2,316,200	2,174,021	71,069 ⁸	49,472 ⁸
Non-operating income.....	11,527	12,466	286,952	292,712	16,471	29,557	163,084	146,046	.....	.....
Gross income.....	12,162	39,312	557,180	550,010	761,058	510,385	2,479,284	2,320,068	71,069	49,472
Deduct. from gross income.	.....	62	576,477	476,098	219,147	149,278	1,260,494	1,289,727	128,054	128,121
Net income.....	12,162	39,250	19,297	73,912	551,911	361,109	1,218,790	1,030,341	200,123	170,593
Operating ratio.....	0.935	0.876	.....	.....	0.704	0.782	0.759	0.787	.....	.....

	Des Moines Railway, Des Moines, Iowa		Empire State Railroad, Syracuse, N. Y.		Evanston Railway, Evanston, Ill.		Evansville & Ohio Valley Ry., Evansville, Ind.		Fonda, Johnstown & Gloversville B.R., Gloversville, N. Y.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	2,041,628	.....	23,655	25,522	332,495	354,703	274,299	.....	922,123	1,025,933
Railway operating expenses	266,389	.....	25,725	27,427	215,398 ¹	236,783 ¹	246,038 ¹	.....	744,265	760,871
Net revenue, railway oper..	775,239	.....	2,070	1,901	.....	.....	.....	.....	177,858	265,061
Taxes	168,000	.....	2,187	2,225	.....	.....	.....	.....	57,640	70,775
Operating income.....	607,239	.....	4,257	4,189	117,096	117,920	28,261	.....	120,218	194,285
Non-operating income.....	.....	.....	47	54	.....	.....	.....	.....	87,152	122,767
Gross income.....	607,239	.....	4,209	4,075	117,096	117,920	28,261	.....	207,370	317,053
Deduct. from gross income.	713,005 ⁸	.....	.....	.....	39,562	75,963	24,454	.....	355,957	381,130
Net income.....	105,767	.....	.....	.....	77,534	41,958	3,807	.....	148,586	64,077
Operating ratio.....	0.620	.....	1.087	1.075	.....	.....	.....	.....	0.807	0.74

	Harrisburg Railways, Harrisburg, Pa.		Holyoke Street Ry., Holyoke, Mass.		Johnstown Traction Co., Johnstown, Pa.		Lehigh Valley Transit Co., Allentown, Pa.		Lethbridge Municipal Ry., Lethbridge, Alta.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	1,482,178	1,628,222	567,074	703,745	988,054	1,083,724	3,803,254	4,220,636	53,817	62,206
Railway operating expenses	1,162,497 ¹	1,152,999 ¹	526,346 ¹	618,709 ¹	657,465 ¹	732,599 ¹	2,788,702 ¹	3,022,681 ¹	49,065	50,912
Net revenue, railway oper..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Taxes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Operating income.....	319,681	475,223	40,728	85,036	280,589 ⁸	301,125 ⁸	1,014,552	1,197,955	4,752	11,294
Non-operating income.....	82,136	78,237	23,136	24,429	.....	19,741	196,321	177,942	.....	.....
Gross income.....	401,818	553,460	63,865	109,465	280,589	320,866	1,210,874	1,375,897	4,752	11,294
Deduct. from gross income.	296,901	303,931	82,234	82,605	203,480	196,800	770,256	873,693	310,17	31,020
Net income.....	104,917	249,529	18,369	26,860	77,109	124,066	440,618	502,204	26,585	19,726
Operating ratio.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

	Levis Tramways, Levis, P.Q., Canada		Lincoln Traction Co., Lincoln, Neb.		Market Street Ry., San Francisco, Cal.		Memphis Street Railway, Memphis, Tenn.		New York & Stamford Ry., New York, N. Y.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	159,959	173,361	420,117	474,997	9,196,340	9,590,194	2,652,932	2,915,090	0	1,362
Railway operating expenses	127,689 ¹	134,161 ¹	403,253 ¹	415,779 ¹	7,286,745	7,469,478	1,874,778 ¹	1,997,052 ¹	35,138	9,831
Net revenue, railway oper..	.....	.....	.....	.....	1,909,595	2,120,716	.....	.....	.....	.....
Taxes	.....	.....	.....	.....	556,000	595,000	.....	.....	4,942	3,931
Operating income.....	5,996 ⁸	12,587 ⁸	13,864	59,218	1,353,595	1,525,716	524,876 ⁸	918,038 ⁸	40,100	12,400
Non-operating income.....	1,410	1,384	3,717	2,139	20,523	22,522	861	792	148,772	137,140
Gross income.....	7,406	13,971	17,581	61,357	1,374,118	1,548,268	525,737	674,262	108,672	124,740
Deduct. from gross income.	6,583	12,397	44,047	48,194	1,195,212	1,255,783	550,652	528,343	127,951	132,144
Net income.....	823	1,574	26,466	13,163	178,906	292,485	24,915	145,919	19,280	7,403
Operating ratio.....	.....	.....	.....	.....	0.792	0.778	.....	.....	.....	.....

	New York State Rys., Rochester, N. Y.		New York Transportation Co., New York, N. Y.		Northampton Street Railway, Northampton, Mass.		Northern Texas Traction Co., Fort Worth, Tex.		Ohio Valley Electric Ry., Huntington, W. Va.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	7,578,955	9,126,524	6,299,767	6,730,730	176,494	217,983	2,181,865	2,514,379	541,817	650,298
Railway operating expenses	7,198,284	7,623,292	5,064,295							

Condensed Financial Reports of Electric Railways, 1930-1929 (Concluded)

All Figures Are in Dollars, Unless Otherwise Indicated

	Oregon Electric Railway, Portland, Ore.		Pacific Electric Railway, Los Angeles, Cal.		Peninsular Railway, San Jose, Cal.		Peoples Motor Bus Co., St. Louis, Mo.		Peoples Railway, Dayton, Ohio	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	639,889	778,814	15,692,359	18,417,335	225,435	228,764	2,191,678	2,460,634	589,373	680,540
Railway operating expenses	1,180,063 ¹	1,247,970 ¹	13,989,913	15,499,320	292,413	264,201	1,949,426	2,141,258	454,659 ¹	483,869 ¹
Net revenue, railway oper.	.....	.....	1,693,446	2,918,014	66,977	35,436	242,252	319,376	.....	.....
Taxes.....	.....	.....	1,082,933	1,112,611	12,138	11,964	140,766	151,650	.....	.....
Operating income.....	540,174	469,156	610,512	1,805,403	79,115	47,401	101,486	167,726	100,876 ²	153,356 ²
Non-operating income.....	7,271	6,160	331,484	376,658	34,254	40,716	19,373	10,513	646	275
Gross income.....	532,903	462,996	941,996	2,182,061	44,860	6,685	120,859	178,239	101,522	153,631
Deduct. from gross income.	751,828	713,399	2,911,818	2,897,621	123	2,153	11,203	14,123	27,336	28,220
Net income.....	1,284,731	1,176,395	1,969,821	715,560	44,984	8,838	109,659	164,116	74,186	125,411
Operating ratio.....	.....	.....	0.895	0.841	1.297	1.111	0.889	0.878	.....	.....

	Petaluma & Santa Rosa R.R., Petaluma, Cal.		Philadelphia & West Chester Traction Co., Upper Darby, Pa.		Pittsburgh Motor Coach Co., Pittsburgh, Pa.		Pittsburgh Railways, Pittsburgh, Pa.		Portland Railroad, Portland, Me.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	520,278	511,069	1,156,832	1,238,174	1,014,608	887,072	18,758,598	20,258,007	1,208,078	1,252,291
Railway operating expenses	391,673	387,803	920,606	925,577	886,373	703,583	14,373,546	15,272,740	1,156,968 ¹	1,090,493
Net revenue, railway oper.	128,605	123,265	236,226	312,597	128,235	183,488	4,385,052	4,985,267	.....	161,798
Taxes.....	21,746	29,944	42,999	45,262	12,790	6,185	508,167	535,459	.....	80,917
Operating income.....	106,858	93,321	193,227	267,335	115,445	177,303	3,876,885	4,449,808	51,110	80,881
Non-operating income.....	45,015	40,019	58,819	49,517	3,903	5,989	76,689	106,556	.....	.....
Gross income.....	151,873	133,340	252,046	316,852	119,348	183,292	3,948,113	4,556,374	51,110	80,881
Deduct. from gross income.	62,363	61,793	222,099	222,090	219,087	169,479	4,537,020 ¹¹	4,540,469 ¹¹	263,548	163,598
Net income.....	89,510	71,547	29,956	94,762	99,738	13,813	588,906	15,904	212,437	82,717
Operating ratio.....	0.753	0.758	0.796	0.747	0.873	0.793	0.766	0.754	.....	0.871

	Rochester & Syracuse, R.R., Syracuse, N. Y.		San Francisco, Napa & Callistoga Ry., Napa, Cal.		San Jose Railroads, San Jose, Cal.		Second Avenue R.R., New York, N. Y.		Stockton Electric R.R., Stockton, Cal.	
	1930	1929	1930	1929	1930	1929	1930 ¹	1929	1930	1929
Railway operating revenue	513,029	655,634	172,842	215,888	323,693	349,061	863,491	306,041	257,298	278,471
Railway operating expenses	569,842 ¹	632,744 ¹	146,807	166,562	266,431	293,199	872,726 ¹	281,935 ¹	215,013	227,480
Net revenue, railway oper.	.....	.....	26,034	49,325	57,261	55,862	.....	.....	42,284	50,991
Taxes.....	.....	.....	11,550	11,685	22,793	23,693	.....	.....	18,223	20,340
Operating income.....	56,813	22,890	14,484	37,639	34,467	32,169	9,235	24,106	24,061	30,650
Non-operating income.....	.....	.....	3,197	3,307	1,860	1,872	3,769	261	740	506
Gross income.....	56,813	22,890	17,681	40,947	36,328	34,041	5,466	24,367	24,801	31,156
Deduct. from gross income.	41,951	125,734	63,079	75,276	101,185	102,231	.....	.....	0	0
Net income.....	103,764	102,844	45,397	34,329	64,856	68,190	.....	.....	24,801	31,155
Operating ratio.....	.....	.....	0.849	0.771	0.829	0.840	.....	.....	0.832	0.817

	Tacoma Municipal Railway, Tacoma, Wash.		Toronto Transportation Commission, Toronto, Ont.		Trenton Transit Co., Trenton, N. J.		United Railways & Electric Co., Baltimore, Md. ⁷		Visalia Electric R.R., Exeter, Cal.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	96,305	100,379	14,068,379	14,498,624	1,481,478	1,664,575	16,188,688	16,273,825	200,525	192,777
Railway operating expenses	119,992	88,561	9,008,602 ¹	9,131,853 ¹	1,200,370 ¹	1,308,284 ¹	10,796,439	10,885,708	93,521	99,832
Net revenue, railway oper.	.....	.....	.....	.....	.....	.....	5,392,249	5,388,117	107,004	92,945
Taxes.....	.....	.....	.....	.....	.....	.....	1,575,938	1,579,061	19,918	18,192
Operating income.....	34,687	11,818	5,059,776	5,366,773	281,178	356,291	3,816,291	3,809,056	87,085	74,752
Non-operating income.....	31,323	1,912	3,197	3,307	12,674	29,090	165,656	175,041	6,941	7,087
Gross income.....	7,636	9,416	5,059,776	5,366,770	293,712	385,381	3,981,947	3,984,097	94,026	81,839
Deduct. from gross income.	18,096	17,400	4,937,407	5,175,089	426,896	449,158	3,446,582	3,410,955	1,191 ²	454 ²
Net income.....	10,460	7,493	122,369	191,682	133,184	63,777	535,365	573,142	92,835 ³	81,384 ³
Operating ratio.....	1.246	0.882	.....	.....	.....	.....	0.666	0.667	0.463	0.511

	Washington, Baltimore & Annapolis Elec. R.R., Baltimore, Md.		West Penn Railways, Pittsburgh, Pa.		Winona Railroad, Warsaw, Ind.		Melbourne & Metropolitan Tramways Board, Melbourne, Australia		Central London Ry., London, England	
	1930	1929	1930	1929	1930	1929	1930 ¹	1929 ¹	1930	1929
Railway operating revenue	2,389,435	2,537,511	6,264,112	7,127,969	199,487	257,387	£2,349,154	£2,435,548	£502,498	£512,410
Railway operating expenses	2,346,138 ¹	2,159,373 ¹	3,290,107 ¹	3,558,723 ¹	202,738 ¹	215,283 ¹	1,658,830	1,704,678	314,041	332,576
Net revenue, railway oper.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Taxes.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Operating income.....	43,297	378,138	2,482,649 ⁶	3,100,240 ⁶	3,258	42,097	693,234	730,870	188,457	179,834
Non-operating income.....	6,748	5,912	.....	.....	2,832	4,378	.....	.....	84,201	86,936
Gross income.....	50,045	384,050	2,482,649	3,100,240	426	46,475	693,234	730,870	272,658	266,770
Deduct. from gross income.	663,127	585,449	937,168	805,411	62,481	54,289	338,237	345,885	97,147	92,072
Net income.....	613,082	201,409	1,545,481	2,294,829	62,906	7,814	352,087	384,945	175,511	174,698
Operating ratio.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

	Underground Electric Rys., London, England		Christchurch Tramway Board, Christchurch, N.Z.		Hamburg Elevated Railway, Hamburg, Germany ⁹	
	1930	1929	1930 ²	1929 ²	1930	1929
Railway operating revenue	£15,848,088	£15,097,592	£264,249	£276,689	67,573,240	68,108,807
Railway operating expenses	12,888,762 ¹	12,288,229 ¹	189,813 ¹	196,522 ¹	53,072,835	53,675,711
Net revenue, railway oper.	.....	.....	.....	.....	.....	.....
Taxes.....	.....	.....	.....	.....	.....	.....
Operating income.....	2,959,326	2,809,363	74,436	80,167	14,500,405	14,433,096
Non-operating income.....	.....	.....	.....	.....	.....	.....
Gross income.....	1,028,586	1,080,003	.....	.....	144,548	126,412
Deduct. from gross income.	3,987,912	3,889,366	74,436	81,167	14,644,953	14,559,508
Net income.....	2,831,375 ⁴	2,738,940 ⁴	74,442	72,421	12,949,603	12,791,594
Operating ratio.....	1,156,537	1,150,426	.....	.....	1,695,350	1,767,914

¹Includes taxes
²Year ended June 30
³Includes depreciation
⁴Includes auxiliary operations
⁵Includes dividends on guaranteed stocks
⁶After depreciation
⁷Revised statement
⁸Company owes Southern Pacific \$1,051,381 on which no interest is being paid
⁹In reichsmarks
¹⁰Mar. 12, 1929 to June 30, 1929
¹¹Includes 6 per cent return on capital investment
¹²Includes Pittsburgh & Beaver Street Railway

Trend of REVENUES and EXPENSES

PUBLICATION of earnings figures of leading companies covering an entire year is continued in this issue as a regular monthly feature. From these statistics it appears for the first time in several months that there

is a fairly general trend toward a cessation of the large losses in revenue experienced each month since early in 1930. Besides this, the curtailment in expenses by practically all the companies listed has continued, so that in a number of instances there has been an actual gain in net income for the latest month over the corresponding period of last year. This is an indication that the business situation is at last growing less severe and is on the way toward recovery.

Abstracts of annual reports of 60 additional companies are given on pages 308 and 309.

Monthly and Other Financial Reports

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
	\$	\$	\$	\$	\$
Boston, Revere Beach & Lynn R.R., Boston, Mass.					
3 mo. end. Mar., 1931	271,067	246,997a		24,070	11,149
3 mo. end. Mar., 1930	280,550	256,500a		24,050	11,927

Boston, Worcester & New York Street Railway, Framingham, Mass.					
3 mo. end. Mar., 1931				5,765	13,956
3 mo. end. Mar., 1930				11,342	3,152

Cincinnati Street Railway, Cincinnati, Ohio					
April, 1931	664,131	426,468	57,504	206,071	17,778

Denver Tramway, Denver, Col.					
3 mo. end. Mar., 1931	920,724	648,644	113,282	171,405	49,960
3 mo. end. Mar., 1930	1,060,205	727,162	123,083	221,805	96,150
3 mo. end. Mar., 1929	1,088,420	726,359	124,035	250,348	120,951
3 mo. end. Mar., 1928	1,090,628	730,245	127,115	242,759	117,018

Des Moines Railway, Des Moines, Iowa					
March, 1931	163,662	110,958	14,000	38,703	3,529
March, 1930	188,316				
April, 1931	158,393	109,884	14,000	34,509	7,805
April, 1930	173,461				

Edmonton Radial Railway, Edmonton, Alta.					
March, 1931	69,539	47,087		22,451	21
March, 1930	77,239	47,472		29,766	2,539
3 mo. end. Mar., 1931	200,197	136,189		64,008	4,291
3 mo. end. Mar., 1930	238,390	146,412		91,978	7,638
April, 1931	62,707	46,218		16,488	3,940
April, 1930	66,384	45,298		21,086	1,611
4 mo. end. Apr., 1931	262,905	182,407		80,497	8,222
4 mo. end. Apr., 1930	304,775	191,710		113,064	5,996

Havana Electric Railway, Havana, Cuba					
3 mo. end. Mar., 1931	1,049,751	958,619a		92,686	64,203b
3 mo. end. Mar., 1930	1,356,063	1,448,840a		213,227	53,642b

Honolulu Rapid Transit Co., Honolulu, Hawaii					
March, 1931	86,308	50,797	7,744	28,917	18,462
March, 1930	89,848	53,790	8,819	28,423	16,309
3 mo. end. Mar., 1931	247,554	150,689	25,740	64,249	42,878
3 mo. end. Mar., 1930	259,325	160,079	26,458	76,161	40,393
April, 1931	84,244	51,294a		32,950	14,749
April, 1930	86,015	46,272a		39,743	18,296
4 mo. end. Apr., 1931	330,835	201,983a		128,852	57,627
4 mo. end. Apr., 1930	344,390	206,351a		138,039	58,689

Kansas City Public Service Co., Kansas City, Mo.					
3 mo. end. Mar., 1931	2,073,908	1,692,644		381,264	115,887

Mexico Tramways, Mexico City, Mex.					
March, 1931	804,330	890,519a		86,180	
March, 1930	877,870	901,730a		23,860	
3 mo. end. Mar., 1931	2,269,230	2,594,600a		395,370	
3 mo. end. Mar., 1930	2,491,460	2,637,830a		145,370	

New York Railways, New York, N. Y.					
March, 1931	452,987	401,831a		51,156	13,549
March, 1930	461,704	427,031a		34,673	27,246
3 mo. end. Mar., 1931	1,280,207	1,398,383a		118,175	2,847
3 mo. end. Mar., 1930	1,330,128	1,415,695a		85,567	101,442
April, 1931	452,547	394,032a		58,515	10,346
April, 1930	453,266	414,223a		39,043	22,740c
4 mo. end. Apr., 1931	1,732,755	1,556,065a		176,690	22,195
4 mo. end. Apr., 1930	1,783,395	1,558,785a		124,610	124,183c

Schenectady Railway, Schenectady, N. Y.					
3 mo. end. Mar., 1931	362,462	312,281	24,694	26,818	40,956
3 mo. end. Mar., 1930	420,558	354,599	23,358	43,563	22,215

Twain City Rapid Transit Co., Minneapolis, Minn.					
3 mo. end. Mar., 1931	2,982,243	2,249,402		732,840	221,316
3 mo. end. Mar., 1930	3,579,496	2,539,930		1,039,566	

Youngstown Municipal Railway, Youngstown, Ohio					
March, 1931	132,284	128,842		3,442	
March, 1930	168,162	168,848		886	

Italic figures indicate deficit. a Includes taxes. b Before depreciation. c Before adjustment bond interest.

Trend of Revenues and Expenses by Months

	Operating Revenue	Increase or Decrease Per Cent*	Operating Expenses and Taxes	Increase or Decrease Per Cent*	Net Income	Increase or Decrease Per Cent*
	\$		\$		\$	
Boston Elevated Railway, Boston, Mass.						
Apr., 1930	2,813,083	3.54	2,073,580	0.95	311,386	21.80
May	2,824,945	5.17	2,084,708	2.50	302,590	25.51
June	2,550,775	3.93	1,937,134	3.05	143,016	36.53
July	2,371,152	5.04	2,108,071	0.61	167,529	189.94
Aug.	2,280,322	7.81	2,113,183	1.55	274,728	163.79
Sept.	2,470,918	3.78	2,091,718	0.52	69,888	200.31
Oct.	2,811,399	4.04	2,157,474	1.29	221,188	31.80
Nov.	2,579,899	10.34	2,066,206	2.26	71,150	77.86
Dec.	2,850,330	8.20	2,178,896	2.54	235,950	68.22
Jan., 1931	2,840,159	8.44	2,082,456	6.23	314,067	30.66
Feb.	2,534,828	8.33	1,952,032	6.23	142,339	48.27
Mar.	2,769,564	7.30	2,019,081	4.92	309,212	29.08
Apr.	2,616,188	7.00	1,909,176	7.93	275,740	11.45

Brooklyn-Manhattan Transit System, New York, N. Y.						
Apr., 1930	5,074,571	23.82	3,578,817	23.35	802,168	51.14
May	5,229,829	21.65	3,600,727	22.46	929,201	35.36
June	5,070,028	21.64	3,591,743	21.59	776,745	28.77
July	5,003,577	2.86	3,608,741	6.06	720,302	18.55
Aug.	4,727,623	4.39	3,558,841	6.84	465,144	14.91
Sept.	4,834,251	2.49	3,453,431	4.62	667,323	6.20
Oct.	5,036,775	2.28	3,572,553	4.22	758,817	2.78
Nov.	4,769,083	1.27	3,366,923	6.98	689,470	2.34
Dec.	5,065,484	2.66	3,546,963	4.25	814,788	2.04
Jan., 1931	4,852,706	5.48	3,475,330	7.01	674,029	5.80
Feb.	4,453,655	3.79	3,159,903	5.96	583,468	2.40
Mar.	5,028,562	2.56	3,475,847	3.27	814,360	4.13
Apr.	4,969,481	2.09	3,458,940	3.35	804,235	0.25

Brooklyn & Queens Transit System, New York, N. Y.						
Apr., 1930	1,936,880	3.18	1,644,070	7.65	195,127	63.
May	2,030,966	4.65	1,615,294	7.31	310,865	9.11
June	1,968,238	2.41	1,603,996	8.02	257,482	18.78
July	1,917,118	6.16	1,603,893	7.10	203,433	4.15
Aug.	1,827,238	6.45	1,595,256	7.11	120,864	8.16
Sept.	1,887,499	4.66	1,564,271	5.65	213,728	2.65
Oct.	1,922,388	5.20	1,597,166	5.60	214,924	7.74
Nov.	1,820,498	5.65	1,522,735	7.68	187,822	5.20
Dec.	1,920,463	4.40	1,560,950	6.11	250,893	6.06
Jan., 1931	1,849,644	6.18	1,541,235	7.58	197,355	3.02
Feb.	1,704,677	3.98	1,416,192	5.40	176,217	2.58
Mar.	1,941,078	1.98	1,602,862	2.56	227,472	1.21
Apr.	1,911,878	1.29	1,592,919	3.11	208,514	6.86

Capital Traction Company, Washington, D. C.						
Apr., 1930	375,237	1.51	290,560	1.54	57,675	15.73
May	369,413	5.11	285,970	3.10	53,985	18.72
June	340,623	5.25	271,761	3.80	40,884	16.70
July	306,527	9.02	272,490	4.65	4,935	78.13
Aug.	314,513	3.48	268,561	4.09	16,103	2.62
Sept.	327,713	7.06	268,066	1.61	30,259	6.78
Oct.	374,646	1.22	288,351	1.43	58,638	17.56
Nov.	346,054	2.70	273,481	1.54	42,659	11.05
Dec.	369,885	1.77	274,221	3.21	67,651	0.61
Jan., 1931	347,491	3.06	280,514	3.30	37,705	5.11
Feb.	312,815	3.47	252,080	5.68	30,521	1.87
Mar.						
Apr.						

Chicago Surface Lines, Chicago, Ill.						
Apr., 1930	4,981,987	7.42	4,077,371	2.02	764,786	10.75
May	5,012,190	6.39	3,986,513	4.11	831,499	7.91
June	4,766,687	6.89	3,835,838	4.49	776,880	7.48
July	4,535,460	10.05	3,807,075	7.10	649,307	19.05
Aug.	4,488,146	12.20	3,796,705	8.06	680,219	15.82
Sept.	4,568,564	9.50	3,789,472	4.40	713,323	12.91
Oct.	4,879,570	10.79	3,933,416	7.35	799,118	11.89
Nov.	4,537,647	13.48	3,769,538	6.86	712,177	20.77
Dec.	4,846,000	8.09	3,984,572	9.89	767,348	15.67
Jan., 1931	4,576,133	12.65	3,825,964	5.37	718,129	21.00
Feb.	4,234,704	10.90	3,665,038	6.04	601,726	15.44
Mar.	4,584,224	4.35	4,287,237	5.34	557,167	15.05
Apr.	4,759,624	4.46	4,092,047	0.36	675,629	11.66

*Decreases or deficits are shown by *italic figures*.

Trend of Revenues and Expenses by Months (Concluded)

	Operating Revenue \$	Increase or Decrease Per Cent*	Operating Expenses and Taxes \$	Increase or Decrease Per Cent*	Net Income \$	Increase or Decrease Per Cent*		Operating Revenue \$	Increase or Decrease Per Cent*	Operating Expenses and Taxes \$	Increase or Decrease Per Cent*	Net Income \$	Increase or Decrease Per Cent*
Staten Island Rapid Transit Company, New York, N. Y.							United Electric Railways, Providence, R. I.						
Apr., 1930.....	198,184	9.46	169,662	11.10	34,026	476.60	Apr., 1930....	563,595	7.82	509,726	0.65	2,838	93.98
May.....	214,848	20.61	176,605	9.84	25,183	0.00	May.....	569,925	.....	514,320	.....	5,602	.....
June.....	224,980	18.31	178,999	10.17	30,052	30.63	June.....	532,783	.....	478,197	.....	4,583	.....
July.....	243,991	9.78	189,173	39.19	41,021	34.99	July.....	513,367	11.04	458,817	8.90	5,480	77.94
Aug.....	233,371	13.92	168,110	11.19	49,486	33.97	Aug.....	495,723	.....	442,076	.....	3,643	.....
Sept.....	206,908	15.93	165,525	4.87	26,127	60.73	Sept.....	493,296	12.72	434,036	10.39	8,376	72.04
Oct.....	205,631	10.68	167,586	6.49	29,723	26.11	Oct.....	531,803	13.76	.....	.....	41,223	53.80
Nov.....	178,652	17.42	161,608	0.58	10,788	80.37	Nov.....	506,318	14.58	439,930	12.83	16,958	54.37
Dec.....	178,474	9.08	160,715	47.29	5,997	92.23	Dec.....	559,363	13.02	460,420	21.92	51,623	889.51
Jan., 1931.....	170,387	9.58	158,982	6.35	1,448	114.6	Jan., 1931....	543,940	13.39	493,596	12.94	372	95.68
Feb.....	161,415	13.58	142,565	9.20	2,151	93.49	Feb.....	482,566	14.30	437,444	13.02	4,503	160.71
Mar.....	173,723	7.98	159,035	7.78	1,164	81.24	Mar.....	524,299	10.44	480,958	9.38	6,233	265.73
Apr.....	.....	.....	.....	.....	.....	.....	Apr.....	510,645	9.39	470,964	7.60	9,992	455.60
Third Avenue Railway System, New York, N. Y.							United Railways & Electric Company, Baltimore, Md.						
Apr., 1930*.....	1,236,554	6.16	1,026,448	4.64	12,657	1,461.90	Apr., 1930.....	1,449,416	1.82	1,117,959	1.23	67,093	52.91
May*.....	1,291,409	6.92	1,043,554	7.63	58,138	84.27	May.....	1,457,181	0.42	1,125,365	0.52	73,214	13.05
June*.....	1,244,961	6.73	1,018,619	7.64	45,078	1,056.24	June.....	1,332,275	2.63	1,043,008	2.92	35,318	4.76
July.....	1,429,730	5.18	1,212,311	8.54	2,066	106.36	July.....	1,236,414	6.91	964,582	6.24	14,358	69.86
Aug.....	1,350,064	5.88	1,180,853	8.08	46,540	28.34	Aug.....	1,198,180	8.34	831,241	18.41	6,119	71.42
Sept.....	1,428,136	3.48	1,167,528	8.36	45,636	277.91	Sept.....	1,261,734	6.71	995,805	5.02	10,050	75.81
Oct.....	1,456,688	4.03	1,205,455	9.73	36,257	317.06	Oct.....	1,354,086	7.28	1,049,306	4.84	25,163	71.16
Nov.....	1,373,335	5.37	1,146,168	10.17	12,079	130.15	Nov.....	1,263,811	10.26	983,047	7.40	9,200	87.30
Dec.....	1,438,752	3.49	1,197,249	8.61	26,250	186.44	Dec.....	1,350,553	8.19	1,043,315	7.25	36,700	54.54
Jan., 1931.....	1,393,054	5.10	1,178,797	9.14	1,694	96.33	Jan., 1931....	1,268,536	10.90	994,411	11.89	7,388	69.22
Feb.....	1,274,832	4.27	1,070,307	8.56	11,443	126.49	Feb.....	1,136,604	15.78	891,421	15.97	24,088	231.16
Mar.....	1,418,429	3.38	1,174,984	6.86	27,364	430.88	Mar.....	1,262,429	14.90	981,026	14.76	12,212	84.94
Apr.....	1,408,235	3.25	1,155,880	5.98	44,331	250.25	Apr.....	.....	.....	.....	.....	.....	.....

*Excluding buses.

*Decreases or deficits are shown by italic figures.

World's Largest Trolley Bus System at Shanghai



Latest type of trolley bus used in Shanghai, entering a typical narrow street

FOR several years the Shanghai Electric Construction Company, Ltd., in China, has held the distinction of being the largest operator of trolley buses in the world, having a fleet of 98 vehicles. When the latest order of the Chicago Surface Lines is delivered, however, the system there will have a total of 114 trolley buses, making it the largest.

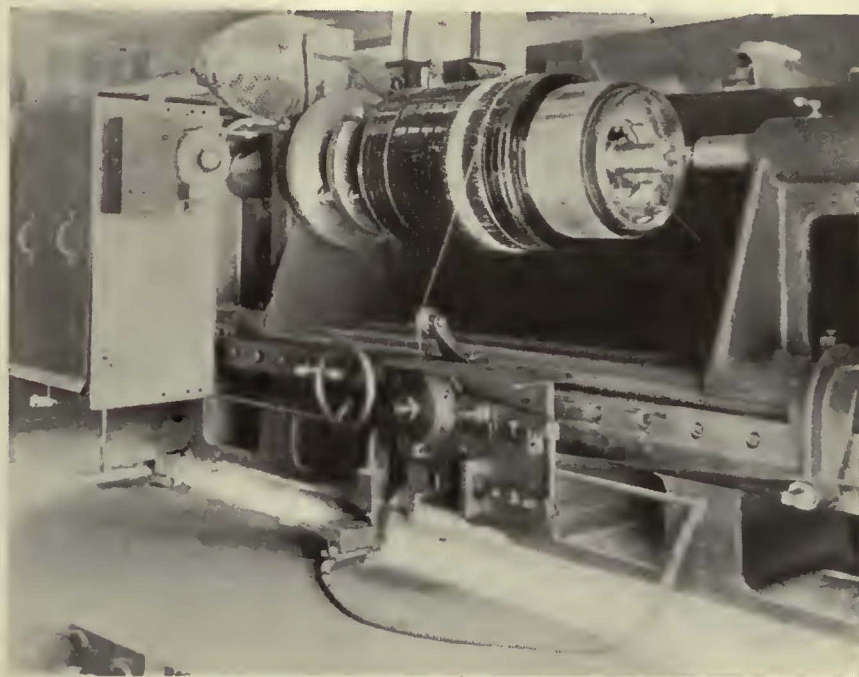
Trolley buses were first introduced in Shanghai in 1915, when the company established a route 0.7 mile in length. After nearly six years of experience, extensions were authorized and several new vehicles were ordered. These were put into use in 1922. The chassis were manufactured by John I. Thornycroft & Company, Ltd., of England. The bodies were built at the Shanghai company's works. These vehicles are propelled by a single 40-hp. ventilated motor, supplied by the English

Electric Company, Ltd. They are divided into two sections, the forward one-third being first class and the rear two-thirds being third class.

New routes and vehicles were added steadily thereafter until the present totals of 98 vehicles and 17,167 route-miles were reached. Street railway trackage in the city totals 17,968 miles. The railway has 101 motor cars and 100 trailers. During the year 1930 the company operated 2,869,693 trolley bus-miles and 5,839,244 car-miles. A total of 41,220,275 passengers were carried on the trolley buses and 87,344,680 on the street cars.

The trolley bus is being used on several heavily traveled streets which were too narrow for a double-track car line. The heavy pedestrian traffic in the streets, as well as the many carts and other odd vehicles, make the added flexibility of the trolley bus most desirable.

Practical MAINTENANCE Ideas



Band tension is held to close limits by this machine, which flashes a red light when tension is low, and a green light when tension is correct

BANDING ARMATURES *To Proper Tension*

By R. E. FERRIS

Railway Engineering Department,
Westinghouse Electric & Manufacturing Company

BANDING of railway motor armatures is of the first importance. Fundamentally, a band should have a reasonable factor of safety at overspeeds, and should be installed with not less than the maximum tension attained during overspeed. This will obviate actual band breakage, and prevent radial movement of the coils with consequent chafing of the insulation that may cause a short circuit. The centrifugal force tending to burst the band varies as the armature diameter and weight of coils and as the square of the speed. Hence the weight of the armature coil is important. Railway motor armatures invariably have coil supports, so the main point in determining banding tension is the type of winding, whether wire, ribbon or strap wound.

In order to pull the windings down without undue tension or pounding, it is advisable to band the armatures while hot, at a temperature of from 60 deg. C. to 80 deg. C.

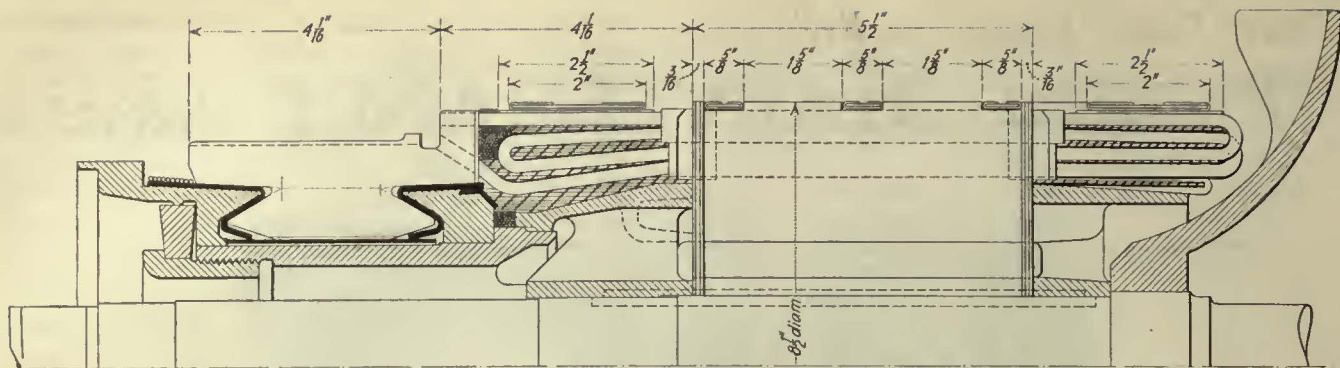
Especially with wire windings, care must be used to

see that the coils are not crushed, as otherwise short circuits may result. Filler pieces placed between the diamond part of the coil ends will prevent crushing. These pieces may be built into the coils, or may be put in place while the coils are being placed in the slots.

The band wire used should be uniform in strength and hardness. Its ultimate tensile strength should be not less than 200,000 lb. per sq.in., and its toughness such that it will bend 180 deg. flat upon itself without cracking or splitting.

It is desirable to pull the coils down with a temporary band while the armature is hot. This temporary band usually should be placed before the armature is dipped and baked, but an armature so constructed that it is difficult for the varnish to penetrate should be dipped and partially baked before the temporary band is put on.

After dipping and baking, the armature should be allowed to cool before the temporary band is removed. The permanent bands should then be put on cold and



Typical banding arrangement on an 8½-in. armature

soldered. A thinned steel strip beneath the core bands is desirable. It may be insulated from the core by a strip of asbestos paper or asbestos cloth tape from 0.010 in. to 0.015 in. thick.

For some large armatures the core bands must be split to prevent undue eddy current losses. In making a split band, the wire should be continuous but the sections should be separated.

In soldering, the irons must have a temperature of not more than 350 deg. C., otherwise, the yield point of the band wire will be permanently lowered. Pure tin solder is recommended, especially on an armature which is to operate at Class B temperatures. Bands should be soldered all the way around, with tinned steel clips under both core and end bands to hold the wires together. On the cores the clips should be placed over the coils from 3 to 4 in. apart. The start and finish of each band should be held with a clip, and the end of the wire hooked over the edge of the clip.

Banding tension is quite important. The size wire, number of wires and tension for any given armature may be obtained from the manufacturer or may be calculated. The accompanying table gives recommended tensions for various band wires. It will be noted that 250 lb. is the maximum tension listed for wire or small ribbon. With a higher tension there is some danger that the coils may be crushed. Even with this tension it is sometimes necessary to use filler pieces. The number of band wires should be such that the maximum tension attained in service will be from 20 per cent to 30 per cent lower than that given in the table.

Banding Tensions for Various Wires

Diameter of band wire, inches...	0.0285	0.0453	0.064	0.081
Tension in pounds:				
For wire or small ribbon coils...	80	200	250	Not used.
For large ribbon or strap coils...	80	200	400	550

Definite instructions for banding armatures may be summarized as follows:

Preheating—Heat the armature for eight hours at 115 to 125 deg. C. Heating will be uniform at the rate of 1 in. depth of punching per hour.

Temporary Banding—Dipping and baking may be done if desired while the armature is still hot, after which it is drained and returned to the oven for a preliminary baking of from four to six hours before placing the temporary band. Usually armatures are dipped and baked after the temporary banding.

The temporary bands of at least two-thirds the number of turns used by the manufacturer or calculated for the permanent band should be put on the core and end

windings within two hours after removing the armature from the oven. One or two layers of untreated duck strips slightly wider than the band will protect the windings. Band the entire armature in one operation without releasing the tension. Start on the core groove at one end of the armature. Continue toward the other end, including the end band; then proceed to the opposite end band. Each coil must be pulled down tight against the coil supports, avoiding arch binding. Now solder the band across its full width at the start and finish.

Permanent Banding—After treating, temporary banding, dipping, and baking, let the motor reach room temperature, and remove all temporary banding material.

Place the permanent band insulation and lay the proper number of clips on it keeping the clips and insulation in place with twine. Anchor the banding wire about the right end of the core by wrapping it upon itself and increase the tension to that given in the table. Then start the core bands, winding the required number of turns so each wire touches the adjacent one. After all core and end bands are in place, solder the ends of each, cut off the wire and form a hook at each end of each band so it will lie flat against the rotor and be not more than 1/8 in. long. Finally solder the entire band.

Repaired or Rebanded Armatures—Even with armatures banded as outlined, bands may loosen due to insulation shrinkage after service of a year or two. All new or rewound armatures should be examined after one to two years. Tapping lightly with a hammer will detect loose bands. If tight, a band should give a solid sound, and also no vibration between band and coils should be apparent by touch with the fingertips. With any looseness of the armature bands, the coils will move and chafe with final ground or short circuit. Sometimes the movement is so pronounced that the insulation is worn through and the copper exposed.

If there is any suspicion of looseness, the armatures should be rebanded, dipped in a good grade of insulating varnish and baked. The method of banding old windings does not vary greatly from that given. If the winding is very badly dried out, it may be desirable to reduce the tension somewhat from that given in the table. This reduction in tension, however, should not permit movement of coils due to centrifugal force.

Repairing Broken Car Windows

"Emergency Sash for Broken Car Windows," published in the May number, page 262, was incorrectly credited to W. H. McAloney. John C. Burdett, Georgia Power Company, is the author.

Power Factor Regulation Reduces Penalty Charges*

BY WILLIAM J. HANKEY

Assistant to Superintendent Power Conversion
Cleveland Railway

WHEN the alternating-current load demand of the Cleveland Railway varies from unity power factor the railway must pay a penalty charge to the power company. To reduce the penalty charges to a minimum a study was made of the power factor conditions at each substation. As the alternating-current power is metered at the power company's end of the line, it was necessary to fix conditions at substations so that unity power factor would result at the sending end. The electrical characteristics of the cable and the conditions at each

substation were investigated to determine the value of power factor necessary to result in a unity power factor at the sending end. The settings of the field rheostats on the synchronous converters were changed to bring about this result without appreciably lowering the efficiency at the substations.

As a result of the adjustment of power factor at the substations, the average system power factor at the sending end was increased from 99.16 per cent to 99.87 per cent, or an increase of 0.71 per cent. This increase represented a saving of \$284 in demand charges for the first month the change was made. From November, 1926, when the readjustments were first made, to December, 1930, an average saving of \$225 per month was made, showing a gross saving of \$11,250 or a yearly saving of \$2,700.



F. W. Drowley



Grayson S. Evans



John C. Burdett

Maintenance Contest Winners

for Second Period

F. W. DROWLEY

When he was fifteen F. W. Drowley left the south shores of Ireland to begin his career in Canada. The Canadian Shipbuilding Company gave him his first opportunity. Later he joined other companies from which he obtained valuable experience in machine shop practice and drafting. In 1911 Mr. Drowley entered the service of the Toronto Railway Company as a trackman. In a short time he advanced through the positions of timekeeper, draftsman, general foreman and assistant superintendent. When the Toronto Transportation Commission took over the electric railways, he was appointed roadmaster.

Mr. Drowley served overseas in the World War with the First Battalion, Canadian Railway Troops.

GRAYSON S. EVANS

Grayson S. Evans was born on Jan. 7, 1902, in Sharpsburg, a suburb of Pittsburgh, Pa. After graduation from the Carnegie Institute of Technology, Mr. Evans entered the service of the Duquesne Light Company in 1920, where he was assigned the duties of general meter maintenance. Three years later he accepted the position of superintendent of the meters and tests department with the United Electric Light Company, Wilmerding, Pa.

F. W. DROWLEY
Toronto Transportation Commission
"Depressing Rail Lips at
Track Drains"

GRAYSON S. EVANS
Pittsburgh Railways
"Improved Current Selective
Relay for Track Switches"

JOHN C. BURDETT
Georgia Power Company
"Emergency Sash for Broken
Car Windows"

FARRELL TIPTON
San Diego Electric Railway
"Frame for Testing All Sizes
of Bus Starters and
Generators"

When the United Electric Light Company consolidated with the Duquesne Light Company, Mr. Evans joined the power and inclines division of the Pittsburgh Railways. He has since been actively engaged in revising electric track switches and signal control apparatus.

JOHN C. BURDETT

Before he journeyed to the neighboring city of Atlanta, John C. Burdett spent the years of his youth on a farm in Fulton County, Georgia, where he was born in 1882. During those early years he developed an ability for fixing things that would not work. When he reached manhood he decided to capitalize on his mechanical aptitude. In 1907 he left the farm and entered the service of the Georgia Railway & Electric Company, now the Georgia Power Company, as a mechanic. He is now in the body maintenance department.

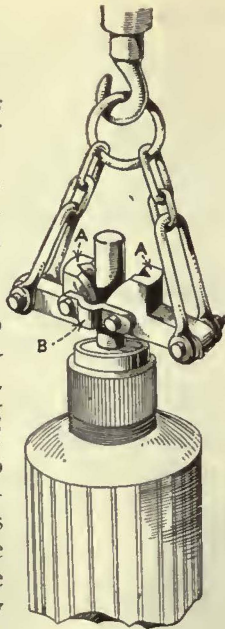
FARRELL TIPTON

For the second consecutive period of the Maintenance Contest an award has been made to Farrell Tipton, electrician of the San Diego Electric Railway. A short detail of his career was published in the March number.

Sling Clamp

BY CHARLES WILLEY
*Superintendent Hoyts Electrical Works
 Concord, New Hampshire*

FOR the rapid handling of armatures about the shop, and especially for vertically dipping them into tanks of insulating compound the sling shown in the illustration is useful. The sling is made of two cam-action, V-faced clamping members, *A*, and two formed straps, *B*, joining them into a double-acting clamp. The clamping members *A* are of soft metal to avoid injury to the shaft. When hooked for hoisting the two levers cause the V faces to grip the shaft of the armature securely and without injury. The accompanying illustration shows how the clamp is used for hoisting armatures.

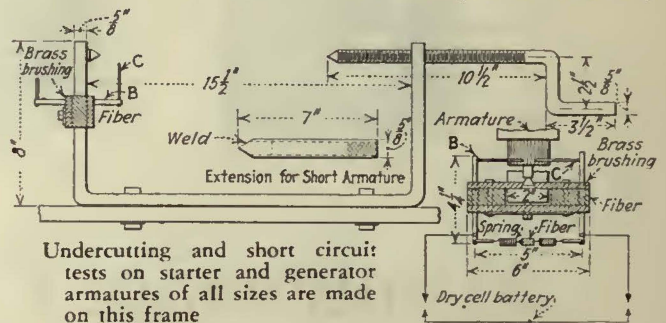


reached in an ordinary day's work, and several other spot-welding jobs were left undone.

Under the new arrangement the equipment is carried on a special truck. The outstanding feature of this truck is an overhead horizontal beam on which is operated a 1-ton chain block. This is used for lifting the grinding machine, weighing 1,800 lb., from the street onto the truck bed. The total time consumed in this operation does not exceed five minutes, and is handled by the two operators who form the crew. Space is also available for hauling the welding grid and other necessary welding material. After loading, a speed of 30 m.p.h. can be attained in moving to the next location. This allows two or more locations to be reached and the work completed in an eight-hour day.

Frame for Testing All Sizes of Bus Starters and Generators*

BY FARRELL TIPTON
*Electrician,
 San Diego Electric Railway*



Undercutting and short circuit tests on starter and generator armatures of all sizes are made on this frame

Improved Transportation of Welding Equipment

BY F. J. MARTIN
*Superintendent of Maintenance
 Pittsburgh Railways*

DELAYS in the transportation of electric welding equipment of the Pittsburgh Railways have been greatly reduced through the use of a special truck on which it is carried. Formerly, the equipment was moved from place to place on its own wheels, being hauled behind a work truck assigned to one of the track gangs. Difficulties frequently were experienced in obtaining the service of a truck, and its use for hauling the welding apparatus interfered with the work of the track gang. Moreover, in making a movement of this kind, consideration had to be given to the type of street traversed, since a speed exceeding 5 m.p.h. on a roughly paved street would be likely to shake the grinder to pieces. Thus, it often happened that only one location could be

OVERHAUL of bus starters and generators consists of turning the commutator in a lathe, undercutting the mica and making a millivoltmeter test on the armature to detect short circuits. The undercutting and testing is done in a frame developed by the San Diego Electric Railway to facilitate this work. The frame is adjustable to hold the many sizes of armatures overhauled.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.



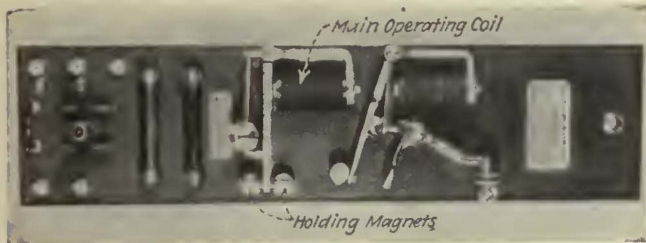
Formerly electric welding equipment was moved from place to place slowly on its own wheels behind a regular truck. Now it is carried on this specially designed truck, which can move at high speed and thereby save much time

After the armature is turned in the lathe it is placed in the frame, shown in the illustration, and is fixed firmly by turning the pivot at the right. An extension to the pivot is used for small armatures. The contact unit for the millivoltmeter test is lowered while the mica is being undercut. In making the millivoltmeter test, the contacts are raised and adjusted to the proper spacing on the commutator. The shaft carrying the contacts is set in a bronze bushing and can be moved one way or the other to fit the commutator. The contact points are rounded to prevent scratching of the commutator.

Improved Current Selective Relay for Electric Track Switches*

By GRAYSON S. EVANS
Pittsburgh Railways

PRIMARILY, two relays control an electric track switch. One, the power relay, limits the time during which current flows through the magnet. The other, the current-selective relay, directs the current to one of the two track magnets. The armature of the current-selective relay picks up or remains stationary, depending on whether the car passes the contactor with power or coasts through it. An adjustable weight varies the current required to pick up the armature. The relay has the disadvantages that the position of the armature may be changed when current is passing through it to the track magnet, and also that when the armature changes position under load it draws an arc from one contact



Small holding magnet prevents the reversal of switch direction while the car is passing through the pan

and establishes a circuit to the other contact, thus energizing two magnets simultaneously and nearly doubling the current. When this happens, the power relay fails to open the circuit and the fuse blows. In addition, the switch will very often throw back. If the car is traveling at a good speed and the switch is set for the desired direction, the car may split the switch.

The new current selective relay has been devised to eliminate these hazards. It has a contact spacing of about $\frac{1}{16}$ in. Two small holding magnets are located above and below the extreme end of the armature, so that the contacts are located in their magnetic circuit. When a circuit is closed in either position of the armature, the armature will not move until the power is off. If the passage of a car has started to operate the switch, and then some obstruction makes it necessary to stop, the switch will go through its cycle in the direction controlled by the initial impulse. This relay will permit faster movement of cars over the contactor. It will also eliminate trouble with heaters and pumps during the winter, and, what is more important, it will practically eliminate split

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Tell the Judges of the

Electric Railway Journal Maintenance Contest

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MAINTENANCE JOB
YOU ARE DOING

Send in your data for the Company Award now

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JULY 1

switches that are caused by electrical defects in the relays.

Three of these relays have now been in service on the Pittsburgh Railways system for approximately six months at the most hazardous switch locations without a failure. There are about 230 electric switches in service, on which it is planned to replace the old-style selective relay with the new relay.

Identifying Good Control Fuses

By W. R. McRAE
Superintendent Rolling Stock and Shops
Toronto Transportation Commission

SERVICE delays frequently can be avoided if a spare control fuse is available. Failure to report changing of the fuse is one cause of trouble, and a flustered operator may fail to identify the good and bad fuses.

On the Toronto Transportation Commission cars this difficulty is obviated by placing two spare fuse holders at distinctly different locations in the front vestibule. One is cream colored for the good fuse, and the other is red for the defective fuse. Despite special instructions, routine inspections in the carhouses, and a weekly test of spare control fuses on the cars, occasionally a defective fuse in the "O.K." fuse holder is the cause of prolonging a delay.

To avoid this possibility on the T.T.C., one end of each tested fuse is wrapped in a 2 x 4-in. label of the type illustrated, gummed at the bottom edge only. On the face is printed the statement that the fuse is good, along with the instruction to remove the label before using the fuse. The gum is so placed that the label does not adhere to the metal ferrule, and the difference in diameters of ferrule and cartridge forces out an edge or corner of the label so that quick removal is easy. Presence of the label indicates that the fuse is good, obviating the weekly test.



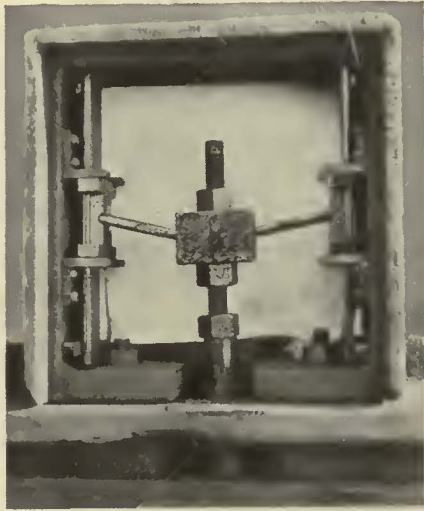
In Toronto good control fuses are marked with detachable gummed labels for quick identification

Lock Box for Track Switches*

BY JAMES J. BURNS

Road Master
City of Detroit, Department of Street Railways

TRACK switches of the city of Detroit, Department of Street Railways, are locked by a simple device with practically no wearing parts. This device has been found to be very effective and reliable in its locking action. By adjusting the nuts on the pull-pin, it can be made to act as a two-way or a one-way throw device for spring switches. Under ordinary operation it is not possible to stop the tongue switch on dead center; the farther the collar on the pull-pin moves over the center, the tighter the switch is locked.



This low-cost lock box has been found effective in Detroit

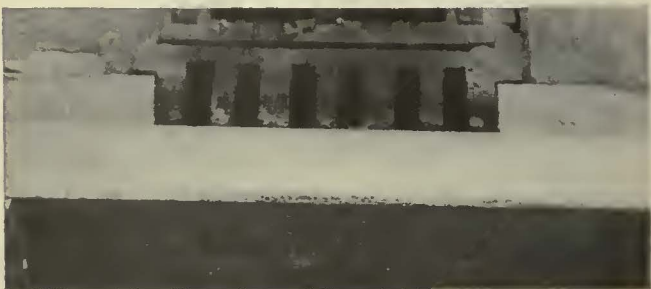
Between the jam nuts on the pull-pin is fitted a slot collar, into which are inserted short wedges of tool steel. The heels of these wedges rest in saddle blocks which engage flat springs, and are fixed between the guards. The ends of the flat springs rest on rectangular bars so that when the bars are turned on the high or on the low side the springs are placed in tension. As the construction of the locking box is so simple the cost has been reduced to about one-half that of the ordinary locking box. The maintenance required for this type of box is negligible.

Depressing Rail Lips at Track Drains*

BY F. W. DROWLEY

Roadmaster
Toronto Transportation Commission

REMOVAL of the rail lip at track drain castings was the cause of a number of broken rails. Although great care was exercised in the removal of the lip section by drilling a series of holes adjacent to the gage line, and marking a saw cut at each end of the section to be



Broken rails often resulted at drain castings where the rail lip was cut away

removed, as well as installing a welding plate for reinforcement, the breakage continued. By depressing the rail lip to make an even groove to the drains this trouble was eliminated. The depression was made by heating and forging the rail. Since this method was adopted no further trouble has been experienced.

Careful Maintenance Prevents Grounded Trolley Cables*

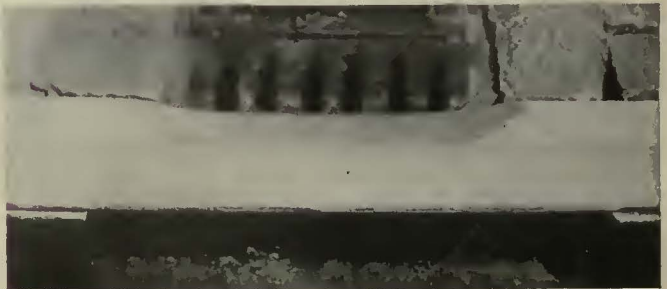
BY R. W. JAMES

Electrical Inspector
Ottawa Electric Railway

GROUNDING of the trolley cable between the fuse box and the line switch, and from the line switch to the controller gave us considerable trouble during the years 1928 and 1929. The source of the trouble appeared to have been at the end of the conduit pipes where the insulation showed a tendency to wear very rapidly. To stop this trouble we insulated all the cables at the ends of the conduit pipe by means of rubber and friction tape, and afterwards painting them with black insulating varnish. Large splashers were placed on the truck frames immediately in front of the cable outlets to prevent any water reaching the conduit pipes. Since we have installed the splashers we have found that whenever one is broken or damaged during the winter by rubbing on the icy ruts that have formed along the edge of the rails, the cable of that car will almost always ground soon after. Formerly, the largest number of grounded cables occurred during the winter months when water collected in the large deep ruts along the tracks, and was splashed on the cables causing them to ground. However, we are satisfied that this source of trouble has practically been eliminated since we have had only as many grounded cables in February and March, usually the worst months for such trouble, as we had during the summer months of July and August.

The almost complete elimination of grounded trolley cables has more than repaid for the extra maintenance work incurred in insulating the cables more thoroughly. As it is a great expense to renew these cables, a large saving has thus been made. A more important result is the elimination of interruption to car service. The great reduction in grounded cables has been extremely gratifying and may be indicated by a comparison of the records of the period before and after the improved maintenance. In the sixteen months prior to the inauguration of the improved maintenance method, 39 cars were taken out of service because of grounded trolley cables. In the following period of 33 months only four cars were out of service for the same cause.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.



By depressing the rail lip to form a smooth groove to the drain broken rails at these points were eliminated



Track in Somerville, Mass., restored to good condition after 30 years of service

Old Track Successfully Restored at **SMALL COST**

By H. M. STEWARD

*Superintendent of Maintenance
Boston Elevated Railway*

AFTER 30 years of service, surface tracks of the Boston Elevated Railway on Elm Street, Somerville, Mass., were recently restored to good operating condition at comparatively small cost. Restoration of the old track was considered preferable to the construction of entirely new track because the rapid transit line may be extended to this territory in the near future.

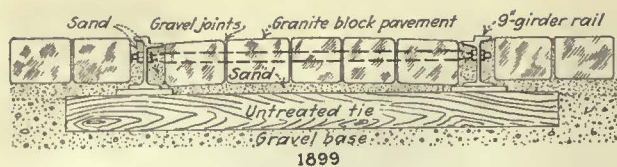
The track on Elm Street was built in 1899 with 95-lb. girder rail, Pennsylvania Steel Company section 222, with bolted joints and bonds. The rails were laid on wood ties 7 ft. in length, tamped with material then found in the street; paved with 8-in. granite blocks laid on gravel base with gravel joints.

In 1913-14, the city of Somerville laid a permanent paving in the roadways on both sides of the track, but the railway did not at that time rebuild its tracks, although they were from fourteen to fifteen years old. Instead, the tracks were simply relined and resurfaced, such ties as were necessary were renewed, and a concrete beam 4 in. thick and 18 in. wide was installed below the ties under each rail. The paving blocks were relaid with

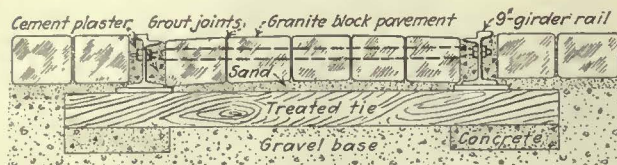
grouted joints, without a concrete base. The bolted joints were replaced by Lorain bar-welded joints.

The track remained in this condition for about fifteen years. Although occasional repairs to the rails and pavement were required, it remained generally in fair condition. In 1930, however, the city again decided to lay a new pavement in the roadways, this time with a concrete base and asphalt top, as the pavement previously installed had become worn out. Again the railway preferred not to build new track due to the possibility of rapid transit extension, in which event the surface tracks probably would become unnecessary and buses would be used.

First, the pavement was removed and a careful examination made of the concrete beams. They were found to be intact, and the ties which were firmly embedded in the concrete were in very good condition. It was necessary only to renew a small number of ties which were partially decayed. The track was relined and resurfaced where necessary without disturbing the concrete beams, by using shims and respiking the rails on the ties.



1899



1913-1914



1930

Cross-section of track as first built and as restored in 1914 and again in 1930

After the track had been brought to good line and surface, a concrete paving slab of a minimum thickness of 6 in. was installed between the rails of the track in place of the old granite block paving. The mixture used was 1:2:4 impregnated with 5 lb. of lampblack to every four bags of cement, to give the surface an appearance resembling the asphalt used elsewhere on the street. The top of the pavement in the center was brought to the height of the head of the rails, arching down to the flat tram of the rails.

Two Jackson tie tampers were mounted on a small push car and a puddler made of 6-in. channel iron, shaped to produce the cross-section desired, was attached to the tie tampers. This car was moved at the rate of 3 ft. per minute, and the tie tampers, operating at 3,600 strokes per minute, vibrated the concrete thoroughly, driving out all the imprisoned air, bringing the water to the surface, and causing the concrete to penetrate into all parts of the track structure between the rails. As the municipality installed a concrete base to support the asphalt pavement in the roadways and dummy, the rails which had then been 31 years in service were firmly anchored in the concrete.

An examination of the track, made after the winter of 1930-1931, showed that the track has remained true to line and surface, that there are no breaks or cracks in the concrete pavement, and no signs of heaving.

Checking Air Gap Clearances

By JOHN S. DEAN
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

REPLACEMENT of field coils in box type motors necessitates removal of the poles, and when the new coils are installed care must be taken to get a good metal-to-metal contact between the pole and the machined seat in the frame to obtain a low reluctance path for the magnetic flux. The pole washer or spring should not be allowed to slip between the pole and the frame as it will prevent proper seating.

As a check on the assembly, a gage should be used

after the poles are assembled and drawn tightly in place. Such a gage can be made from a round sheet-steel disk. The proper diameter is the diameter of the armature core plus twice the air gap. Failure of the gage to go inside the pole faces indicates that one or more poles have not been pulled up to proper position. Adjustment of the air gap is essential, as it affects motor speed.

Easy Installation of Roof Equipment*

By A. HANSMANN
Master Mechanic
Hamburg Elevated Railway
Hamburg, Germany

EASY removal or replacement of the car circuit breakers that are installed on the roofs of the Hamburg elevated cars is made possible with the help of a device developed in the company shops. These breakers weigh about 60 kg. (130 lb.). Previously, the breaker was lifted up a ladder by one man, who stood on the car roof while another man pushed from beneath. Now it is possible for one man standing on a ladder, as shown



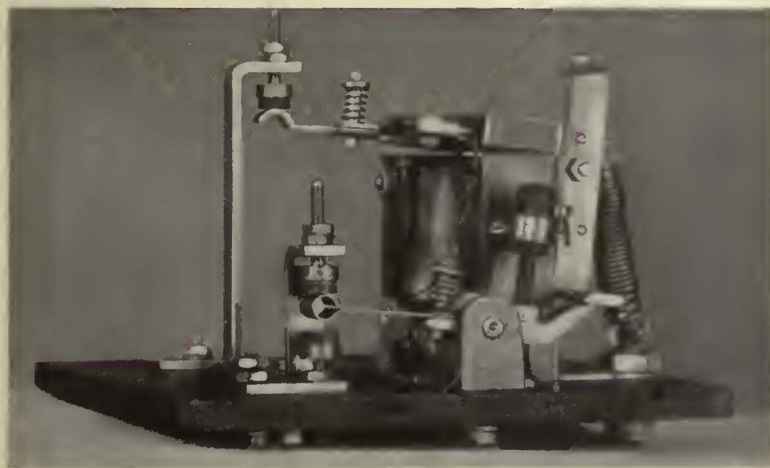
This light hand crane facilitates installation or removal of equipment on the car roofs in Hamburg

in the illustration, to remove or install the breaker. A crane of steel pipe is hooked into the roof gutter while the bottom is clamped tightly to the side sill. At the top is a swinging arm carrying a pulley block at its end. The breaker to be installed is lifted from the floor with the pulley, swung into position and dropped in place. Removal is made in the reverse manner.

The device can be attached or taken down from any car by one man in two minutes. It cost 50 reichsmarks (\$12) and weighs 25 kg. (55 lb.). Increased protection against accidents is assured.

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

NEW PRODUCTS *for Use by* the Railways



Pantograph-lowering relay has been developed for cars or locomotives which do not have circuit breakers of large capacity

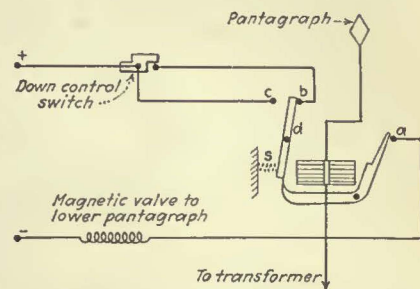
Relay for Lowering Pantagraph on Line Interruptions

DUE to space limitations, it is usually dangerous to install on an electric locomotive or car a circuit breaker having sufficient rupturing capacity to open the heavy currents which flow in case of a fault. Hence, the duty of interrupting fault currents falls to the breaker at the nearest substation. As the opening of a substation breaker entails a service interruption, it is important to isolate the faulty unit in the minimum time.

A locomotive or car can be isolated from the line by merely lowering the collapsible pantagraph from the trolley. This is usually accomplished by a magnetic arrangement which actuates a compressed air mechanism. However, under no conditions should the pantagraph be disconnected from the line when fault current is flowing, as the heavy power arc would damage both the pantagraph and trolley.

A relay has been devised by the Westinghouse Electric & Manufacturing Company which will prevent the pantagraph from being lowered until the substation breaker opens. The relay will operate the lowering mechanism the instant the fault current is interrupted, clearing the locomotive or car from the line before the substation breaker recloses. This relay consists of a rectangular core

surrounding the high-tension lead and a pivoted metal piece which is arranged to operate a latch. In the diagram the circuit is shown under normal conditions, no fault current flowing. Actuating the pantagraph "down" switch under this setting will lower the pantagraph from the trolley by energizing the magnet or valve.

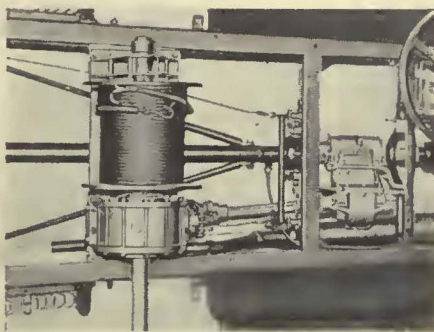


Pantagraph is lowered after the line is opened at the substation

However, should fault current be flowing the coil surrounding the high tension bus will be energized, and the metal piece will be attracted, breaking the contact at *A* which prevents the magnetic valve from being energized. The movable lever is unlatched, breaking contact at *B* and closing contact at *C*. As soon as the substation breaker is opened, fault current ceases to flow in the bus and the spring mechanism causes contact at *A* to be made. As contact *C* has been made previously, the down switch is thus bridged and the pantagraph will be lowered immediately upon the interruption of the fault, regardless of whether the "down" switch has been operated.

Service Truck for Line Work

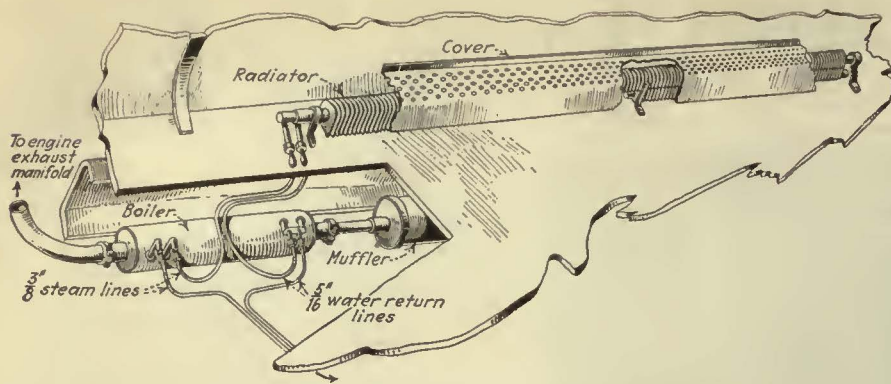
EQUIPPED with a winch, and a truck body and chassis specially designed to stand heavy service demands, a truck has been built by the American Coach & Body Company, Cleveland, suitable for line construction service.



View showing winch and transmission gear box

In line pole construction the winch is capable of handling the largest sizes of poles.

Power for the winch is supplied by the engine through a change-over box which is an addition to the regular transmission mechanism. The change-over box is built especially for this truck by the Ohio Gear Company, Cleveland. There are two positions of the shift lever. The first connects the engine to the winch, and the second position connects it to the regular truck propeller shaft and the rear differential. On the winch-drive side of this gear, power is transmitted through a silent chain and worm gearing to the drum itself. With this arrangement, it is impossible for the load to overhaul the winch by its own weight.



View showing boiler, one radiator and connecting lines

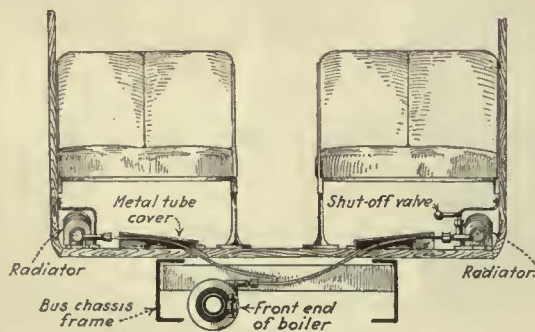
Steam Heater for Buses

EXHAUST gases form the source of heat in the steam-heating system for buses manufactured by the Foster-Vernay Corporation, Brooklyn, N. Y. The boiler, containing about one pint of water, is placed in the exhaust line anywhere between the muffler and engine manifold. Heat is transferred to the water through a coil of stainless steel, creating steam at a pressure of from 35 to 60 lb. per sq.in. The circulation of steam and condensate between the boiler and radiators is through copper connecting tubes. The radiators are placed under the seats, one running longitudinally along each side of the bus. They are covered with a perforated metal covering.

The boiler may be placed anywhere between the muffler and the engine manifold where it will be most convenient for the connecting lines. It is installed by cutting a section from the exhaust line 4 in. shorter than

the over-all length of the boiler. This will allow the ends of the exhaust pipe to protrude 2 in. into the boiler. The boilers are provided for either right or left-hand exhaust pipes so that the standpipes will always face the center of the chassis.

Excepting for the "on" and "off" valves, there are no moving parts. It is not necessary to remove the heater in the summer; the heater will cease to function by merely turning the shut-off valve. Radiators can be obtained in standard lengths of 6 ft., 8 ft. and 10 ft. For standard installations, the length of the radiator is governed by the space available from the front seat to the front of the rear wheel housing. All boilers are tested with a pressure of 500 lb. per sq.in.



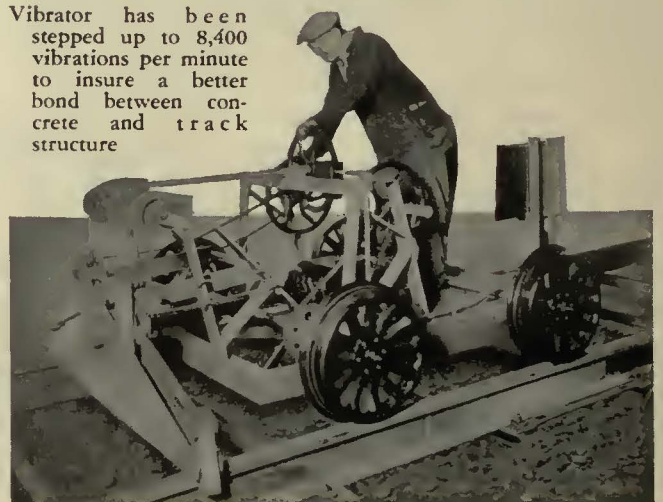
Front sectional view showing right-hand boiler installation

Improved Concrete Vibrator

SEVERAL improvements have been made in the machine, known as the Mortar-Flow Pulsator and manufactured by the International Steel Tie Company, Cleveland, for vibrating the track structure when pouring concrete in track construction. Improvements have been made in the lifting mechanism, in the detail of all keys, bolts and nuts which may be loosened by the vibration. This improved machine has worked on a 12-mile track without any difficulties.

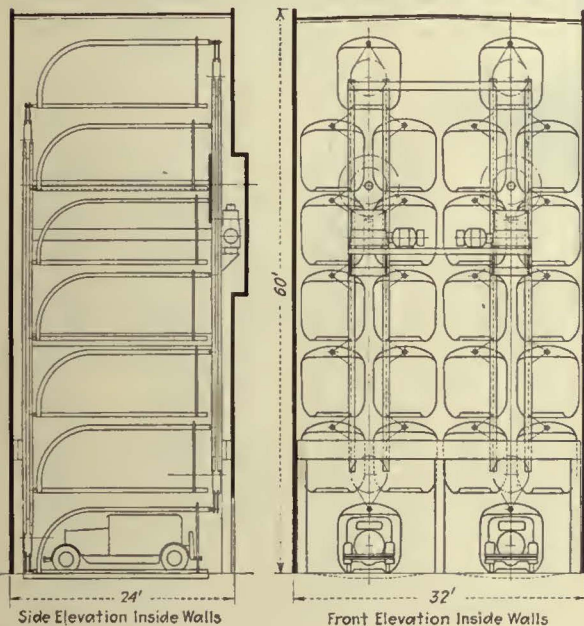
The motor speed has been increased from 1,800 to 2,100 r.p.m., giving a theoretical number of vibrations per minute of 8,400. The motors now furnished are completely inclosed as protection against weather and dirt. Special machines are available with speed regulation from 1,800 to 2,700 r.p.m. While the amount of pulsating force required to cause the concrete to flow efficiently into all voids and bond with the structure depends on the rail size, the depth of concrete and other factors, the usual work has been most successful at a motor speed of 2,100 r.p.m. or 8,400 vibrations per minute. It is claimed that the high frequency of vibration will not cause the track structure to move out of line or surface, or cause a segregation of the coarse aggregate in the concrete, because the 8,400 high frequency vibrations are not violent. It is impossible to tell whether the motor is in operation when standing at a distance of 15 ft. from the machine. The manufacturers recommend the machine for sealing and waterproofing the track structure, and for a better bond between the rail and concrete.

Vibrator has been stepped up to 8,400 vibrations per minute to insure a better bond between concrete and track structure



Automatic Storage for Automobiles

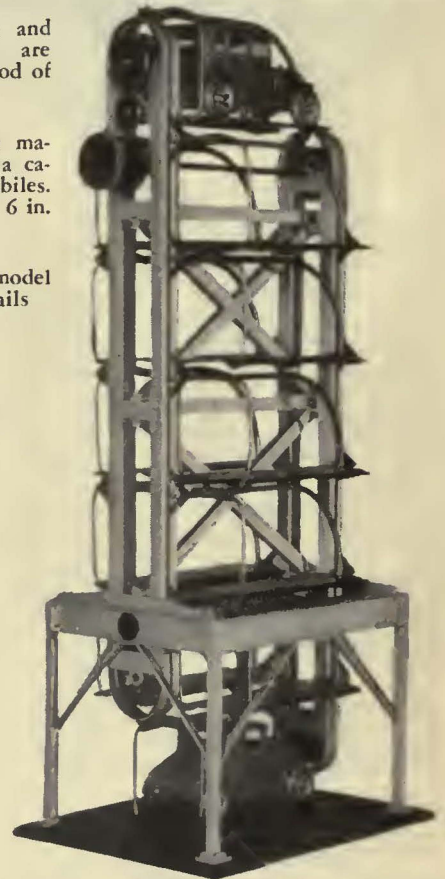
*A Solution to the
Parking Problem*



Above—Individual cradles and an automatic control are features of this new method of storing automobiles

At left—A double parking machine; each machine has a capacity of twelve automobiles. Cradles can be made 3 ft. 6 in. shorter for smaller cars

At right—Hand-operated model showing construction details



PPROMISCUOUS parking of automobiles on the streets is one of the causes of traffic congestion, which is resulting in great economic waste in the large cities. A practical and economical solution of the parking problem is extremely desirable. An important step in this direction is the automatic parking machine developed by the Westinghouse Electric & Manufacturing Company.

Consisting of individual cradles for each automobile, which are supported between two endless vertical chains driven by electric motors, one machine occupies a ground space of only 16x24 ft. and has a vertical height of 108 ft. Machines of smaller capacity are also made; for each pair of cradles removed a decrease of 8 ft. in height is effected.

The vertical chain travels at a speed of 100 ft. per minute, making the average time required to bring a cradle to the driveway level in a 24-car machine only 30 seconds..

The machine can be operated by either of three methods, all of which use the same control but different

master switches. A key system is best suited for garages where space is rented by the week or month. Each tenant has a key to call his cradle to the driveway level, by inserting it in the proper lock. When the cradle is at the driveway, the door can be opened with the same key.

A push button control system can be used in a public garage. When a customer wishes to park an automobile a dispatcher directs him to a machine and opens the door to the cradle. When the customer has stepped out of the inclosure he operates a lever to get his check. This lever stamps the check with the location of the car and the time of parking. At the same time the lever sets up the circuit that closes the doors and dispatches an empty cradle to the driveway level to receive the next automobile. When the driver returns for his car he presents his check to the cashier who collects the charge and pushes the button corresponding to the check number to bring the car to the driveway.

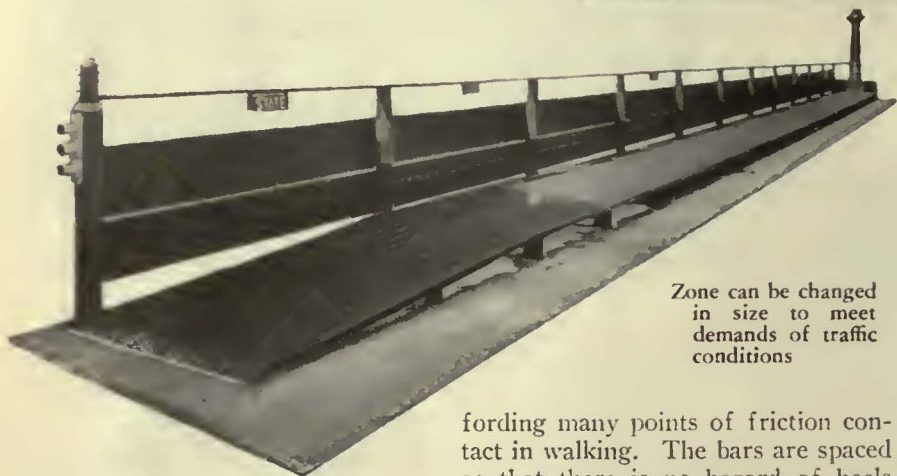
The coin system is similar to the

push button system, except that a coin machine is used instead of push buttons. The driver deposits the coin which opens the door to an empty cradle for parking his car. He takes the check as a key, which enables him to call the cradle to the driveway level when he wishes his car. If he has overstayed his time additional money must be deposited to obtain the car.

Portable SAFETY ZONE



Safety zones have been placed along Fort Street, Detroit



Zone can be changed in size to meet demands of traffic conditions

PORTABLE safety zones for the protection of passengers getting on or off street cars at busy street intersections have been developed by the Blaw-Knox Company, Pittsburgh, Pa. The zone is entirely structural, having pipe or I-beam posts set into the pavement to which are anchored I-beam base members, splash plates and guard rails. Channels supported on the I-beam members contain fitted panels of electro-forged, one-piece, non-slip grating with a ramp to afford an easy grade for entering the zone. The entire platform is 8 in. above the street level. The zone is open only at the street-intersection end, the traffic end being properly buttressed to avoid danger from incoming traffic, and equipped with signal or warning lights.

The zone can easily be removed to another location, taken up temporarily to open the street for construction work, or changed in size according to the demand of traffic conditions.

The grating platform is said to be non-slip even in extremely muddy weather or in ice-forming conditions. This non-slip feature is accomplished because of forced drainage of the open flooring and a twisted cross bar construction in the grating itself, af-

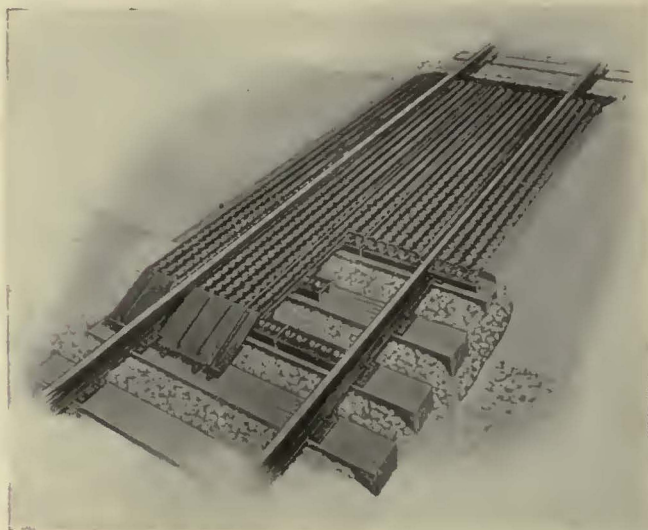
fording many points of friction contact in walking. The bars are spaced so that there is no hazard of heels becoming caught between them. The city of Detroit was the first municipality to install these zones, having done so after much experimental work and trial.

Pressed-Steel Crossing

RAIL-HIGHWAY crossing, said to require little or no maintenance, has been placed on the market by the A. O. Smith Company, Mil-

waukee, Wis. The crossing is made up of pressed-steel members, only three different shapes being used. They have been designed to obtain the maximum distribution of load to enable them to withstand shocks and loads from abnormal traffic and still be light in weight. A crew of two men can easily and quickly assemble or disassemble the crossing without the need of a crane or hoist.

The roadbed requires no other preparation than the use of sawed ties spaced 18 in. apart. Locking bases are spiked to these ties, flange-ways are slid in along the ball of the rail, and finally the deck channels are laid in place and then moved endwise 9 in. to interlock. Suitable end ramps are furnished if desired. They are made of pressed steel to safeguard against dragging equipment and to act as end-thrust members for the deck channels. Raised nubbins, pressed integrally with the shapes, make the surface of the crossing non-skid even under bad weather conditions.



Non-skid, ease of installation and no maintenance are the chief claims made for this pressed steel crossing

NEWS of the Industry

Improvement Projects

El Paso, Tex.—Three of the eight cars being rebuilt at a total cost of \$12,000 by the El Paso Electric Railway are now operating on the Mexico line. Among the new features are dash lighting, dome lights for the interior, sanitary hand straps, motorman's mirrors, and interlocking doors. Passengers can leave the car at the front as well as the rear end. The interiors are painted red, white and blue, with gold lettering and striping.

Chicago, Ill.—A new overhead transfer bridge on the Chicago Rapid Transit lines at Jackson Boulevard and Wells Street is to be placed in service this month. The bridge is intended primarily to allow passengers on the inner loop "El" trains to transfer to the Wells Street terminal of the Chicago, Aurora & Elgin line without first going to the street.

Michigan City, Ind. — The Chicago, South Shore & South Bend Railroad has installed three sets of switch heaters designed to keep switches free from ice and snow during stormy weather. One set, being tested at the east end of Tamarack siding west of Michigan City, uses a gas flame to heat the points of the switch; one near Virginia Street, Gary, uses electricity; and one in the yards at Michigan City uses oil burners.

Tremont, Ind.—The Chicago, South Shore & South Bend Railroad is soon to construct a siding here 1,150 ft. long, for unloading material to be used in Dunes State Park.

Kokomo, Ind.—Officials of the Indiana Railroad have announced that the entire 30 to 100 ft. right-of-way of the 20-mile interurban line between Kokomo and Loganport, abandoned last fall, will be deeded without charge to farmers whose property adjoins the right-of-way, the company taking in return easements for transmission lines.

Bus Operations

Kenosha, Wis.—If the Railroad Commission approves plans which were presented to it recently for the establishment of a trolley bus service here to replace the present street car and bus system, Kenosha will be the first city in the country to be served exclusively by the trolley bus.

Syracuse, N. Y.—The Cayuga Omnibus Corporation has received a certificate from the Public Service Commission authorizing the operation of a bus route between Marcellus and Syracuse. This company already operates several routes in Auburn and the Town of Owasco and

(Late News Continued on Page 336)

Maintenance Discussed by Middle Atlantic Equipment Men

With a program of papers, formal addresses and questions about evenly divided between the street car and bus interests, the regular semi-annual meeting of the Electric Railway Association of Equipment Men, Middle Atlantic States, was held May 14 and 15 at the Hamilton Hotel, Washington, D. C.

President D. E. Frame introduced C. M. Sharpe, assistant to president of the Washington Railway & Electric Company, who described railway and bus operation in the federal district.

Dean Locke, director of research United Railways & Electric Company of Baltimore, made an informal progress report on the operation of the 150 new cars put into service on that property during the past year. These cars are designed for fast acceleration and deceleration as well as passenger comfort. They are now operating on ten out of the company's 30 lines, furnishing about 25 per cent of the system car mileage. According to Mr. Locke, they have increased the speed of the ride 14 per cent, and have met with a favorable reception at the hands of the public.

W. C. Klein, superintendent of equipment of the Lehigh Valley Transit Company, in his paper, "Some Aspects of Free Wheeling," described a number of interesting developments carried out under his direction on one of his company's cars. This car, which has been in operation on one of the city lines since Jan. 2, 1931, is mounted on a modified Brill truck with split axle drive, propelled by eight 35-hp. motors. Unusual performance in the way of smoother operation, less power consumption, and easier riding qualities is claimed for the car by Mr. Klein.

At the afternoon session the delegates were addressed by J. H. Hanna, president of the American Electric Railway Association, who reaffirmed his faith in the future of community transportation. "In spite of the difficulties through which we are now passing," said Mr. Hanna, "I believe this

business is a permanent business—much more sure of its future than many other of our present-day organizations." He added that he hoped for a changed attitude on the part of the public toward the electric railways.

"The M-33 Brake Valve as a Means to Improved Braking," was the subject of a paper by J. F. Craig, of the Westinghouse Traction Brake Company. Mr. Craig dwelt particularly upon the results obtained in Baltimore, where this type of brake had been installed on 250 cars. Bus maintenance practice as developed under his

(Continued on Page 331)

Permanent Transport Exhibit

New York's first permanent exhibition of the development of land and sea transportation from their beginnings to the present day, comprising hundreds of exact scale models of ships, trains, wagons, automobiles and other conveyances, together with numerous historic originals and replicas, was opened to the public on May 25 at the Museum of Science and Industry, 220 East 42nd Street, by Frederic B. Pratt, president of the museum, in the presence of a large group of prominent New York industrialists, railroad and ship executives. The exhibit covers highway, railroad and marine travel respectively.

Co-ordination in Philadelphia Approved—Cab Fares Cut

The Board of directors of the Philadelphia Rapid Transit Company, which was reorganized under the direction of Judge Harry S. McDevitt recently following the capitulation of the Mitten interests, voted on May 26 to retain the system co-ordinating trolley, bus, subway, elevated and taxicab service, but decided to reduce taxicab fare by 5 cents a mile, effective July 1.

There was nothing in the formal statement issued after the meeting to indicate what would be done with the Quaker City Cab Company, which had been bought for \$1,360,000. Judge McDevitt denounced this deal some time ago and recommended that it be repudiated. The transit company also owns the Yellow Cab Company, but this will be retained.

One of the notable decisions reached by the board was to retain Dr. A. A. Mitten "to give his entire time to the service of the company" as chairman of the board, "to develop plans and policies for the board, to direct the operation of the co-operative plan and to perform such other duties as may be assigned to him by the board."

The *Ledger* said that Dr. Mitten, as the new deal worked out, found himself a "chairman of the board" without portfolio, but that "under the new plan it is anticipated that he will receive a salary."

Coming Meetings

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

July 16-18—Mid-West Electric Railway Association, Brown Palace Hotel, Denver, Col.

July 29-31—Electric Railway Association of Equipment Men, Southern Properties, Richmond, Va.

Aug. 6-8—Pacific Claim Agents Association, Stockton, Cal.

Sept. 9-10—Central Electric Railway Master Mechanics' Association, Cincinnati, Ohio.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Bus Operations

(Continued from Page 325)

also a route between Auburn and Syracuse which passes through Skaneateles and Marcellus. The receivers of the New York State Railways oppose the taking on of passengers within the city limits of Syracuse for discharge within the city. The consent of the city restricts such transportation except between Hutchinson Avenue and the city line.

Memphis, Tenn.—The task of studying the many problems involved in the conversion of certain lines of the Memphis Street Railway into trolley bus routes is well under way by experts of the railway and the public utilities and engineering departments of the city. It is expected that the work will be far enough advanced by June 15 to enable a date to be set for installation of the first route.

Evansville, Ind.—The petition of the Evansville, Suburban & Newburgh Railway, operating buses from Evansville to Newburgh and Boonville, to run buses from Boonville through Spurgeon, Winslow, Petersburg and Washington has been denied by the Public Service Commission. This company replaced rail service on the Evansville-Boonville line and the Evansville-Newburgh line less than a year ago with service by bus.

Service Changes

South Bend, Ind. — A program for equipping six more of the railroad's passenger cars with new style, individual, "bucket type" seats, has been announced by the Chicago, South Shore & South Bend Railroad. Forty-four of the line's passenger cars are now equipped with these latest type seats. Changing the seats necessitates extensive alterations inside the cars.

Los Angeles, Cal. — Plans to curtail service on the Pacific Electric motor coach line serving Hollywoodland, Hollywood, Beverly Hills, the University of California at Los Angeles, Santa Monica and Ocean Park were considered at a conference attended by representatives of the carrier, of the districts affected and the State Railroad Commission. It is expected that present schedules will be maintained from 6:30 a.m. to 9 a.m., and 3 p.m. to 7 p.m., with hourly service for the rest of the day.

Salt Lake City, Utah—The Salt Lake & Utah Railroad has asked the Public Utilities Commission for permission to reduce the number of trains it operates daily over its lines, and to substitute, for at least a part of the abandoned service, a bus line between Salt Lake City and Payson. In lieu of the present schedule of eight passenger trains daily each way between Salt Lake City and Payson, it is proposed to operate six trains daily between Salt Lake City and Payson, with an additional train, from Provo to Salt Lake City and a bus each way daily between Salt Lake City and

Payson. The petition denies any intention of handling local traffic between Salt Lake City and Sandy, in opposition to the Utah Light & Traction Company service. On the Magna route, seven train or bus trips each way are on the proposed daily schedule.

Waverly, N. Y.—The Waverly, Sayre & Athens Traction Company, which substituted bus for trolley service between Waverly, N. Y., and Sayre and Athens, Pa., about a year ago, has been asked to begin removal of its tracks and overhead equipment here before June 1 in accordance with its agreement with the city.

Los Angeles, Cal. — Patrons of the Pacific Electric Railway between downtown Los Angeles and Hollywood prefer the longer surface line by way of Hill and Sunset to the route by subway through the hill. This is believed to be due to the greater accessibility of the surface line.

Davenport, Iowa — A fleet of six modern street cars, designed with particular attention to the requirements of the bridge line between Davenport and Rock Island, will be put into service by the Tri-City Railway to replace cars of a type now considered obsolete.

Los Angeles, Cal.—The Pacific Electric Railway has applied to the Railroad Commission for authority to abandon passenger service between Arlington and Corona.

Convention Entertainment

PRELIMINARY plans made by the Entertainment Committee for the 50th Annual A.E.R.A. Convention include a variety of events beginning on Sunday, Sept. 27, and continuing through Thursday. Those now scheduled are:

SUNDAY

Golf Tournament, Atlantic City Country Club, Northfield, N. J.

MONDAY

Afternoon—Ladies Tea, Auditorium.
Informal Bridge, Auditorium.

Evening — President's Reception, Auditorium.

TUESDAY

Afternoon — Ladies Musicales and Tea, Auditorium. Informal Bridge, Auditorium.

Evening—Advisory Council Night, Auditorium.

WEDNESDAY

Afternoon—Ladies Bridge Tournament with Music, Auditorium. Tea, Auditorium.

Evening — Special Entertainment, Auditorium.

THURSDAY

Afternoon—Ladies Tea, Auditorium. Informal Bridge, Auditorium.

Evening — Formal Dance, Auditorium.

San Francisco, Cal. — The Market Street Railway cars began running regularly over the Municipal rails on Market Street on May 11, to permit the Market Street Railway to reconstruct its track on Market Street between Jones and Gough Streets. The Market Street cars will use their own rails during the rush hours, from 3 to 7 p.m.

St. Louis, Mo.—The St. Charles Electrical Express Company, which for many years has maintained an express service between St. Louis and St. Charles, Mo., using the tracks of the St. Charles Electric Railway of the St. Louis Public Service Company, will, hereafter, carry its express in trucks to improve service. In the past one round-trip a day was made. Two trips each way will be made by truck.

Sault Ste. Marie, Mich.—What is believed to be the oldest system of the kind in Michigan will be discontinued within six weeks if the Sault Ste. Marie Traction Company carries out its announced intention to suspend. President Frederick expects that the city or some private corporation will install buses.

Financial News

Minneapolis, Minn. — Vice-President McGill, of the Twin City Rapid Transit Company, says bus line feeders are an economy for crosstown lines and extensions, but that it would be impossible to supplant trunk line trolleys by bus and give economical and satisfactory service. The Nicollet-Hennepin bus line handles 8,000 passengers a day while on either side one block distant is a car line, one of which carries 125,000 passengers daily and the other 115,000. Operating costs of the street cars are 30 cents a mile and of the bus 25 cents a mile, but in the cars many more persons are accommodated for only 5 cents a mile additional expense.

Omaha, Neb.—At the request of the City Council, Acting Mayor John Hopkins has announced a committee of nine citizens to assist the Council in discussing the requests of the Omaha & Council Bluffs Street Railway to be relieved of the cost of paving between the rails and of occupation tax so as to avoid the possibility of an increase in fares.

Ogden, Utah—At the annual meeting of the Utah-Idaho Central Railroad, E. G. Bennett was elected a director to succeed Marriner A. Browning, resigned.

Canton, Ohio—Offering to continue railway service between Canton and Massillon, the Intercity Rapid Transit Company, Inc., formed by Canton and Alliance men, has asked the City Council for permission to operate electric cars between the western city limits and the Canton city-square. Options have been secured from the Canton Traction Company, owner of the Canton-Massillon line, on the trackage to serve the two cities, sufficient rolling stock to provide railway service and the car shops at Massillon. The Public Service Commission will hear on May 13 the plea of the

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Convenience of Boston "El"

Told in New Advertising Series

Once again the Boston Elevated Railway is using newspaper advertising to maintain and, if possible, increase rider volume during the summer months. Last year a campaign was run in Boston newspapers featuring the advantages of using the rapid transit lines from the suburbs into the city proper. The whole campaign was built around the thought of "Park where the 'El' begins." This year the company answers that question which inadvertently arises: Where does the "El" begin? The heading of every ad in this year's campaign reads: "Where the 'El' Begins—From Highways Leading to the East Boston Tunnel." This head remains the same in all the ads with one exception, and that is the very last words, which are changed to Cambridge Subway, Forest Hills, or whatever the section may be.

A map of the section of the line serving the suburbs in the various sections is shown in each ad. Included in the ads is information about the running time from that particular station to various intown stations.

The whole theory of the advertising is one of co-operation with the motorist. Last year's campaign played up the dangers met in the traffic problems of intown Boston. In Boston they are particularly bad. This year speedy transportation is the keynote.

Most of Boston's workers live out in the suburbs—in many cases, distant suburbs. Her narrow streets make traffic movement slow and difficult. Many of the suburbanites own automobiles and use them in going to and from business. To the Elevated, this meant an opportunity to increase its business.

Near every station on the Boston "El's" rapid transit line is a garage or a parking space. The company has even purchased land adjacent to its stations and leased it for parking areas or the building of garages. Thus, the suburbanite can now park his car for a small charge and ride quickly and safely to his place of business.

Five separate ads are included in this year's campaign. They will appear in Boston and suburban newspapers. The ads can be repeated during the summer months

Where the "EL" Begins
from highways leading to the
CAMBRIDGE SUBWAY



Use the "EL"
Quick — Safe
Economical

Running Time
TO
WASHINGTON STATION
(17 minutes and Transfer Stations)
1/2 mile from Harvard
7 minutes from Central
1 1/2 miles from Kendall

Park Where the "EL" Begins
Boston Elevated Railway
In interlocking system of underground, overhead and surface lines.

* MOTORISTS from Winchester, Arlington, Lexington, Belmont, Waltham, Watertown and Cambridge—leave your cars at convenient garages and parking areas near Harvard, Central and Kendall stations of the Cambridge Subway, and USE THE "EL" in and out of Boston. Avoid the annoyances of traffic, the delays of red lights and the chance of police tickets.

Enticing those who would roll their own

since there is no time element in the copy. The insertions are so arranged that one ad appears every day, sometimes twice a day in at least one newspaper.

Terre Haute's Sale Set for June 23

Sale at public auction of all remaining properties of the Terre Haute, Indianapolis & Eastern Traction Company was ordered on May 21 by Judge J. Ryan of Marion Superior Court. The sale will be held in Indianapolis on June 23. The minimum sale price was fixed by the court at \$2,500,000.

Fare Cut on Baltimore "Owls"

Transfers will be free between all-night cars in Baltimore after May 16, officials of the United Railways & Electric Company, Baltimore, Md., recently announced. Ever since all-night car service was started 30 years ago, passengers who transferred have

had to pay two fares, it was pointed out. The decision to abandon the 30-year-old practice is an outgrowth of the 10-cent fare and taxicab competition. Officials explained that all-night car service never has been profitable, and that it has refrained from installing the free-transfer privilege for fear of further reducing the revenue from the owl cars. Now, however, with service on a 10-cent basis, the possible losses in revenue from free all-night transfers do not seem to outweigh the advantages of this step to make the service more attractive. It is also believed that the new move is not unlikely to be helpful in "meeting fly-by-night taxi competition with cheaper fly-by-night street car service."

The United keeps fourteen of its 35 lines running all night, the fourteen being selected as the best for connecting the most thickly populated suburban sections with the centers of downtown night life.

Simplification Sought in Indiana Merger

Merger of the Indiana Electric Corporation into the Public Service Company of Indiana, formerly the Interstate Public Service Company, is proposed in a petition filed with the Public Service Commission.

The Indiana Electric Corporation serves with gas and electricity about 30 communities in central-western Indiana which lie between territories served by the Public Service Company of Indiana. The Public Service Company supplies approximately 200 communities with electric service and 25 with gas service and operates an electric interurban railway and motor coach service between Indianapolis and Louisville, Ky. Both companies are in the group of utilities controlled by Midland United.

According to the petition, the joining of the properties will increase the financial stability and will tend to insure continued improvement in the service rendered to the communities through the medium of these properties.

Common stock without par value of the Public Service Company of Indiana would be issued in exchange for all of the preferred and common stocks of the Indiana Electric Corporation.

Trestle for Tracks of Indiana Harbor Railroad at Bellwood Electric Line Crossing



Photo by courtesy of Chicago Rapid Transit Co.

Rapid progress is certainly being made at Bellwood, west of Chicago, on the grade separation project which will carry the tracks of the Indiana Harbor

Belt Line over the tracks of the Chicago, Aurora & Elgin Railroad, the Rapid Transit Lines and the Chicago Great Western Railroad. The separation will

permit faster service over the Rapid Transit Lines and the Aurora & Elgin Line between the Loop, in downtown Chicago, and the Western suburbs.

Financial News

(Continued from Page 326)

Canton Traction Company to discontinue service on the Canton-Massillon interurban. In the event councils of Canton and Massillon grant the new company permission to operate, the commission will be asked to dismiss the hearing on the ground that service will not be continued. C. M. Shetler is president and C. E. Sperow is general manager of the Stark Electric Railroad, which operates between Canton, Alliance and Salem.

Buffalo, N. Y.—Approval of the declaration of abandonment by the International Railway of its Bellevue and Lancaster division, operated in the towns of Cheektowaga and Lancaster and the villages of Depew and Lancaster, was given by the Public Service Commission on May 20, since this portion of the route is no longer necessary for the successful operation of the railway or for convenience of the public. The route to be discontinued includes 53,737 ft. of line.

Harrisburg, Pa.—The mystery of who cashed the checks for \$736,000 in the Yellow Cab deal and what become of the cash, which has baffled the State Legislature for so long in its investigation into the affairs of the Philadelphia Rapid Transit Company, was cleared up on May 14 when Albert M. Greenfield, real estate operator of Philadelphia, testified that a member of his office force cashed the checks and gave the money to him. The money was then turned over to the late Thomas E. Mitten.

Albany, N. Y.—The Public Service Commission ordered all utility companies in the state to appear at public hearings before the commission in New York City on May 18, Buffalo on May 20, and Albany on May 25 and file a statement setting forth the amount of securities issued under authority of the commission and the amount of securities which have been authorized but not issued, and to show cause why unexercised authority should not be rescinded.

Indianapolis, Ind.—Reductions in assessed valuations of several more Indiana electric railways have been announced by the state board of tax commissioners. Valuation of the Indianapolis & Southeastern Railroad was cut from \$437,770 to \$377,605, interurban properties of the Southern Indiana Gas & Electric Company, Evansville, from \$180,500 to \$129,810; Evansville city lines of the same company from \$1,913,410 to \$1,238,620; Lafayette Street Railway from \$137,510 to \$127,020; Dayton & Western Traction Company (in Indiana) from \$19,436 to \$9,820; and Vincennes Electric Railway from \$40,580 to \$32,810.

Detroit, Mich.—The City Council has authorized negotiations on behalf of the Municipal Railway for the purchase of as much equipment and other property from the Detroit Motor Bus Company as it deems necessary to establish full municipal control of all bus lines in the city.

St. Louis, Mo.—Oliver Chapman, license collector, reports that for the fiscal year ended on April 10, last, the St. Louis Public Service Company paid the city \$194,870 in mill taxes compared with \$223,714 the previous year. There was also a falling off in the revenue from the 3 per cent bus tax levied on receipts of the People's Motor Bus Company. During the 1930-31 fiscal year that company paid \$73,129 against \$76,517 in 1929-30.

Fresno, Cal.—The Fresno Traction Company has lodged a complaint with the State Railroad Commission objecting to rates for electric power charged by the San Joaquin Light & Power Corporation. The commission is asked to fix interim rates pending a hearing.

New York, N. Y.—The Hudson & Manhattan Railroad has obtained a modification of its agreement for power supply from the New York Edison Company, and as a result, it is possible that the company will be able to effect a small reduction in cost.

Regulation and Legal

Portland, Ore.—The public utilities commissioner has notified the six major electric operators in Oregon that he desires statements from them showing the amount of money expended for advertising purposes, the character of the advertising, and where the advertising was placed, and a clear outline of the reasons and necessity for such advertising. Railway companies have been asked to supply similar data.

Los Angeles, Cal.—An amendment to the city charter empowering the City Council to grant franchises for bus lines has been proposed in a resolution of the Council. The resolution was referred to the city attorney and to the Council's legislative committee for study. No mention of bus lines is made in the city charter, according to the resolution, and their increasing use makes it necessary that some provision concerning them be included in the charter.

Los Angeles, Cal.—Demands for extensions in various parts of the city of the Los Angeles Railway's lines are piling up in the Department of Public Utilities and Transportation. As a result its transportation committee is kept busy trying to reconcile the needs of the various communities on one hand and what the company is willing to do, on the other. In response to the request of the board itself that the railway apply for a franchise for a Third Street car line west from Main Street, because of opening and widening proceedings west of the Third Street tunnel, the company has replied regretting that it considers it inadvisable at this time.

Los Angeles, Cal.—The Pacific Electric Railway has applied to the Railroad Commission for exemption from the provisions of an order of the Railroad Commission requiring advance notice to the public of changes in the arrival and departure of certain of its motor coach lines, including those operated by Los Angeles Motor Coach Company.

Harrisburg, Pa.—The Legislature adjourned on May 27 without the Governor sending to the Senate for confirmation a nominee to the Public Service Commission to fill the vacancy caused by the resignation of James S. Benn. A recess appointment is expected. Governor Pinchot, declaring that the Public Service Commission was the "cat's paw of corporations," led the fight for the abolition of the commission and the creation in its place of a fair rate board to be elected by the people. The House lined up with the Governor, while the Senate opposed his program. The session was marked by a continuous fight over public utility regulation, with the result that no outstanding legislation of the kind was passed.

Tallahassee, Fla.—Regulation of street railways, bus companies and all other carriers of passengers or freight between points within the Jacksonville city limits would be under the direction of the Jacksonville City Council under the provisions of a measure introduced in the House. Under the proposal the Council would have authority to regulate fares, the kind and manner of equipment used, including the designation of routing and rerouting of cars, buses or trucks; the increasing and decreasing of service, the fixing of schedules, the location of stops and the laying and removal of tracks.

Madison, Wis.—Payments by customers of public utilities for extensions of equipment required to furnish service may not properly be included in a valuation upon which securities may be issued or upon which rates may be based, it was held by the Wisconsin Supreme Court in a decision just rendered.

General

Indianapolis, Ind.—The Midland United Company has instituted a new series of informative advertisements in behalf of its subsidiary companies. These advertisements are being scheduled in 213 newspapers published in Indiana towns served by these subsidiaries. The ads are essentially informative. Reprints have been made of the first series of advertisements run a few months ago.

Ann Arbor, Mich.—Announcement has been made of the establishment of a four-year program in transportation engineering by the University of Michigan in recognition of the importance of adequate preparation for one of the most significant developments in modern industrial and social system. This new curriculum will parallel the other established divisions in engineering education and will offer a carefully prepared program leading to the degree of Bachelor of Science in Engineering (Transportation). In subject matter, however, and in the arrangement of courses, it represents what may be considered a departure in engineering education.

Detroit, Mich.—More than 500 of 600 employees at Highland Park car shops of the Department of Street Railways, operating the municipal railway and bus lines, have joined the trainmen's union.

An Engine That Leaves Its Hood



Several novel features are embodied in the construction of 33 new buses recently purchased by the Pacific Electric Railway for service in Pasadena. Twenty-three of the new units, each with a capacity of 28 passengers, are being supplied by the Fageol Company, Oakland, Cal. Ten, of the 24-passenger size, are en route from the plant of the Twin Coach Company, Kent, Ohio. The entire lot represents an expenditure of about \$282,000.

The Fageol buses have been designed with a "travel out" engine. The 120-hp.

Hall-Scott engine can be projected out in front of the coach within 30 seconds by means of a separate electric motor. This novel feature is intended to aid in speeding emergency repairs without discomfort to passengers.

The entire engine can be removed in two minutes, thus facilitating repairs and saving shop space when a new motor is installed. The engine is projected 60 in. in front of coach, and, after repair is completed, the engine can be started and tested without first being returned to the normal position.

Another Chicago Consolidation Step

Three final decrees, ordering the foreclosure and sale of the Chicago Surface Lines, were entered by Federal Judge Wilkerson on May 11. The action was a legal prerequisite to the consolidation of the Chicago transportation companies.

The company has ten days in which to meet obligations of approximately \$80,000,000. Thereafter, a date of sale may be asked by attorneys responsible for the reorganization plan. Thomas J. Pedden was appointed special master to handle the sale. He will receive bids and report back to the court.

The decrees entered were virtually the same as submitted recently by attorneys for the First Union Trust & Savings Bank and the Harris Trust & Savings Bank, trustees for the three classes of securities holders.

Long Period of Public Control

As indicated briefly in *ELECTRIC RAILWAY JOURNAL NEWS* for May 23, Governor Ely of Massachusetts has signed the Boston Elevated Railway bill. Thus, it is hoped, six years of discussion, not to say altercation, have come to an end.

The new law provides for continuance of public control for 28 years, for a reduction of common dividends from 6 per cent, as guaranteed under the 1918 law, to 5 per cent, and for the purchase of the preferred stock from the proceeds of a bond issue to be made by the transit district. Large savings in fixed charges will thus be made.

The act now must be accepted by the stockholders but acceptance is expected and the public in general feels that, while none of the parties gets all it might ask for, the

settlement is the best that can be made.

The Legislature passed the 1918 act at a time when the system was in dire need and made the law a contract between the commonwealth and the elevated company, giving the stockholders a veto power over any plan for continuance of public control that the Legislators might formulate. That act provided also that the state might take over the road on certain terms and also exercise an option for return to the owners under certain conditions.

Governor Signs Interurban Tax Relief Measure

The Washington, Baltimore & Annapolis Electric Railroad, operating under a receivership, has been relieved of the payment of state and county taxes in Maryland for a period of two years since Governor Ritchie has signed a bill to this effect passed by the General Assembly. As originally introduced, the bill provided for exemption for four years, but it was amended to permit the Assembly to act on the subject again at the session two years hence.

The taxes from which the company will be relieved amount to almost \$100,000. When the receivership action was taken it was announced that unless substantial economies were brought about the road might discontinue. Schedule changes have been made and the employees have agreed to a substantial reduction in wages. Residents of Anne Arundel County opposed the concession to the company, but representatives of the United States Naval Academy, located at Annapolis, urged passage of the bill.

In signing the measure, Governor Ritchie said it could not be considered a strictly local measure as the road provides service

between Washington, the capital of the nation; Baltimore, the largest city in Maryland, and Annapolis, the capital of Maryland and the home of the United States Naval Academy. The effect of abandonment of the road, the Governor said, on the people of Annapolis and Anne Arundel County could hardly be estimated.

General

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Oakland, Cal.—East Bay Street Railway, Ltd., and East Bay Motor Coach Lines, Ltd., applied to the Railroad Commission on May 23 for authority to increase the one-way cash fare on both systems from 7 cents to 10 cents, and to sell seven tokens for 50 cents.

Newark, N. J.—Public Service Coordinated Transport intends to use the present type of trolley cars on the lines of the Newark City Railway, the new rapid transit line, while observing that, with operation not expected to begin until 1934, it is impossible to make plans except as to "broadest policies." The equipment listed as available for operation in City Railway includes 186 cars. They have an average seating capacity of 54 passengers and are rated as able to carry an equal number of standing riders "with reasonable comfort." One hundred trailers, also are listed as available. They seat 65 passengers and are rated as having enough aisle space to carry an equivalent number of persons standing.

San Francisco, Cal.—A survey of the Municipal Railway by engineers of the State Railroad Commission will be recommended to the Board of Supervisors by its Public Utility Committee in the hope that it will show "what is wrong with the Municipal line."

Memphis, Tenn.—The Memphis Street Railway joined in the gala celebration of May 8, during National Music Week, the event being climaxed with a parade of 40 bands from the tri-states led by Memphis Federation. There were about 50 floats by Memphis stores and industries. The railway contributed two units of flat cars beautifully decorated and lighted. More than 700 musicians appeared on the floats and with the bands.

San Francisco, Cal.—The Market Street Railway has erected three painted signboards on company property at different points. Each sign is about 80 ft. long, the top being about 16 ft. from the ground. The cars depicted on the sign are painted in natural color—deep green bodies, white fronts, gold striping. At night the signs are illuminated with nine 200-watt, direct-current lamps hooked to the regular trolley current in series, with latest sign reflectors attached.

Washington, D. C.—During 1930, state gasoline taxes yielded nearly \$500,000,000, an increase of 14.6 per cent over the 1929 figures, according to a statement made on May 3 by the Bureau of Public Roads, Department of Agriculture. Every one of the states and the District of Columbia now has a gasoline tax, the report reveals, the rate varying from 2 to 6 cents. The average rate for the country was 3.35 cents.

Lack of Leadership Shown at Business Conferences

The Chamber of Commerce of the United States and the International Chamber of Commerce are the most important and representative organizations of business men in the world. The first expresses the common interests of business in the richest and most powerful industrial, commercial and financial nation; the second, the common interests of business in 35 countries, including nearly every part of the globe except Russia and some of Latin America. Coming as they did, in the middle of the most severe depression in modern history, on two successive weeks, the meetings of these two bodies were a dramatic event.

To evaluate the outcome of these conferences, domestic and international, it is necessary to remember their limitations. These organizations are not agencies for action but forums for exchange of experience and expression of opinion. They are composed of the most diverse interests, not organized on the basis of single industries or lines of trade. The American Chamber is made up of large numbers of small business men as well as representatives of the dominant concerns. To this diversity of domestic interests the International Chamber adds that of national differences. Some of the national chambers are really governmental agencies. In both bodies purely political factors—personal, national or international—inevitably play a part and help to paralyze or shape purely economic considerations. Moreover, the effectiveness of the national chambers is hampered by the fundamental differences between rural agricultural and urban industrial or financial psychology; and the international body by differences of language. They are exclusively employers' organizations.

Despite these handicaps, the potentialities of accomplishment are great. It is possible through these organizations not merely to promote better understanding among the diverse interests through personal contact and exchange of practical experience among business leaders in different fields and different countries, but also to present to the public and to government pronouncements of principle or policy or even general programs of action to be executed by individuals, organized industries or public authorities. Something of this sort was certainly expected at this time. In some of these respects the result was undoubtedly disappointing. The degree of disappointment depends upon the extent of one's expectations.

The discussions, reports, personal contacts and exchange of experience were of practical value, served to concentrate serious attention on current economic problems, helped clarify understanding of the depression, and strengthened the sense of responsibility of business for economic security and social welfare. In all these respects the work of the International Chamber was more substantial and impressive than that of the American Chamber. But neither at Atlantic City nor in Washington was American business leadership at its best.

The psychology of the conferences was one of anxious caution and conservative control, not of creative courage. It was turned backward to the past, not forward to the future. It was concerned primarily with discovering the causes of what has happened—exposing the follies, errors and evils of the past, reconstructing and read-

justing things to a previous condition, complaining about the various handicaps to remedies that have been proposed—not with pushing out along new paths, or even carrying on the constructive accomplishments of recent years. These were largely condemned and repudiated. There was no remedy but by restoring the *status quo ante* by thrift, hard work, restricting production, canceling debts, lowering tariffs, reducing wages and living standards and abandoning all "artificial" efforts to prevent deflation and readjustment. Only here and there was there occasional recognition of the need for new forms of governmental or organized business effort to meet new problems or promote further progress, especially in relation to employment stabilization.

INTERNATIONAL BUSINESS RELATIONS DRIFTING

The International Chamber was racked by concealed conflicts of national interests over war debts, tariffs, commercial policies silver, Russian relations. Business men at these meetings persistently protested against the extension of governmental activity in economic matters, but were obviously relying more and more upon governmental support for their special industrial or national interests. They protested against trade barriers, but were at the same time preoccupied with various new protective devices. Business abroad is evidently being driven into concerted action through cartels, regional commercial agreements and other arrangements which are creating new conflicts and subjecting it to new governmental controls for political purposes. In the discussions of Russian and European-American trade relations, in the comments on American tariff policies and in the disputes over the most-favored-nation principle in commercial treaties, it was obvious that new forms of economic nationalism are developing and that international business relations are drifting more and more definitely under governmental control, as a consequence of failure of co-operative business effort.

Although there was the usual insistence on the interdependence of nations, the striking feature of this meeting was the emphasis laid upon inherent differences in economic structure and social psychology among the various countries, especially in Europe and America. For the first time

The Business Outlook

BUSINESS has reached its resistance level. The full April records clinch the evidence of improvement. Production volume has increased slowly for four successive months, supported especially by lines involving consumer goods rather than capital goods. Business failures have apparently passed their peak. Construction, however, is the conspicuous laggard. Firm Federal Reserve policy has become a plainly favorable influence in interior and foreign money markets. Doubtless all these factors dictated the cautious, oracular optimism of official utterances from the capital at the recent cabinet meeting.

—The Business Week.

there was an evident tendency to admit that international interdependence is not uniform or universal, that international co-operation has its limits, and that intelligent nationalism has its advantages. This realistic reaction against exaggerated international idealism appears to be an important by-product of the depression along with the recognition by business men of their primary responsibility for the economic security of the working classes in their own country.

At the Atlantic City meeting two distinct phases of transportation constituted topics of round-table discussion. Wide differences of opinion were in evidence among railroad, highway and waterway adherents at the conference which considered the question: "What Is Fair Competition in Transportation?" Moreover, no appreciable progress was made toward agreement. At the conference to discuss mass transportation, however, harmony of opinion prevailed concerning the importance of this problem to the business men of the country and the need for intensive study of its economic aspects.

As indicated in *ELECTRIC RAILWAY JOURNAL* News for May 2, representatives of mass transportation agencies emphasized two major points in presenting this subject: the vital necessity of mass transportation to business, industrial and civic development, and the fact that companies rendering this essential service are not able to operate on a sound financial basis, and have not been able to do so for some time. It was held that the relative merits of different kinds of vehicles was a matter of detail to be settled after study of actual conditions in specific places.

Exclusive Use of Street by Railway Suggested

A petition signed by the owners of property fronting on Chestnut Street between Fourth Street and Twelfth Boulevard, St. Louis, Mo., has been presented to the St. Louis Public Service Company requesting that a one-way street car track be laid in Chestnut Street to relieve traffic on Olive Street. The company is asked to divert either its eastbound or westbound track on Olive Street east of Twelfth Boulevard to Chestnut Street. The signers of the petition said that if the company will consider operating cars on Chestnut Street they will ask the Aldermen to make Chestnut Street a railway street exclusively. It is estimated that the plan would save car riders 20,000 hours a day.

Buses to Replace Omaha Interurban

The Omaha & Southern Railway, an interurban owned by the Omaha & Council Bluffs Street Railway, has been authorized by the Nebraska Railway Commission to abandon its service and remove its tracks. The commission said that if rates to which it were entitled by law were fixed, they would be prohibitive. Moreover, the commission refused to adopt the theory of objecting patrons who desired the road continued because it is an integral part of the city system, the state body ruling that it cannot burden Omaha patrons with a deficit sustained by separate suburban lines. The Omaha & Suburban Bus Company has been organized in the interest of the railway to supply bus service over that part of the rail route calculated to prove remunerative. The interurban runs from Omaha through Bellevue to Fort Crook.

Buses Brought Under New York Commission

Governor Roosevelt of New York on April 21 signed the Thayer bill as Chapter 531, laws of 1931, amending the public service law in relation to state regulation of bus lines. This measure for the first time brings bus companies under the jurisdiction of the Public Service Commission in New York. The Governor felt that New York State has been far behind in the line of progress in placing this class of corporations under the jurisdiction of its regulatory utility body. Protest was made to him relative to the penalty provided in the bill for violation of its provisions, but he obtained an opinion from the Attorney General pointing out that this bill did not change the penalty in this regard from what it was before. The Attorney General said:

Under existing law the operation of a bus through the streets without a certificate of convenience and necessity is a misdemeanor (Sec. 29, Penal Law). The owner and the driver may be arrested. The proposed law simply states this in more direct and emphatic terms in the confines of the statute itself without necessity of going to the Penal Law to find the violation denominated the same crime.

It is my opinion that present statutes make the act as much a misdemeanor as does the proposed law. Nothing will be new in this regard.

Under presently existing law, no omnibus line can operate in a city without (1) having obtained the consent of the city and (2) a certificate of convenience and necessity (Sec. 65, 66, Transportation Corporations Law; Long Beach vs. Public Service Commission, 249 N. Y. 480). In towns and villages, if such municipalities pass a resolution requiring their consent, the omnibus line must likewise first obtain that consent and then a certificate of convenience and necessity (Sec. 67, Transportation Corporations Law), except that under the proposed law the municipalities may not unreasonably withhold their consent.

Maintenance Discussed

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Gorum, assistant master mechanic of the Virginia Electric & Power Company. Mr. McGorum believes that mileage is the most effective basis on which to carry on maintenance, but that its adoption as a standard should be accompanied by a diagnosis by each operator of the peculiarities of his own equipment.

A description by R. C. Hall, engineering aide of the United Railways & Electric Company of Baltimore, of the twelve double-deck buses recently put in service in that city completed the first day's session. Mr. Hall outlined the considerations which led to the selection of this particular size and type of equipment.

The second morning was taken up with discussion of a prepared list of questions. York, Pa., was chosen as the next meeting place. Officers chosen to direct the affairs of the association during the ensuing year follow: President, J. T. Porter, superintendent of equipment Virginia Electric & Power Company; vice-president, C. E. Kefer, master mechanic Altoona & Logan Valley Electric Railway; secretary, R. D. Voshall, superintendent of equipment Washington Railway & Electric Company.

The entertainment program included a banquet on the evening of May 14. Following the closing session a visit by bus was made to the new garage of the Washington Railway & Electric Company and the shops of the Capital Traction Company.

Elimination of Steam Contemplated in England

Complete electrification of all British railroads over a period of twenty years at an estimated cost of approximately \$1,860,000,000 is favored by the special committee, headed by Lord Weir, in its report to the British Government.

Describing the project as one of unusual magnitude in the history of world enterprise, the committee recommends the substitution of electricity for steam over the entire British railway system. If adopted, the scheme, according to the committee's calculations would cost the railways approximately \$1,270,000,000, the Central Electricity Board \$390,000,000 and \$200,000,000 for suburban electrification.

The committee's report states that the total mileage of standard gage lines not already equipped for electric working is approximately 36,000 track-miles running line and 15,500 miles of sidings. The estimates of cost call for 10,400 electric locomotives and 4,800 equipments for three and four coach multiple unit sets, and includes equipment for carriage heating.

The committee takes the view that the electrification of the railways should not be allowed to proceed by piecemeal stages, but that the transformation from steam to electricity should be achieved by a single comprehensive scheme.

Commenting on the capital expenditure involved, the committee states:

The magnitude of this would be unique in the history of world enterprise. On the other hand, we feel bound to point out that without any predetermined long-term program, our national expenditure on the construction, improvement, and maintenance of roads in the last ten years has probably amounted to the colossal sum of £500,000,000 and is now proceeding at the rate of over £60,000,000 per annum.

The three members of the committee, which was appointed in September, 1929, are Lord Weir, Sir Ralph Wedgewood, chief general manager of the London & Northeastern Railway, and Sir William McLintock, an eminent accountant. Their report is unanimous, and it is generally understood in British circles that the railway companies are in agreement with the committee's findings.

Leeds Tram Cars Continue Popular

Continued popularity of the tram car as a means of transportation in England is attested to by the annual report of the general manager of the Leeds, England, Tramways and Transport Department. The total receipts for the year, amounting to £1,045,275, constitute a record for total income in the history of the undertaking. Receipts from the tramway alone were £939,002, an increase of 2.03 per cent over the previous year, while motor buses yielded receipts amounting to £106,273, an increase of 24.45 per cent.

As an indirect advantage of the tramway to the city, the report states that of the total revenues no less than £525,000 are paid in wages to the employees, who are practically all Leeds citizens. This represents more than 50 per cent of the receipts. In addition, large purchases of manufactured goods and raw materials are made locally.

Electricity for the tramway is supplied by the municipal electricity department, for which the sum of £41,192 was paid. This made the tramway one of the largest and most profitable customers of the lighting department. Costs for pavings and maintenance of pavings of the tramways were heavy. Assumption of these costs by the tram relieved the highways department, but resulted in little benefit to the car riders. In addition, £42,041 were paid in local taxes during the year.

Despite the large earnings, the average fare charged is approximately ½ penny (1 cent) per mile.

Important Subway Extension for London

The decision of the London Underground to extend the Bakerloo section of the London Electric Railway from the Elephant and Castle, its present eastern terminal, has been publicly acclaimed. The extension will be 1.75 miles long. It will be served by two new stations. The cost of the new work will be approximately \$9,375,000. If the necessary powers are obtained the line will open in 1933.

London, England—The County Council has decided to make another trial of two-pence all-the-way fares on its cars on Sundays, the concession to extend from the third Sunday in April till the last Sunday in September. Last year the experiment was made during August, September, and October. The two-pence all-the-way fare obtains all the year round on week days during off-peak hours. The one-penny fare, of course, continues for short distances.

Tokyo, Japan—"In the future," says the *Japan Advertiser*, published in Tokyo, "the motorist who races trains to crossings will do so at his own risk. His heirs will have no claim on any railway, public or private, if his temerity sends him on a journey he had not expected to take so immediately. The new ruling is a recognition of the fact that this is an age of speed, and that the country will be benefited more by faster train schedules than by preserving the lives of idiots who race trains to crossings."

Nottingham, England—The Council has approved a scheme for the conversion of its tramways and its petrol bus services to the trolley bus system at an estimated cost of £203,925. This includes £156,400 for trolley vehicles and £45,525 for overhead equipment. The routes will radiate from the center of the city, with a circular route like the rim of the wheel connecting the radial routes. An outer ring along a new road is also contemplated. The Town Council has powers for the expenditure of £900,000 in all for conversion to the trolley bus system, and for extensions. It was stated at the meeting of the Council at which the step was approved that it has been the experience of the Transport Committee that whenever local lines had

been converted to the trolley bus system earnings per mile run went up perceptibly. In the last annual report the respective revenues per mile run were shown as follows: Buses, 11.15d.; tramcars, 16.49d.; trolley buses, 17.84d. The respective surpluses per mile were: Buses, 0.97d.; tramcars, 3.48d.; trolley buses, 5.93d.

Plymouth, England—The Council has approved a proposal to eliminate the tramways and to substitute buses gradually over a period of ten years. If full tramway service were maintained, £25,000 would be required for track reconstruction and £62,000 for new tramcars. The track length of the Plymouth tramway is about 34 miles.

the bound publications in which it appears and also for the purpose of ascertaining whether standards have been issued on any specific subject.

Economics of Power Plant and Line Design

"Generating Stations, Economic Elements of Electrical Design," by Alfred H. Lovell, professor of electric power engineering University of Michigan. Published by McGraw-Hill Book Company, Inc., 359 pages, 171 illustrations, price \$4.

Power generation and transmission having arrived at a highly developed stage technically, the great need now is for further economic studies and developments in this field. Having been developed from lectures and problems given in a course on power plant and transmission systems, this book gives an opportunity to apply the element of economics to the problem of power plant and transmission design in the selection of apparatus, in proportioning the details in an assembled whole, and in balancing initial and subsequent costs. Attention is given to the vital interrelation of the mechanical and electrical elements in the design with detailed analyses of special engineering features. The book contains ten chapters which are devoted to the following: Principles of corporate finance, cost of stations, depreciation and obsolescence, power plant load curves, economical study of distribution systems, power plant location, bus systems, oil circuit breakers, protective relays, and transmission lines with synchronous condensers.

Nemesis and Narcissus

"Business Adrift," by Wallace Brett Donham, with an introduction by Alfred North Whitehead. Published by Whittiesey House, McGraw-Hill Book Company, Inc., New York; 165 pages. Price, \$2.50.

Business men cast adrift recently from the sea of profits to engulfing waters of deficits should take courage from the penetrating analysis of challenging problems expounded by W. B. Donham, dean of the Graduate School of Business Administration of Harvard University.

Accessible to fundamentals as dean of that institution, the author offers no fantastic program. Nevertheless, his work is a ringing contribution to liberal thought about an economic era rapidly approaching modification, and it should challenge the business leaders of the country to take their coats off and go to work.

The introduction by Professor Whitehead also, deserves more than passing praise. It is a hopeful sign of regeneration when the philosopher contributes thoughts to big business even if it is only to the extent of helping business men to know themselves and to appreciate their true place in the community and their obligations to society. It is the philosopher who is best fitted to identify the collapse of an old regime or predict the entrance of a new epoch. Dr. Whitehead's virtue is the vision of Plato.

As surely as there exist underlying currents to demand the inquiry in this book, it is the part of wisdom to cooperate intelligently for self-preservation rather than lose the good features of the present business civilization. And most helpful to this end should "Business Adrift" prove in approaching the problems which it hypothecates.

London Underground Agrees to Traffic Board Scheme

Lord Ashfield, chairman of the London Underground combine, recently presided over a meeting in London of the stock and shareholders of the twelve undertakings associated in the combine, at which, by a large majority, approval was given to the provisional arrangement reached with the Minister of Transport for placing London traffic under the control of a Passenger Traffic Board. The terms include the right to withdraw from the settlement in the event of any material alteration to the bill by Parliament repugnant to the provisions.

Lord Ashfield said he had been engaged in negotiations with the Transport Minister, in order to obtain such terms for the exchange of stocks as he could recommend for acceptance. He said:

We are still engaged in negotiations with the Minister upon the amendments required in the bill, and even if these should be agreed with the Minister, as I anticipate, we shall be compelled to watch narrowly other amendments which may be introduced into the bill, in case their effect should be to jeopardize or impair your interests.

We have a long and anxious period ahead before all these questions are determined, but to-day we are to decide the course we are to pursue, whether we shall support the bill or oppose it. I hope you will pass a resolution approving what I have already done, and authorizing me to continue my negotiations with the Minister and bring them to a conclusion.

Lord Ashfield then explained the stocks to be issued by the board, and the manner in which the income of the board was to be applied under the present plans. The upshot of the arrangement is that the Underground stockholder after two years shall receive not less than he does today, with an expectation of a further 1 per cent. He continued:

I can but think that our prospects are improved by the proposals of the bill, and that if in the future we might not obtain quite such large returns as we have a chance of obtaining under the present management, yet the interest will be more surely secured, and will be most certain to continue. I have therefore no hesitation in recommending to you the acceptance of the terms of the memorandum as being in your best interest, and as affording you as good prospects in the future as you might fairly expect.

Lord Ashfield assured the meeting that the Transport Board would be free from political interference. To cries of "No!" he retorted:

I have read this bill carefully, and I beg you to accept that I know what I am talking about. You cannot conceive I would be guilty of such folly as to suggest to you in a matter in which my whole life has been wrapped, that you should transfer your interests to a board subject to political interference, that could play ducks and drakes with your investments. Acts of Parliament are not treated like scraps of paper. They are scrupulously observed by all parties. I have promised the Minister my support. You may fail to support me,

but in that event you will have to find somebody else to manage your undertakings. I have pledged my word, and I am not going back on it.

This speech was greeted with cheers, after which the resolution was carried by a large majority.

The bill is still a matter of debate as to principles.

BOOK REVIEWS

Treatise Both Theoretical and Practical

"Mercury Arc Power Rectifiers," by Othmar K. Marti, chief engineer American Brown Boveri Company, Inc., and Harold Winograd, rectifier engineer American Brown Boveri Company, Inc. Published by McGraw-Hill Book Company, Inc., 473 pages, 230 illustrations, price \$6.

Appearing as it does at a time when the application of the mercury arc rectifier to railway power transmission and distribution is becoming increasingly important, this book should be of great value both as a theoretical and practical treatise to power engineers and to executives who come in contact with this newer means of power rectification. Nothing is lacking to make the explanation of the operation of the rectifier complete. For the theory of the operation, all mathematical relations of current, voltage and power factor in the rectifier circuits are derived. Circuit relations of rectifier transformers, the practical design of transformers and the load characteristics of load rectifiers as affected by the type of transformers used are dealt with in some detail. Detailed calculations are also given for several of the more important types of transformer connections.

A part of the book is given over to the outline of present day practice in the application of steel inclosed rectifiers, with emphasis on their employment in railway service.

Materials Standards Indexed

Index to A.S.T.M. Standards and Tentative Standards. Issued by the American Society for Testing Materials, Philadelphia, Pa.

This pamphlet of some 100 pages constitutes a combined index to all A.S.T.M. standards and tentative standards in effect as of September, 1930. A complete list of the 427 standards and 155 tentative standards is given. It is designed to be of service to those familiar with the society's standards in locating any specification or method of test in

Changes Are Made in Philadelphia Rapid Transit

Messrs. Myers, Queeney and Joyce Are Deposed as Directors. R. T. Senter and R. F. Tyson Retained. Careers of the New Directors Are Reviewed.

WITH the elimination of Mitten Management from the affairs of the Philadelphia Rapid Transit Company Dr. A. A. Mitten becomes merely a director of P.R.T. His continuance has been regarded as extremely desirable because of his intimate knowledge of the Mitten plan of co-operation between the company and the men founded by his father, and his own long and friendly associations with the employees, while R. T. Senter, as the practical operating head of the company, is also being retained.

Messrs. Myers, Queeney and Coleman J. Joyce, the leaders in Mitten Management, with Dr. Mitten, since the death of Dr. Mitten's father, and before T. E. Mitten's death his chief lieutenants in company management, disappear from the company completed. R. F. Tyson retires as a director, but continues as vice-president in charge of operation.

Messrs. McCarthy, McKinnon, Patterson, Gribbel, Talbot and Tily, the six business men named by Judge McDevitt to assume the new control represent a cross-section of the city's highest business circles.

CAREERS OF NEW DIRECTORS REVIEWED

For many years John A. McCarthy was a close associate of the late George H. Earle, Jr., and has been a factor in the Real Estate Trust Company since its reorganization in 1906. He is 58, a lawyer by profession and today, besides his executive positions in the trust company and the sugar corporation, is president of the Pennsylvania Warehousing & Safe Deposit Company and vice-president of the Finance Company of Pennsylvania. He is also a director of the Stanley Company of America and the Electric Construction Company.

George V. MacKinnon is 49. He has been in the great Stetson corporation since 1900, rising to treasurer, then to vice-president in charge of finances, and to the presidency in 1928 following the death of J. Howell Cummings. He is a director of the Fidelity-Philadelphia Trust Company, the Philadelphia Manufacturers Mutual Fire Insurance Company and Philadelphia's Goodwill Industries, of which he is also treasurer.

George Stuart Patterson has been a member of McFadden & Brother, cotton brokerage firm, since 1919. Prior to that he was general solicitor of the Pennsylvania Railroad.

John Gribbel has numerous business interests, one of his leading connections being the presidency of the American Meter Company. He is also president of the Tampa Gas Company and a director of the Philadelphia National Bank, Real Estate Trust Company, the Canadian Meter Company, the Kings

County Lighting Company, the Constitution Indemnity Company, the Insurance Company of North America, the John B. Stetson Company, the Exchange National Bank, the Alliance Insurance Company, the Alliance Casualty Company, the Fire Association of Philadelphia, the Liberty Mutual Insurance Company, Victory Insurance Company, Indemnity Insurance Company of North America, the Reliance Insurance Company, the Curtis Publishing Company, the Union Transfer Company, the Pennsylvania Sugar Company and the Cities Service Company.

Walter LeMar Talbot is the second of two presidents of the Fidelity Mutual Life Insurance Company in its 53 years' existence. Starting with it as office boy in 1882 he became second-vice-president in 1903; vice-president in 1911, and president in 1914. He is a director and member of the utilities committee of the Philadelphia Chamber of Commerce and a director of the Corn Exchange National Bank and the Real Estate Trust Company.

Dr. Herbert J. Tily was originally chosen by Judge McDevitt as one of the three receivers he proposed, in his decree of April 11, to place in charge of the transit company in order to displace Mitten Management and to reform the P.R.T. affairs. He is best known as president of Strawbridge & Clothier, one of Philadelphia's big stores. When agitation was started to sell the underliers to the city Dr. Tily, as chairman of the utilities committee of the Chamber of Commerce, directed a study of the transit problems of Philadelphia.

R. A. Weston in Public Accounting

R. A. Weston, connected with the accounting department of the Connecticut Company for several years, has opened an office in New Haven for the practice of public accounting. Prior to his work with the Connecticut Company, Mr. Weston was connected with the New York, New Haven & Hartford Railroad, and for nine years he was general storekeeper of that company and its subsidiary electric lines.

During the last ten years Mr. Weston has served on the executive and other committees of the American Electric Railway Accountants' Association and has been a contributor of articles on accounting and storekeeping subjects to the *ELECTRIC RAILWAY JOURNAL* and to *Railway Age*.

In his accounting practice, Mr. Weston will include special investigations and reports with respect to organization and system in accounting and store departments of electric railways and companies operating bus lines.

R. T. Sullivan in Receiver's Post at Tacoma

Richard T. Sullivan, former manager of the Tacoma Railway & Power Company, Tacoma, Wash., has been appointed successor to Scott Z. Henderson, resigned, as receiver for the Puget Sound Electric Railway, by Judge Edward E. Cushman. Mr. Henderson's total compensation was fixed at \$60,000, of which he had already received \$41,939. Frank D. Oakley, attorney for the retiring receiver, was allowed \$30,000 as full compensation in closing the affairs of the old Tacoma-Seattle electric line. Operation of the line ceased on Dec. 30, 1928. Mr. Henderson was appointed receiver in February, 1928. He declared that he devoted all of his time during the first year to the line's business, and about 25 per cent of his time after that. The interurban's property already disposed of has brought approximately \$350,000.

Employees Honor Retiring Official at Wheeling

C. R. Bendell, who recently resigned as superintendent of the Wheeling Public Service Company, Wheeling, W. Va., and Bus Transportation Company, a subsidiary, after serving many years with the organization, was presented May 11 a watch and chain by employees at an informal gathering in the company's offices. R. E. Grimes on behalf of the employees commented on the long service by Mr. Bendell with the organization and of the feeling of affection between the head of the company and its employees. Mr. Bendell has been with the organization since 1910. On the back of the watch are Mr. Bendell's initials, while on the inside of the case is engraved, "From the Employees of the Wheeling Public Service Company and Bus Transportation Company to C. R. Bendell" and the date.

Simon Glerum Made Secretary and Treasurer at Grand Rapids

Directors of the Grand Rapids Railroad, Grand Rapids, Mich., have elected Simon Glerum secretary and treasurer of the company to fill the vacancy caused by the recent death of W. E. Livingston. Mr. Glerum has been assistant secretary and assistant treasurer. He is succeeded in those positions by Ray A. Poteracke, who will continue as chief clerk of the company.

Mr. Glerum was born in Grand Rapids. He began his business career as a member of the clerical staff of the law firm of Kingsley & Weeks in that city, but left this firm to be private secretary to Congressman Carl E. Mapes in Washington. In 1914 he went to the Grand Rapids Railway, predecessor of the Grand Rapids Railroad, as private secretary to Benjamin S. Hanchett, vice-president and general manager.

In 1920 Mr. Glerum became private secretary to L. J. DeLamar, who succeeded Mr. Hanchett as vice-president and general manager. Mr. Glerum continued in this position until January, 1927, when he was elected assistant secretary and assistant treasurer.

Mr. Poteracke has been with the company since 1917, entering the service as an accountant in the stockkeeping department. Later he was promoted to be head bookkeeper and then to chief clerk in the general offices.

Frank R. Phillips Made President of Philadelphia Co.

Frank R. Phillips has been elected president of the Philadelphia Company to succeed John J. O'Brien, president since May, 1929. At that time, Mr. Phillips was elected senior vice-president of the company. The Philadelphia Company and its subsidiary and affiliated companies are included in the system of the Standard Gas & Electric Company.

Mr. Phillips is a nationally known figure in the public utility industry. He went to Pittsburgh in 1909 to assist in the development of the street railways of that city. In 1910 he was made superintendent of equipment of the Pittsburgh Railways, and in July, 1923, was made acting general manager for the receivers. Upon the lifting of the receivership in February, 1924, he was appointed mechanical and electrical engineer and also representative of the company to the Traction Conference Board. On Sept. 1, 1926, he was elected vice-president and general manager of the Duquesne Light Company and its subsidiaries, and in April, 1928, was elected vice-president of the Equitable Gas Company and its subsidiaries. On May 24, 1929, he became senior vice-president of the Philadelphia Company and president of its affiliated corporations. He has been active in the affairs of the American Electric Railway Association, having served on many important committees, is a past president of the Pennsylvania Street Railway Association, the American Electric Railways Engineering Association and the Pennsylvania Electric Association.

Westinghouse Promotes J. M. Lessells

John M. Lessells, formerly manager of the mechanics division of the Westinghouse Research Laboratories, has been appointed manager of engineering in the South Philadelphia works of the company, to succeed A. D. Hunt, resigned.

Mr. Lessells was born in Dunfermline, Scotland, in 1888. He attended Heriot-Watt College, Edinburgh; the University of Edinburgh; and the University of Glasgow. From the latter institution he was graduated in 1915 with the degree of Bachelor of Science in Engineering, both mechanical and electrical. He was Lauder-Carnegie scholar at Glasgow in 1911. He has been with the Westinghouse Company since 1920.

C. A. Muth New York Railways Auditor

Charles A. Muth has been appointed auditor of both the Fifth Avenue Coach Company and the New York Railways, New York City, succeeding the late George V. Owen.

Mr. Muth was born in New York in 1884. He attended grammar and high school and specialized in accounting at New York University and Pace Institute. His start in business led to a clerkship and bookkeeper's job with the National Shoe & Leather Bank and later the National Bank of Commerce. Well grounded in accounting procedure in banking, he turned to the

public utility field by joining New York City Railway in 1904 as a clerk. He was selected soon after to establish a cost system for the Metropolitan Street Railway. Upon his return to the accounting department he was appointed assistant chief clerk, and through a series of progressive appointments became assistant auditor of both the New York Railways and the Fifth Avenue Coach Company, which acquired control of the railway in 1926.

Lucius S. Storrs, president of the United Railways & Electric Company, Baltimore, Md., has been elected one of the charter directors of the Baltimore Association of Commerce.

Clinton D. Smith Made Philadelphia & Western Manager



C. D. Smith

Thomas Conway, Jr., president of the Philadelphia & Western Railway, has announced the appointment of Clinton D. Smith as general manager of the lines which provide rapid transit service to Bryn Mawr, Villanova, Wayne, Strafford, Norristown and many other of Philadelphia's rapidly developing suburban communities. In July, 1927, Mr. Smith accepted the newly created position of superintendent of personnel with the Cleveland Railway, Cleveland, Ohio, and effected in a four-year period a comprehensive program of industrial relations. He instigated a personnel or management study, particularly among the transportation department employees, for the promotion of the economic principles of transportation service. The training or sales program developed was successful not only in securing a better mechanical performance on the part of the transportation employee, but also higher standards of personnel service.

In taking up his new operating responsibility, Mr. Smith will co-ordinate his more recent sales development with that of operating experience secured as general manager of the Beaver Valley Traction Company, New Brighton, Pa., and as general superintendent of the Penn-Ohio System in Youngstown, Ohio.

Mr. Smith was graduated from Worcester Polytechnic Institute in 1912. This training was followed with four years practical experience in the several departments of the Public Service Railway of New Jersey. In 1916 he went to Youngstown as superintendent of schedules and traffic, soon becoming superintendent of trans-

New Officers for Shore Line

At a reorganization meeting of the New Haven & Shore Line Railroad, at New Haven, Conn., held recently, Frederick C. Spencer was elected president. Clarence Blakeslee, vice-president, and Harold A. Blakeslee, secretary-treasurer. Eugene Sullivan, who has been secretary, was not re-elected. He represented Kingston interests. New directors include Clarence Blakeslee, Harold Blakeslee, Dr. Frederick Sperry, Benjamin L. Slade, James Fahy, Emil Frieda, Robert A. Lively, Mr. Spencer, and Edward J. Daly. Mr. Slade, as receiver for the Kingston Company, controls the majority stock of the railroad.

portation. In 1923 he resigned as general superintendent to become general manager of the Beaver Valley Traction Company.

Mr. Smith believes that most transportation problems should be analyzed as those of sales, which call for the collection of facts in the field and among the trainmen—that is, the sales force. He feels that the possibilities of the employee as a potential sales force has in but few instances been fully developed, but that this reservoir if once tapped and then constantly developed, will regain much of the revenue lost by competitive forces, presaged of course on speedy and comfortable service.

He has been active in committee work of the American Electric Railway Association and in recent years has served as chairman of the Committee on Transportation Employee.

Thomas C. Moore's Duties Enlarged

When the operation of the interurban cars between New Castle and Youngstown, and Warren and Youngstown, was centered recently in Youngstown, Ohio, the change brought to the superintendency of the reunited interurban lines Thomas C. Moore, to whose duties as superintendent of the West End Traction Company was added the operation of the East End line as well.

Mr. Moore has been in the employ of the company continuously for 27 years. He signed up as a conductor with the old Mahoning Valley Street Railway. When the World War made the superintendent of employment a key position in keeping the wheels turning, Mr. Moore was appointed to that post, and continued in it till the end of the War brought about a readjustment of labor conditions. He was then transferred to the newly created position of chief instructor of motormen and conductors, with headquarters at Haselton. On Sept. 10, 1921, he was appointed superintendent of the West End lines, including the Youngstown-Warren-Leavittsburg interurban line and the Warren city service, with headquarters in Niles. He continued in that position till the recent change, when the Niles carhouse was closed and operation was started from the Haselton carhouse, with the New Castle line as an added responsibility.

J. C. McQuiston Retires From Westinghouse Company

J. C. McQuiston, general advertising manager of the Westinghouse Electric & Manufacturing Company, has announced his retirement effective June 1, 1931. It is understood that he will start on an extended cruise around the world with his wife and daughter. In his decision to retire from Westinghouse, he brings to an end a record of continuous advertising administration for one company unparalleled in American industry.

Gifted with a most pleasing and dynamic personality, and combining the abilities of analyst, speaker and writer, Mr. McQuiston is one of the best known advertising executives in America. As an advertising man, he has left the im-



J. C. McQuiston

print of his personality on every branch of his profession. During his career, he has been responsible for expenditures totaling scores of millions of dollars in every form of advertising media. As president of the Association of National Advertisers and as a leader in association work in the electrical and allied industries he is perhaps better known personally to more members of the electrical world than any other man within it.

During the 29 years that Mr. McQuiston has been in charge of advertising for Westinghouse Electric, the status of advertising and sales promotion, distribution and other allied phases of his profession have gone through as many changes as the electrical industry itself.

Entering the advertising profession when it was in its infancy he contributed greatly to its growth and organization, and by his practice and preaching did much to help raise the ethical standards of the profession. Men long engaged in advertising will remember him for his slogan "Advertising must be truthful," while the modern group are indebted to him for his equally well-known tenet "Advertising and selling must go hand in hand."

In 1920, when the first broadcast was inaugurated on station KDKA at Pittsburgh, Mr. McQuiston arranged its pioneer program. He has been in general charge of all radio programs for Westinghouse broadcasting stations since that time. In this respect his

position in radio broadcasting is unusual in that he is the only advertising man privileged to have been a member of the original council of Westinghouse executives who decided to start broadcasting and to whom was entrusted the very important task of laying down the policies and practices to be followed.

He it was who caused the first union of broadcasting station and newspaper when he located a studio in a newspaper plant and used news bulletins as program material. In all the years during which broadcasting has developed, the pioneer programs of the Westinghouse Company, which he developed, and the ethics of program work, for which he was responsible, have served as the basis upon which all broadcasting programs have been founded.

As a young man just starting out in life, Mr. McQuiston had the benefit of contact with the dynamic personality of the late George Westinghouse. This was an influence that Mr. McQuiston has on more than one occasion gratefully and gracefully acknowledged. Only recently he said: "Mr. Westinghouse's forceful character had a tremendous influence on my whole business life. I have found his influence pervading the entire Westinghouse organization, and, in retiring from active work, my greatest regret is the severing of the happy relations with my associates in the Westinghouse Company."

Mr. McQuiston, born at Sandy Creek, Pa., near Pittsburgh, on Sept. 5, 1875, received his early education in the public schools of Wilkinsburg and then attended the Iron City College, Pittsburgh. On Oct. 1, 1891, he entered the employ of the Union Switch & Signal Company, Swissvale, Pa., but left this position on March 3, 1892, to accept another with the Pennsylvania Railroad in Pittsburgh. After serving with this company for about six years in clerical work, he entered the employ of the Westinghouse Electric & Manufacturing Company under Arthur M. Warren, at that time head of the Westinghouse Companies' publication department. When Mr. Warren resigned some five years later, Mr. McQuiston was made head of that department, which directed the advertising and prepared the popular literature for the Westinghouse interests. In April, 1910, the Westinghouse bureau of publicity and the publication department of the Westinghouse Electric & Manufacturing Company were consolidated, and Mr. McQuiston was made manager of the newly formed department, in which capacity he has since served.

J. H. Porter Reappointed to Missouri Commission

John H. Porter, St. Louis, Mo., has been reappointed to the Missouri Public Service Commission to serve for a six-year term to expire in April, 1937, but S. M. Hutchison, Kansas City, whose term also expired on April 15, will hold over until Governor Caulfield

has determined on his successor. Messrs. Porter and Hutchison are Democrats. Mr. Hutchison is understood to have declined to consider re-appointment in order to carry out plans which he has made to move to California. Mr. Porter is the only engineer member of the commission.

L. G. Ireland Vice-President at New Orleans

Lyall G. Ireland has been elected to the vice-presidency of New Orleans Public Service, Inc., New Orleans, La., operating the railway and light systems there. For the past five years Mr. Ireland has been the assistant to the vice-president of the company.

Mr. Ireland has been identified with utility companies in the United States and Canada for many years. A native of Canada, Mr. Ireland was graduated from



L. G. Ireland

the University of Toronto, in the class of 1908. He entered business with the Midland Construction Company, the construction organization of the Electric Power Company, Ltd., of Toronto. In 1912 he became manager of the Brantford Hydro-Electric System, Brantford, Ont. Six years later he associated himself with the Hydro Power Commission of the Province of Ontario, as manager of its central Ontario system. He remained in this position until 1924 when he went to New Orleans as the manager of the Citizens Light & Power Company. This company was later purchased by the Consumers' Electric Light & Power Company, and Mr. Ireland became the vice-president of the latter.

In 1926 the New Orleans Public Service purchased both of these companies and Mr. Ireland was made assistant to the vice-president of New Orleans Public Service, remaining in that capacity until his recent election to the vice-presidency.

It has also been announced that E. S. Myers, for several years assistant to the vice-president of New Orleans Public Service Inc., has been made assistant to the president. Mr. Myers is a graduate of the engineering school of Purdue University. He became connected with the company at New Orleans in 1923 as superintendent of the railway department. In March, 1925, he was made assistant to the vice-president and served in that capacity until his recent promotion.

Work of Efficient Woman Rewarded by Wheeling Road

Miss Margaret Stamm has just succeeded Carl R. Bendell, resigned, as manager of the Wheeling Public Service Company, Wheeling, W. Va. She finds the operation of a street railway just as "fascinating" today as she did when a girl in her 'teens, just out of school, she took a clerical position in the office of what was then the Wheeling & Elm Grove Railway. Her interest and efficiency were so great that it was only a few months after her services began with the railway that she became secretary to the manager.

For twelve years, Miss Stamm was secretary to successive managers of the company. Today as manager of the line she is assistant to the general manager, F. W. Samworth, who is stationed in Huntington, W. Va. She is the active manager of not only the Wheeling Public Service Company, but also to the Bus Transportation Company, which operates bus lines within the city proper and to West Alexander, Pa.

"I can imagine nothing more fascinating," declared Miss Stamm, when interviewed by a representative of *ELECTRIC RAILWAY JOURNAL*. "The business here has always seemed part of my very existence.

"Women are proving they can fill important executive position as well as men; more and more they are proving their worth in business and industry. They have successfully disproved the old theory that the only tasks the female could perform were menial ones.

"With competition growing keener all the time, electric railways must cultivate the good will of the public, for it is from the public our revenues are derived. That's what we are trying to do here."

Miss Stamm was particularly emphatic in the belief that electric railway executives should maintain at all times friendly relations with representatives of the newspapers. She said operation of a utility was a business in which the public was interested, and that the people had the right to know the facts.

The Wheeling Public Service Company is a subsidiary of the Central Public Service Company, with headquarters in Chicago. Originally it was a horse car line, operating between Wheeling and Wheeling Park, 4 miles east of the city, a section now within the city limits. The line, started in 1873, was extended from time to time until it reached West Alexander, Pa., 16 miles east of the city.

Having during her life never been employed in any other business, and finding that business "fascinating" at all times, Miss Stamm is well-grounded in railway work. A measure of her responsibility is indicated by the fact that the local company hauled 2,803,610 passengers on its cars and buses during the past year.

Miss Stamm is slight of build, with a keen, searching eye, but ever smiling and not one whit worried at the prospect before her in assuming her new and greatly increased responsibility.

★
C. Milo Davis, now retired and living with his daughter at Atlanta, Ga., was recently honored with the jewel decoration symbolic of 60 years continuous service in the Independent Order of Odd Fellows. Born in Stowe, Mass., in 1841,

Mr. Davis moved to Poughkeepsie, N. Y., where he was superintendent of the Poughkeepsie & Wappingers Falls Electric Railway for 28 years, starting out with the parent concern when it was an embryonic public utility with cars drawn up the hills surrounding Vassar College by means of horses. He was president of the Board of Public Works at Poughkeepsie until the time of his retirement ten years ago.

S. T. Dodd Honored on Retirement

Members of the transportation engineering department and women guests, to the number of 140, gathered at Hunters' Lodge recently as a testimonial to Mr. and Mrs. S. T. Dodd. Mr. Dodd is retiring from active work with the General Electric Company on June 1 and will take up his residence in the family homestead in Stephentown, N. Y.

Mr. Dodd has been a member of the transportation engineering department since 1904. He was graduated from Princeton University with the degree of Bachelor of Arts in 1887. Following his graduation he took up teaching, acting as instructor at Princeton in electrical engineering and physics. During this period he took advanced work and received the degree of Master of Arts in 1890 and that of electrical engineer in 1893.

Prior to his work in the locomotive design department of the General Electric Company at Schenectady, he was employed for three years by the Stanley Electric Manufacturing Company at Pittsfield, Mass. This company was afterwards absorbed by the General Electric. For a number of years he was engaged in the design of electric locomotives with A. F. Batchelder, and later was concerned with various general engineering problems for transportation equipment, including gas-electric cars, and, more recently, oil-electric locomotives. He is the author of numerous papers in the technical press and has contributed to the proceedings of the American Institute of Electrical Engineers and to other technical societies.

Mr. Dodd was born in China. A few years ago he revisited that country as a representative of the International General Electric Company.

Col. E. C. Rose A Director of New Jersey Company

At the annual meeting of the board of directors, Col. Edward C. Rose, Trenton, was elected a director of Public Service Corporation of New Jersey and underlying companies including Public Service Coordinated Transport, to fill the unexpired term of David Baird, Jr., who recently resigned. Colonel Rose is president of the First-Mechanics National Bank, Trenton. In 1927 he became president of the First National Bank of Trenton and in 1928, when the First National was merged with the Mechanics National Bank, Colonel Rose was elected chairman of the executive committee. On the death of Arthur H. Wood, president, Colonel Rose was named in his place.

Colonel Rose is commander of the 112th Field Artillery Regiment, National Guard of New Jersey, and is a member of the executive council of the United States Field Artillery Association. He has been active in civic and charitable work in Trenton

and was awarded the Trenton *Times* cup for 1929 as the most outstanding citizen of Trenton in civic affairs for that year.

Indiana Commission Appointments Announced

Harry K. Cuthberton of Peru, a state senator, has been appointed a member of the Public Service Commission of Indiana by Governor Leslie. At the same time, the Governor announced the reappointment of Commissioner Howell Ellis, of Indianapolis. Senator Cuthberton will succeed to a democratic post on the commission now held by Commissioner Calvin McIntosh, whose four-year term expired on May 1.

Senator Cuthberton has practiced law at Peru for eighteen years. While a member of the Senate during the last general assembly, he introduced several bills bearing on public utility matters, one of which was a measure to regulate truck and bus operations.

Commissioner Ellis served as secretary of the commission from April, 1925, until his appointment as commissioner. He is a graduate of DePauw University. Prior to his association with the commission, he was connected with the state department of public instruction. He also was a reporter on the Indianapolis *Star*.

John W. McArdle and Fred C. King have been reappointed chairman and secretary, respectively, of the commission.

A. C. Proudfoot to Manage Tygarts Valley

Arthur C. Proudfoot, master mechanic of the Tygarts Valley Traction Company, Grafton, W. Va., has been made general superintendent of transportation for the company, succeeding in part to the duties of E. W. Alexander who retires on April 1 as general manager and purchasing agent.

G. T. Vance, secretary of the Retail Credit Association, will become assistant secretary and treasurer.

★
Clarence H. Howard has resigned as chairman of the board of the General Steel Castings Company. Clarence H. Howard, Jr., manager of the foreign department of the General Steel Castings Company, and E. Howard Hooper, assistant to the father, have also resigned. It is understood they will be associated with the elder Howard in a new business undertaking not revealed.

★
Charles C. Malone has been appointed assistant auditor of the New York Railways and the Fifth Avenue Coach Company, New York City. "Charlie" Malone has been "through the mill" in the thirteen years he has been with the Fifth Avenue Company, having started his career as a clerk assigned to check tire mileage.

★
Frank Thornton, Jr., manager of residence engineering of the general engineering department of the Westinghouse Electric & Manufacturing Company, has been appointed manager of association activities of that company. He succeeds R. W. E. Moore, resigned. Mr. Thornton was graduated from the University of Missouri in 1908 with the degree of B.S. in Electrical Engineering.

OBITUARY

F. A. Estep

F. A. Estep, aged 82, former chairman of the board of directors of the R. D. Nuttall Company, died recently in St. Petersburg, Fla. In 1870 Mr. Estep went to Oil City, Pa., as freight agent for the Allegheny Valley Railroad. In 1887 he went to Chattanooga, Tenn., as a partner of the firm of F. I. Stone & Company, dealers in mill and industrial supplies.

Returning to Pittsburgh in 1892, Mr. Estep was employed by the Philadelphia Company. The same year he was appointed auditor of the Allegheny Heating Company, a subsidiary of the Philadelphia Company.

In May, 1893, when the Allegheny Heating Company acquired controlling interest in the R. D. Nuttall Company, Mr. Estep was elected president and treasurer. These offices he held until 1925 when he was elected chairman of the board of directors, in which position he continued until he retired in 1928.

Although the Westinghouse Electric & Manufacturing Company acquired the R. D. Nuttall Company in 1896 the latter concern continued as a subsidiary until 1928 when it was merged with the parent company and became the Nuttall Works of the Westinghouse Company.

During the time Mr. Estep served as the head of the R. D. Nuttall Company, it became a leader in the development and manufacture of gear products for electric railway, mining and industrial service. He was a former member of the American Electric Railway Association of the American Gear Manufacturers Association.

Joseph Y. Johnson

Joseph Y. Johnson, 72 years old, maintenance engineer for the St. Louis County lines of the St. Louis Public Service Company, died at his home in St. Louis County early on May 19 of heart disease. He had been in the maintenance department of the St. Louis Public Service Company and its predecessor, the United Railways, for 25 years. He was a member of the St. Louis Camp No. 4, United Spanish War Veterans, and formerly was state commander of that organization. Prior to the Spanish-American War he was captain of a Kentucky National Guard regiment.

W. E. Sanderson

William E. Sanderson, long superintendent of the Wason Manufacturing Company, Springfield, Mass., now a branch of the J. G. Brill Corporation, died in that city on April 26 of pneumonia, at the age of 72. He entered the employ of the Wason firm at the age of twenty years as a helper in the body department. Later he became foreman, and then timekeeper for his department and eventually for the whole establishment. After a short absence he returned to the concern as superintendent in the early '80's, and held the post continuously until 1916. Beginning in 1897 he was active in politics, serving as councilman and alderman and also as representative in the State Legislature.

He was Mayor for three terms. During this period his duties with the car company were lightened so that he could devote the necessary time to his official tasks. He resigned from the company to take a full-time post as member of the assessors' board, of which he was chairman for most of the time until his death.

Charles Day

Charles Day, chairman of the board of Day & Zimmermann, Inc., died on May 10 in the University Hospital, Philadelphia, after an illness of ten days. He was in his 53d year.

As the Philadelphia *Ledger* said, in the death of Charles Day, Philadelphia loses one of its most able and distinguished engi-



Charles Day

neers. Head of the firm of Day & Zimmermann for many years, Mr. Day had a wide experience in the management of public utilities, and his deep interest in the subject of scientific management was given ample scope by its practical application to the many industrial enterprises with which his firm was concerned. During the World War he was able to render conspicuously useful service in France in expediting the movement of the American troops and in the shipment and distribution of munitions and other supplies for the United States Expeditionary Forces. His interests were not confined solely to his profession, for as a manager of the Franklin Institute and a trustee of the University of Pennsylvania, of which he was an alumnus, his public services were many and valuable. His published treatise on "Industrial Plants" has long been a standard work of reference on the subject.

Mr. Day was a native of Philadelphia and a graduate of the University of Pennsylvania. After a connection with an engineering company in Nicetown he aided in founding the firm of Dodge & Day in 1902, and five years later, when John E. Zimmermann entered the business, the name was changed to Day & Zimmermann, Inc. So firm a grasp had he of production methods and problems that he lectured for seven years on these and related subjects at the graduate school of business administration of Harvard University and also at Columbia and Lehigh. It was about 25 years ago that Day & Zimmermann, Inc., extended its activities to include the public utility industry.

Mr. Day served on the directorate of the Pennsylvania Railroad, Interborough Rapid Transit Company, United Gas Improvement Company and Fidelity-Philadelphia Trust Company. As indicated previously, he was a trustee of the University of Pennsylvania and was active in other work, having been a member of the board of managers of the Franklin Institute and a member of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, the American Philosophical Society and other associations.

Edward T. Reeves, retired division superintendent of the Brooklyn Rapid Transit Company, Brooklyn, N. Y., now the Brooklyn-Manhattan Transit Corporation, died at Clyde, N. Y., on May 15, just 24 hours before reaching the 71st anniversary of his birthday.

J. H. Watley, formerly superintendent of the Valdosta Street Railway, Valdosta, Ga., is dead. He was 45 years old.

Charles F. Dege, general superintendent of the Clinton, Davenport & Muscatine Railway, Davenport, Ia., died on May 20 in his home in Davenport following an operation. He was a native of Clinton and had been associated with the interurban railway nearly a quarter of a century, serving the past twenty years as general superintendent. He was 51 years old.

Frederick D. Hoffman, 51 years old, assistant secretary and assistant treasurer of the Chicago Surface Lines, died suddenly on April 23 following an accident in the Belmont Hotel, Chicago, where he lived. Mr. Hoffman had been with the Chicago Surface Lines since 1914. Before that he was with the Chicago City Railway now included in the Chicago Surface Lines system.

Charles C. Elwell, public utilities commissioner of Connecticut, died at New Haven on May 23. He was 72 years old. He became connected with the commission in 1911 as its chief engineer, resigning at that time as engineer of maintenance of way of the Connecticut Company, operating a state-wide system of electric railways. He had gone with the electric railway four years before, after a long experience in steam railroad work. He was educated at the University of Maine as a civil engineer.

Judge F. E. Hunter, associated with the El Paso Electric Company, El Paso, Tex., as a member of the legal department since July 1, 1921, died on May 9. His connection with the El Paso company began as a member of the law firm of Goggin, Hunter & Brown, and was continued with his present partners. He had practiced law in El Paso since 1886. Mr. Hunter was 73 years old.

St. John Clarke, engineer engaged in the design of the structure of the first New York subway for the Rapid Transit Commission, predecessor of the Board of Transportation, died on May 22. Mr. Clarke resigned from the commission in 1905 to take the position of chief engineer on the construction of the Steinway Tunnel, now incorporated as part of the Queensboro subway. He had a vast experience on railroad work and the design and erection of steel for buildings and bridges. Mr. Clarke was born in Richmond, Va., in 1863.

INDUSTRY MARKET AND TRADE NEWS



One of the new cars for Brooklyn & Queens

Brooklyn & Queens Gets 100 Cars

The Brooklyn & Queens Transit Corporation has recently accepted the delivery of 100 cars ordered in December of 1930. The cars are of the single-end, center-exit type, with a seating capacity of 54 passengers. They are equipped with four 35-hp. motors, inside hung, and special noiseless spur gears of heat-treated steel.

Osgood Bradley Car Corporation built 50 cars of this order; these were equipped with Westinghouse electrical equipment. The remaining 50 were built by J. G. Brill Company and equipped with General Electric equipment.

General specifications of the cars built by Osgood Bradley are as follows:

Type of Unit.....	One-man, single-end, double-truck
Number of seats.....	54
Weights:	
Car body.....	19,000 lb.
Trucks.....	10,000 lb.
Equipment.....	9,000 lb.
Total.....	38,000 lb.
Booster centers.....	24 ft.
Length over all.....	45 ft. 6 in.
Length over body posts.....	33 ft.
Truck wheelbase.....	5 ft. 4 in.
Width over all.....	8 ft. 4 in.
Height, rail to trolley base.....	10 ft. 11 in.
Window post spacing.....	2 ft. 7 in.
Body.....	Semi-steel
Roof.....	Arch
Doors.....	Center and end folding
Air brakes.....	Westingh use, straight air
Armature bearings.....	Sleeve
Axles.....	Carnegie Steel Co., heat treated
Car signal system.....	Paraday
Compressors.....	Westinghouse, DH-16
Conduit.....	Metal
Control.....	Westinghouse, type VA
Destination signs.....	Keystone and Hunter
Door mechanism.....	Consolidated Car Heating Co.
Energy saving device.....	Arthur Power Reorder
Fare boxes.....	Coinpassor
Finish.....	Dulux
Floor covering.....	Tu-olith laid on Chansrch
Gears and pinions.....	Westinghouse, noiseless spur
Glass.....	Crystal sheet, 34-oz.
Hand brakes.....	Peacock Staffless
Hand supports.....	Elleon Co., enamel poles
Heaters.....	Consolidated Car Heating Co.
Headlights.....	Consolidated Car Heating Co., WCF
Headlining.....	Aluminum, 1/4 in.
Interior trim.....	Statuary bronze
Journal bearings.....	Sleeve
Journal boxes.....	Cast steel, railway's standard
Lamp fixtures.....	Adams & Wesley, dome
Motors.....	Four Westinghouse 510-A4, inside hung
Painting scheme.....	Aurora red and citron yellow
Registers.....	Railway's standard
Roof material.....	Wood, canvas covered
Safety car devices.....	Safety Car Devices Co.
Sash fixtures.....	O. M. Edwards
Seats.....	Osgood-Bradley, stationary
Seat spacing.....	27 in.
Seating material.....	Wood slat
Slack adjusters.....	Westinghouse Form J
Steps.....	Stationary
Step treads.....	Feralun
Trolley catchers.....	Ohio, Brass, No. 13141
Trolley base.....	Ohio Brass, form 5
Trolley wheels.....	Ohio brass
Trucks.....	Osgood-Bradley Type 48-64
Ventilators.....	Railway Utility Co., exhaust type
Wheels.....	Carnegie wrought steel, 26 in. diam.
Wheelguards.....	H-B.

The 50 cars built by the J. G. Brill Company have the same specifications except as follows:

Weights:	
Car body.....	18,544 lb.
Trucks.....	10,178 lb.
Equipment.....	8,682 lb.
Total.....	37,404 lb.
Length over all.....	45 ft. 8 in.
Width over all.....	8 ft. 4 in.
Height, rail to trolley base.....	10 ft. 5 1/2 in.
Body.....	All steel
Control.....	General Electric, PCM
Gears and pinions.....	General Electric, non-resonant
Heaters.....	Railway Utility Company
Headlights.....	Ohio Brass, type WCF
Interior trim.....	Aluminum, painted
Motors.....	Four GE-702-A, inside hung
Seats.....	Brill, wood slat
Seat spacing.....	29 1/2 in.
Slack adjusters.....	American Brake Co., type J
Trucks.....	Brill, 177-E-1

Brill Management Wins

At the annual meeting of the J. G. Brill Corporation the vote of 341,326 shares of the Class B voting stock approved every act of the management since the organization of the company in 1926. The vote of 9,636 shares were cast against the management. About 255,000 shares of the outstanding 400,000 shares of Class B are owned by the American Car & Foundry Company. William H. Woodin is president of both companies. Opposition to the management was led by George N. Fleming, Philadelphia.

General Electric Awarded Subway Contract

The Board of Transportation of New York awarded a \$2,158,033 contract to the General Electric Company for furnishing and installing all power machinery and equipment needed for the Brooklyn section of the city subway between the Fulton Street tunnel and the Culver line connection of the B.-M.T. The General Electric Company was the lowest of three bidders. Equipment will be installed in twelve substations and four control rooms. Nine of the substations will be underground. The most expensive of the equipment will be fifteen 3,000-kw. mercury arc rectifiers, to cost \$603,750. The installation is to be completed in sixteen months.

When finished it will give to the city a power plant system extending from 210th Street, Manhattan, to the Coney Island connection with the B.-M.T.

Pennsylvania Orders Electrical Equipment for 150 Locomotives

Orders for electrical apparatus to be installed in 150 electric passenger and freight locomotives, constituting part of the equipment which will be used when electrification is completed between New York, Philadelphia, Baltimore and Washington, were announced by the Pennsylvania Railroad. This electrical apparatus will be supplied by the Westinghouse Electric & Manufacturing Company and the General Electric Company at an approximate cost of \$16,000,000.

The Pennsylvania Railroad's program also calls for the later purchase of 80 additional electric locomotives of other types. The American Brown-Boveri Electrical Corporation, of Camden, N. J., is in consultation with the railroad with respect to the design of some of them, and may supply a part of the necessary electrical equipment.

Of the 150 locomotives, 90 will be for fast through passenger trains and 60 for high-speed freight service. They have been designed for operating conditions in the dense traffic territory between New York and Washington, and particularly the speedy handling of long and heavy trains. The weight of the passenger engines will be 375,000 lb. each, and that of the freight engines 330,000 lb. All of the electrical equipment has been so designed as to be interchangeable between the freight and passenger locomotives in order to reduce to a minimum the electrical repair parts to be carried in stock.

Mechanical parts, however, differ materially to meet the requirements of the two branches of traffic. The passenger locomotives will have a relatively high starting tractive effort, with capacity to sustain a very high running speed. The freight engines will have extremely high starting tractive effort with a moderately high sustained speed appropriate to the most efficient movement of freight trains.

Two types of passenger locomotives have been designed. One, with two pairs of drivers and two pairs of motors, develops 2,000 hp. at a speed of 56 m.p.h. Its tractive power at this speed is 13,200 lb. The other, with three pairs of drivers and three pairs of motors, develops 3,000 hp. at the same speed, with 19,800 lb. tractive power. Each has a maximum safe speed of 90 m.p.h.

The freight locomotives are equipped with four pairs of driving wheels, and one motor to each pair. They develop 2,000 hp. at 28 m.p.h., with 26,400 lb. tractive power.

The passenger engines have been so designed that the two types may be used separately or in any combination desired. This will permit the movement of passenger trains at the fastest schedules in any length from 8 to 25 cars. Three freight engines used in combination will handle a maximum length freight train between New York and Washington.

Forty-three of the new engines are to be delivered this year and the remainder before the middle of 1933, when it is anticipated that the electrification work between New York and Washington will be completed.

◀ TO BE GOLDEN FOR YOU, MAKE IT YOUR JUBILEE ▶



"Community Transportation"—Atlantic City's annual epic staged by the American Electric Railway Association

Manufacturers Falling in Line for the Anniversary Convention Exhibit

Business depression or no business depression, the Exhibit Committee is determined to make this year's convention exhibit one of the best ever—one befitting the 50th anniversary of the American Electric Railway Association. The trials of one fleeting year shall not overshadow the achievements of 49, nor dim their brilliance. The ringing call of a golden jubilee summons all to pay tribute to the half-century of service of the A.E.R.A. Operators and manufacturers will join arm in arm for the march to Atlantic City, and there to add a fifth golden star of service to her sleeve.

No stone has been left unturned by Fred Dell and his co-workers to get the manufacturers in line for the big show. Despite the repeated wails of poor business and the sad stories of drastic budget curtailments, they have made a promising start. Already, more than 100 manufacturers have decided to take part in this annual extravaganza of showmanship with a plethora of new equipment and materials. Many exhibitors are digging up some of the old relics of horse car days to lend a touch of the pioneering spirit to the convention. About 75,000 sq.ft. of choice floor space has been assigned. More space is still available for those who are a bit slow in making up their minds to take advantage of this great opportunity to display their ware before the industry. The committee is continuously receiving applications for floor space, and, no doubt, the list shown below will be greatly augmented before the doors of the spacious Atlantic City auditorium will be thrown open on Sept. 26 to a large group of railway men.

A list of exhibitors for the 50th annual convention of the American Electric Railway Association and space assigned by the Exhibit Committee is shown below.

Company	Space
Adams & Westlake Co.	E-620
a.c.f. Motors Co.	C-308
Aluminum Company of America	E-628
American Brake Materials Corp.	E-515
American Brake Shoe & Foundry Co.	E-515
American Steel & Wire Co.	D-428/430
American Steel Foundries	E-572/573
Anaconda Wire & Cable Co.	E-599/600
Automatic Coinwrapping Machine Co.	E-517/519
Automatic Signal Corp.	D-404/406
Bendix Brake Co.	C-303
Bendix Westinghouse Automotive Air Brake Co.	C-303
Bethlehem Steel Co.	E-611/2/3/4/5/6
Blanchard Brother & Lane	E-536/538
Bragg-Kleisrath Corp.	C-303
J. G. Brill Co.	C-315 aod Part C-316
Buda Co.	D-427
Bus Transportation	Part C-316
Carnegie Steel Co.	D-431
L. C. Chase & Co.	C-350
Cheatham Elec. Switching Device Co	D-422
Chillingworth Mfg. Co.	E-577
Ciocciannati Car Corp.	C-312
Barron G. Collier, Inc.	E-530/531
Consolidated Car-Heating Co., Inc.	E-512
Crew Levick Co.	C-320
Delco-Remy Corp.	C-348
De Luxe Products Corp.	C-322
C. I. Earll	E-579
Economy Electric Devices Co.	Part C-319
O. M. Edwards Co., Inc.	E-524
Electric Railway Improvement Co.	E-610
ELECTRIC RAILWAY JOURNAL	E-500/501
Electric Service Supplies Co.	E-514/16/18/20
Electric Traction	E-511
Elleco Co.	E-528
Fargo Motor Corp.	C-317/318
Ferodo & Asbestos, Inc.	C-328
Galena Oil Corp.	E-583
General Car & Coach Corp.	E-565/6
General Electric Co.	E-568
General Leather Co.	C-344
General Motors Truck Co.	C-309 and C-304
General Steel Castings Corp.	E-571
Globe Ticket Co.	E-549
Gold Car Heating & Lighting Co.	E-548
Hale & Kilburn Co.	E-507
Haskelite Mfg. Corp.	C-349
Hercules Motors Corp.	C-351/2
Heywood-Wakefield Co.	E-506/8
Highway Service, Inc.	D-420
Hunt-Spiller Mfg. Corp.	C-324
Hyatt Roller Bearing Co.	E-601

Company	Space
Hymco Register Corp.	E-585
Illinois Steel Co.	D-429
International Motor Co.	C-307
International Steel Tie Co.	D-401/3/5/7
Johns-Manville Sales Corp.	C-326
Kelton-Aurand Mfg. Co.	C-346
Leece-Neville Co.	C-327
Lorain Steel Co.	D-432/3/4/5
P. O. Lund	E-598
McQuay-Norris Mfg. Co.	C-345
Macdonald Mfg. Co.	E-552
Mack International Motor Truck Corp.	C-307
Mack Motor Truck Co.	C-307
Mack Trucks, Inc.	C-307
Manganese Steel Forge Co.	E-618
Metal & Thermit Corp.	F-118/19
Multibestos Co.	C-343
Nachod & United States Signal Co., Inc.	D-424
National Brake Co., Inc.	E-526
National Malleable & Steel Cast. Co.	E-529
National Pneumatic Co.	E-513
Norma-Hoffman Bearings Corp.	E-594
Ohio Brass Co.	E-502/3/4/5
Ohmer Fare Register Co.	E-540/2/4
Okonite-Callender Cable Co., Inc.	E-533
Okonite Co.	E-533
Oxalite Corp.	D-402
Pantastote Co., Inc.	E-554/6/8/560
Perey Mfg. Co., Inc.	Part C-319
Pyrene Mfg. Co.	E-521/523
Rail Joint Co.	D-400
Railway Track Work Co.	D-421/3/5
Railway Utility Co.	E-562
Rawplug Co., Inc.	C-323
Reo Motor Car Co.	C-313
Ross Gear & Tool Co.	C-325
Russell Mfg. Co.	E-522
Safety Car Devices Co.	E-570
St. Louis Car Co.	C-321
Sherwin-Williams Co.	E-535/7
Standard Steel Works Co.	E-574
Texas Co.	E-510
Timken-Detroit Axle Co.	C-314
Timken Roller Bearing Co.	E-606
Tool Steel Gear & Pinion Co.	Part C-319
Triplex Safety Glass Co. of North America, Inc.	C-347
Tuco Products Corp.	E-509
Twin Coach Corp.	C-310
Union Metal Mfg. Co.	E-525/7
United American Bosch Corp.	E-532
Walter Motor Truck Co., Inc.	Part C-319
Westinghouse Electric & Mfg. Co.	E-569
Westinghouse Traction Brake Co.	E570
Wm. Wharton, Jr. & Co., Inc.	D-416/17
Wheel Truing Brake Shoe Co.	E-546
White Co.	C-311
Wiener Body Co.	Part C-302
Wilson-Imperial Co.	E-604
Ypsilanti Reed Furniture Co.	E-534
Zenith-Detroit Corp.	C-333

Bus Deliveries

Birmingham Electric Company, Birmingham, Ala., three White, Model 65A.
Boston, Worcester & New York, Framingham, Mass., three White Model 54A, one White 64.

Capital Traction Company, Washington, D. C., four Twin Coach, small urban.

Chicago Surface Lines, Chicago, Ill., two A.C.F. trolley buses.

Eastern Massachusetts Street Railway, Boston, Mass., eleven Twin Coach, large urban.

Georgia Power Company, Atlanta, Ga., three Yellow Coach, 21-pass. city type.

Illinois Power & Light Company, Chicago, Ill., three Yellow Coach, 25-passenger city type.

Lincoln Traction Company, Lincoln, Neb., four Yellow Coach, 21-passenger city type.

Levis Tramways Company, Levis, Que., one White, Model 61.

Louisiana Power & Light Company, Algiers, La., one White, Model 613.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., two Yellow, 38-passenger, city type; one Yellow, 21-passenger, city type; six Twin Coach, large urban.

North Coast Transportation Company, Seattle, Wash., two Yellow, Type 250; two A.C.F. and on Mack, Model BK.

Schenectady Railway, Schenectady, N. Y., twelve Twin Coach, small urban.
Third Avenue Railway System, New York, N. Y., ten White, Model 54A.

Toronto Transportation Commission, Toronto, Ont., two White, Model 61.

Worcester Consolidated Street Railway, Worcester, Mass., three Yellow, 38-passenger, city type.

Wyoming Valley Autobus Company, Wilkes-Barre, Pa., five Mack, 29-passenger, city type.

Youngstown Municipal Railway, Youngstown, Ohio, five Twin Coach, large urban.

Fageol Sales at Peak

Fageol Motors Co., California, reported sales and service revenues during April considerably above \$500,000. Deliveries of buses and trucks, and orders on hand for immediate delivery totaled \$473,553. The manufacturing plant was placed on full production schedule during April. Two eight-hour shifts are working, giving employment to almost 400 persons. This is the largest force that has been employed during the last eighteen months.

Estimated sales and delivery of completed units for May give every indication of comparing favorably with April sales, which were the peak for the preceding eighteen months. Good volume of business is expected for the balance of the year.

Material Prices

MAY 28, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	8.50
Lead.....	3.75
Nickel, ingot.....	35.00
Zinc.....	3.65
Tio, Straits.....	22.95
Aluminum, 98 to 99 per cent.....	22.90
Babbitt metal, warehouse	
Commercial grade.....	32.75
General service.....	28.00

Track Materials—Pittsburgh

Standard steel rails, gross ton.....	\$43.00
Track spikes, 1/2-in. and larger, per 100 lb.....	2.70
Tie plates, steel, cents per 100 lb.....	1.95
Angle bars, cents per 100 lb.....	2.75
Track bolts, per 100 lb.....	3.90
Ties, 6m x 8m x 8 ft.,	
White Oak, Chicago.....	1.35
Long leaf pine, New York.....	1.00

Waste—New York

Waste, wool, cents per lb.....	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White.....	8.00-12.00
Colored.....	7.00-10.00

Wire—New York

Bare copper wire, cents per lb.....	10.50
Rubber-covered wire, No. 14, per 1,000 ft.....	\$4.22
Weatherproof wire base, cents per lb.....	12.125

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.....	9.60
White lead in oil (100lb. keg), cents per lb.....	13.25
Red lead in oil.....	14.75
Turpentine (bbl. lots), cents per gal.....	53.00
Putty, com'l grade, 100 lb. tins, cents per lb.	2.75

Hardware—Pittsburgh

Wire nails, per keg.....	\$1.85
Sheet iron (24 gage), cents per lb.....	2.20
Sheet iron, galvanized (24 gage), cents per lb.	2.80
Auto body sheets (20 gage), cents per lb.....	3.05

Bituminous Coal

Pittsburgh mine run, net ton.....	\$1.40
Central, Ill., screenings.....	1.00
Kansas screenings, Kansas City.....	1.75
Big seam, Ala., mine run.....	1.70
Smokeless mine run, Chicago.....	1.60

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand.....	\$150.00
Wood block paving 3/4, 16 lb. treatment, N.Y., per sq.yd., f.o.b.....	2.50
Paving brick, 3 1/2 x 8 1/2 x 4, N.Y., per 1,000 in. carload lots, f.o.b.....	50.00
Paving brick, 3 1/2 x 8 1/2 x 4, N. Y., per 1,000 in. carload lots, f.o.b.....	45.00
Crushed stone, 1/2-in., carload lots, N. Y., per cu.yd., delivered.....	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.....	1.35
Gravel, 1/2-in., cu.yd., delivered New York.....	3.40
Sand, cu.yd., delivered New York.....	2.15
Asphalt, in pkg. N.Y., f.o.b. ref., per ton.....	15.00

Scrap Metal—New York

Heavy copper, cents per lb.....	7.25
Light copper.....	6.25
Heavy brass.....	4.25
Zinc.....	2.00
Lead, heavy.....	3.125
Mixed babbitt.....	3.125
Battery lead plates.....	1.125
Cast aluminum.....	5.00
Auto radiators.....	4.25

Old Material—Chicago

Steel car axels, net ton.....	\$11.75
Cast iron car wheels, gross ton.....	9.00
Steel car wheels, gross ton.....	11.25
Leaf springs, cut apart, gross ton.....	11.75
Angle bars, gross ton.....	10.25
Brake shoes, net ton.....	6.25
Steel rails (short), gross ton.....	12.00
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton.....	3.75
Coil springs.....	11.75

Conspectus of Indexes for May, 1931

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares*	May, 1931	Apr., 1931	May, 1930	Apr., 1931	May, 1926
1913 = 4.84	7.81	7.81	7.76	7.81	7.35
Electric Railway Materials*	May, 1931	Apr., 1931	May, 1930	Dec., 1926	May, 1931
1913 = 100	118	120	140	159	118
Electric Railway Wages*	May, 1931	Apr., 1931	May, 1930	Apr., 1931	May, 1926
1913 = 100	233.2	233.2	231.7	233.2	225.4
Electric Ry. Construction Cost	May, 1931	Apr., 1931	May, 1930	Nov., 1928	May, 1931
Am. Elec. Ry. Assn. 1913 = 100	185	186	201	206	185
General Construction Cost	May, 1931	Apr., 1931	May, 1930	Jan., 1927	May, 1931
Eng'g News-Record 1913 = 100	189.3	191.6	205.9	211.5	189.3
Wholesale Commodities	Apr., 1931	Mar., 1931	Apr., 1930	May, 1926	Apr., 1931
U. S. Bur. Lab. Stat. 1926 = 100	73.3	74.5	90.7	100.5	73.3
Wholesale Commodities	May, 1931	Apr., 1931	May, 1930	Jan., 1928	May, 1931
Bradstreet 1913 = 9.21	8.91	9.23	10.94	13.57	8.91
Retail Food	Apr., 1931	Mar., 1931	Apr., 1930	Apr., 1926	Apr., 1931
U. S. Bur. Labor Stat. 1913 = 100	124.0	126.4	151.2	162.4	124.0
Cost of Living	Mar., 1931	Feb., 1931	Mar., 1930	Mar., 1926	Mar., 1931
Nat. Ind. Conf. Bd. 1923 = 100	89.1	89.6	97.8	105.6	89.1
General Business	May 9, 1931	Apr. 11, 1931	May 10 1930	Oct. 6. 1928	Jan. 31, 1931
The Business Week Normal = 100	79.2	78.1	96.9	117.6	77.0
Industrial Activity	Apr., 1931	Mar., 1931	Apr., 1930	Feb., 1929	Jan., 1931
Elec. World, kw.-hr. used 1923-25 = 100	105.7	108.2	120.2	140.4	97.6
Bank Clearings	Apr., 1931	Mar., 1931	Apr., 1930	Oct., 1929	Feb., 1931
Outside N. Y. City 1926 = 100	76.0	72.1	93.4	111.8	69.8

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street

railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

National Pneumatic Company, Rahway, N. J., has received contracts, among others, for treadles for 23 buses of the Pacific Electric Railway, and pneumatic equipment for 30 cars of the Pittsburgh Railways and 38 cars of the Omaha & Council Bluffs Traction Company.



Emergency Brakes that Brake— every time!

Peacock Staffless Brakes are dependable . . . when the emergency occurs they are there with lots of power . . . fast on the take up . . . and they never clog with chain *no matter how much slack there may be in the rigging.*

Sturdy, rugged brakes. Light in weight. Compact, take up little platform space. And braking force is 3000 pounds. When you buy specify Peacock Staffless Brakes.

**NATIONAL
BRAKE CO., INC.**

Buffalo, N. Y.

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



PEACOCK STAFFLESS BRAKES

WHY DOES "THE MAN WHO CHANGES TIRES

LIKE GOODYEAR K RIMS"?

WHEN the tire and rim are clean and new, almost any rim makes a good demonstration.

Men who change tires don't often get them in that condition.

They more often get them after thousands of miles of service in dirt and water.

That's when the man who changes tires thanks Goodyear for building *split base rims*.

The split base principle was origi-

nated for the big pneumatics necessary for trucks today. What Goodyear gives you is not a passenger car rim, made over for trucking sizes — but rims designed, engineered, and developed for truck tire requirements.

Goodyear Type K Rims are the only rims made to fit all wheels. You

can get them for wheels with 18° or 28° bevel mountings. You can use the same type straight through your fleet—on large or small wheels.

K-28 sizes: 5", 6", 7", 8", and 9-10" (for 28° bevel mountings).

K-18 sizes: 5", 6", 7", 8", 9-10", and 11" (for 18° bevel mountings).

Give them a test on your fleet. They cost no more. Write to Rim Department, The Goodyear Tire and Rubber Company, Inc., Akron, Ohio.



GOODYEAR

K-28 RIMS K-18



OVER 1,400 miles of concrete, graveled mountain roads and graded dirt, the Oregon Stages Division of Pacific Greyhound Lines operates its coaches.

In the words of R. W. Lemen, vice president, "the All-Weather tread has given us safety, traction and mileage."

More specifically — the report for January, 1931, shows that Goodyears

covered 488,292 bus miles on these motor coaches and over these road conditions with an average of one road change for every 61,287 bus miles.

Like other transportation companies from coast to coast, this great fleet in Oregon has found that it pays to decide, "I will use only THE leading make of tire."

One of the 143 modern coaches of the Oregon Stages Division, Pacific Greyhound Lines, which operate on Goodyears

THE GREATEST NAME

IN RUBBER

GOOD YEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS

Seal in



those profits

A FEW years ago, effective car journal lubrication was practically impossible of attainment—regardless of the quality of the lubricant! Abrasive road dust, dirt and water found ready access to the journal box with disastrous effect in high maintenance costs. • Today, an entirely new system of lubrication, which has overcome all the old difficulties, is rapidly being put into effect. • Texaco car journal Oil Seals have at last provided complete protection to bearing surfaces. Journal boxes equipped with Texaco Oil Seals *are sealed*—permanently preventing entrance of dirt and loss of lubricant—permanently preventing lubrication profit loss. • And with this has come the possibility of using an entirely new and more effective low-viscosity oil—Texaco Lovis Oil. • These two, the new

Texaco Lovis Oil and the new Texaco Oil Seals have definitely lowered maintenance costs, oil house labor and waste consumption, and have substantially reduced power consumption. Records of electric lines which have installed this new Texaco Lubrication System show that it is highly profitable—and the cost is surprisingly low. Annual savings are many times the cost of installation. Write The Texas Company for the facts.



TEXACO

THE TEXAS COMPANY
135 East 42nd Street, New York City

LUBRICANTS

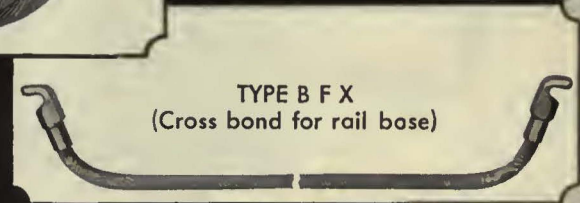
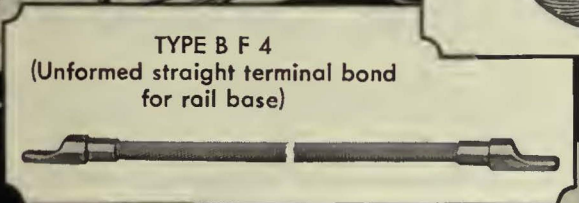
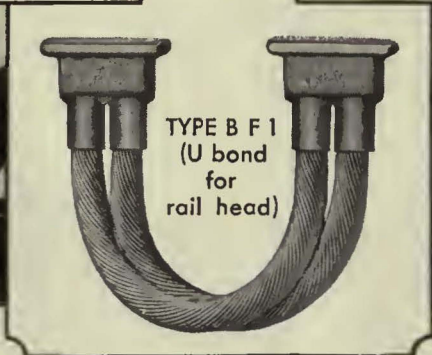
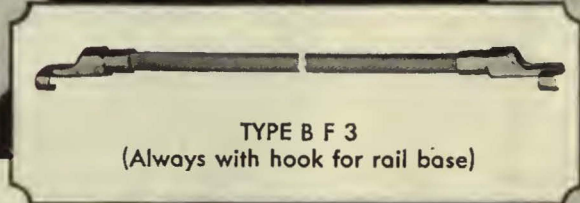
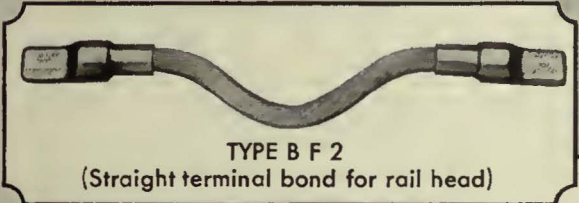
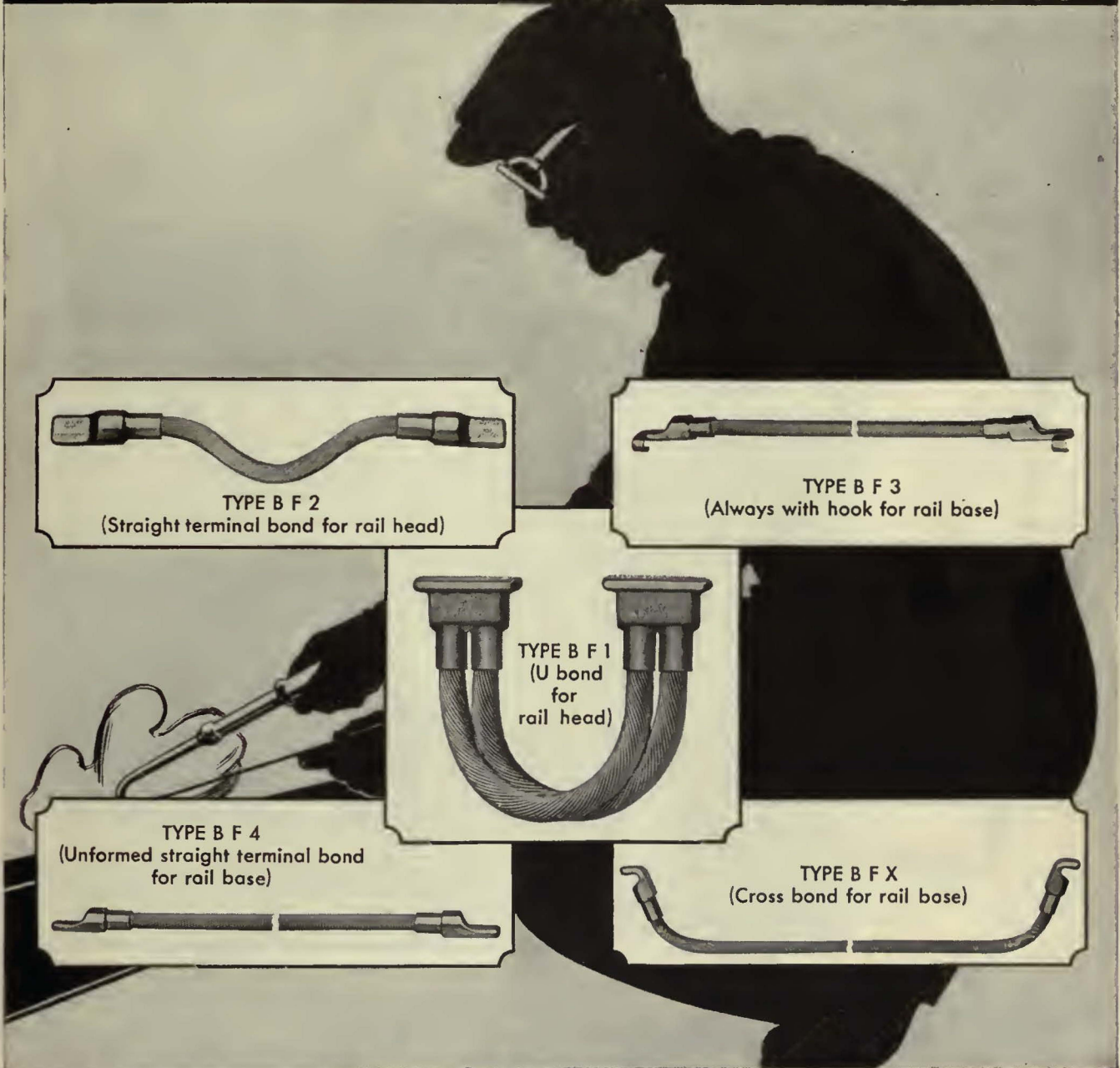
TIGER WELD

FLASH ~ BUTT-WELDED

POWER BONDS

THIS latest and most significant advance in power bond design assures welding simplicity and economy never before realized—as well as higher resistance to vibratory stresses. By newly developed manufacturing methods, the wires are intimately flash butt-welded to solid soft steel terminals, making it easy for any welder to give you better installations at lower cost. Five types—adaptable to flame or arc welding—each bond stretch-tested to insure positive unity. Full particulars and samples on request. Address the nearest office.

A TRIUMPH IN PERFORMANCE AND ECONOMY



1831  1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION And All Principal Cities
 Pacific Coast Distributors: Columbie Steel Company, Russ Building, San Francisco Export Distributors: United States Steel Products Company, New York

Let us put the for you..and show DAYTON

THE DAYTON MECHANICAL TIE COMPANY
CONSTRUCTION ESTIMATE

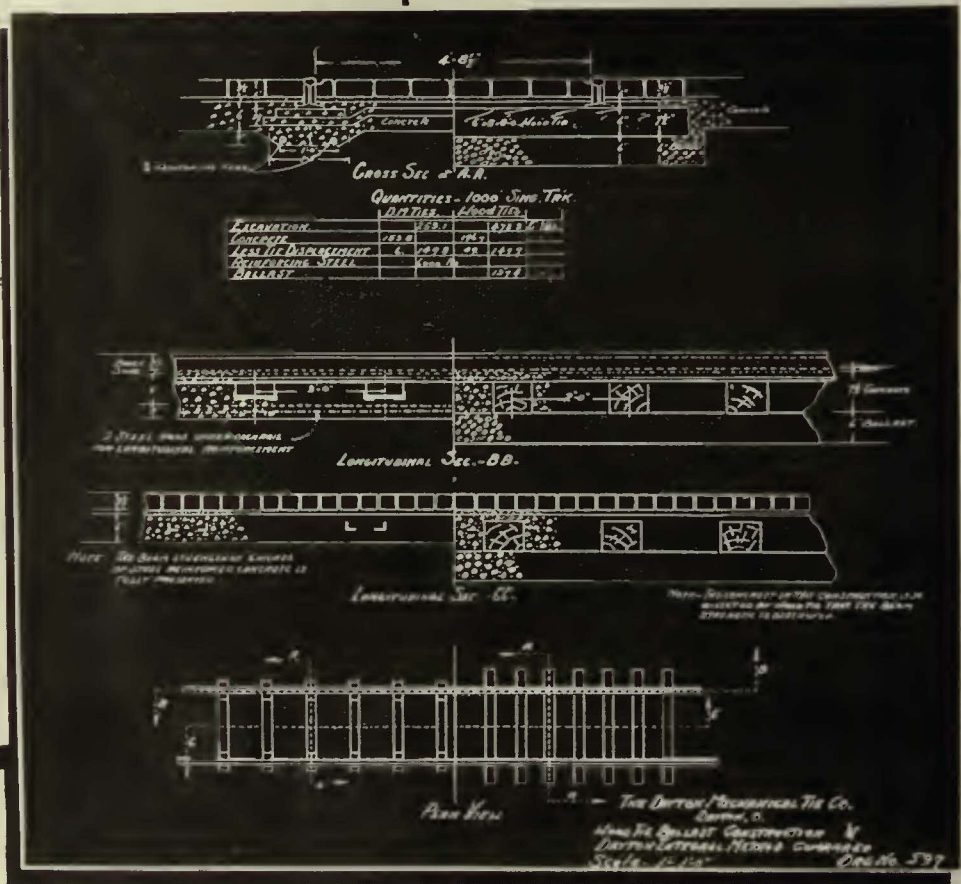
FOR Comparison - Dayton Integral System with Wood Ties in Ballast Date _____

Estimate of Cost of 1000 feet of Single Track Plan No. 597

Pavement 3 1/2" Brick D. M. Ties-Type _____ Plan No. 597

Quantity	Price	Unit	Quantity	Price	Unit
----------	-------	------	----------	-------	------

- Engineering & Supt.
- Temporary Track
- Temporary Crossover
- Removing Old Track
- New Rail and Fastenings
- Rail Filler
- Welding Joints
- Pavement
- Special Work
- Tie Plates
- Tie Rods
- Bonding
- Stone and Gravel Ballast
- Spikes
- Reinforcing
- Excavation & Grading
- Ties
- Frt. Chgs. on Ties
- Concrete
- Labor—
- Haul & Spread Ballast
- Tamping Ballast
- Place & Assemble Rail
- Place & Fasten Ties
- Surface & Align Track
- Watchman
- Switchman



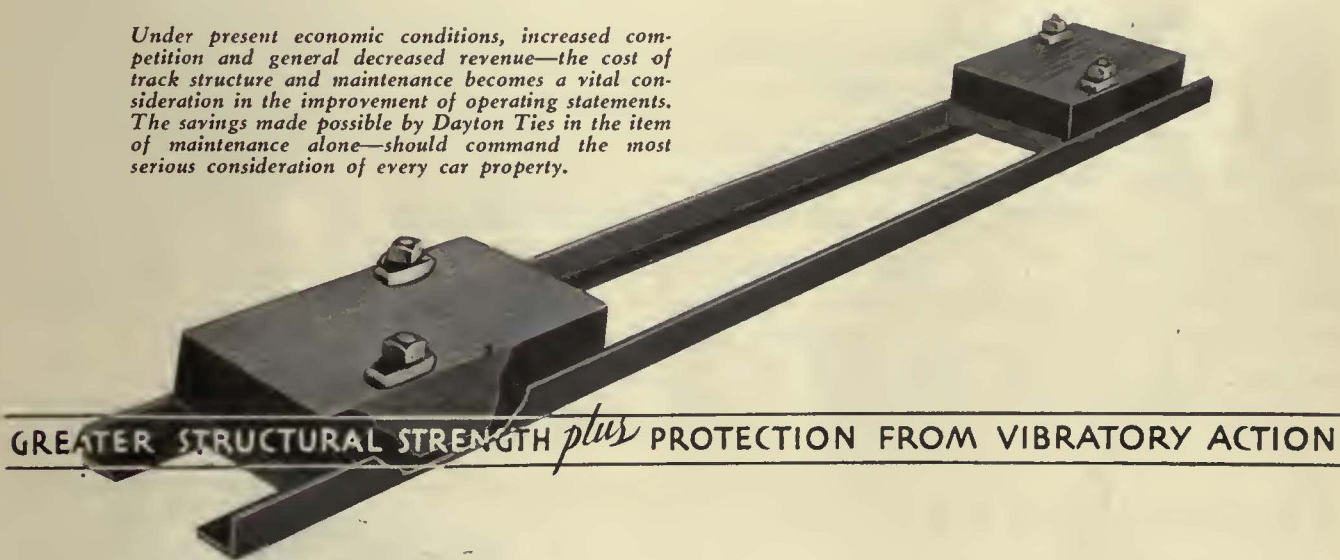
The Dayton Dayton,

proof in figures you exactly what **TIES** *will save in..*

FIRST COST OF INSTALLATION
MAINTENANCE COST
DEPRECIATION CHARGES

JUST send us a sketch and cost data of your standard construction and without obligation our engineering department will make up for you a comparative statement showing exactly what Dayton Ties will accomplish in direct comparison with your standard construction. These figures which embrace every item in track installation are conservatively estimated and will show you savings that you cannot afford to ignore. Why not avail yourself of this opportunity—not only to economize but to improve immeasurably your track structure? There is no obligation for this important service.

Under present economic conditions, increased competition and general decreased revenue—the cost of track structure and maintenance becomes a vital consideration in the improvement of operating statements. The savings made possible by Dayton Ties in the item of maintenance alone—should command the most serious consideration of every car property.



GREATER STRUCTURAL STRENGTH *plus* PROTECTION FROM VIBRATORY ACTION

Mechanical Tie Co.

Ohio.

The SAFETY CAR CONTROL EQUIPMENT

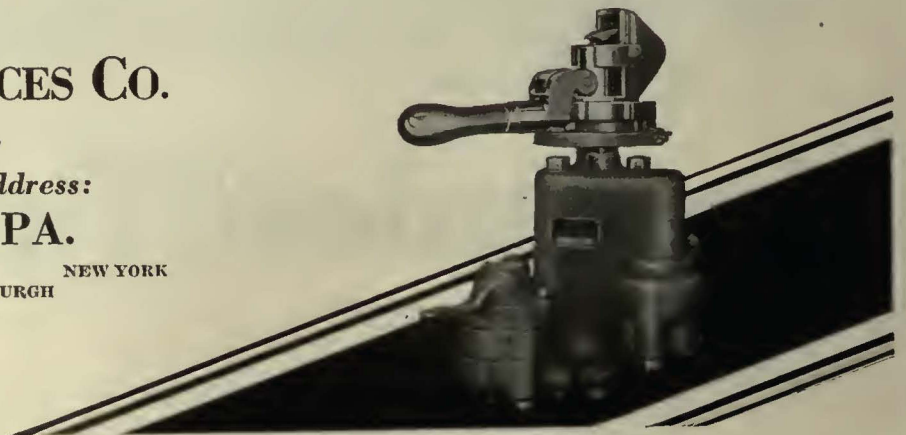
▲ ▲ Promotes
Profitable Service

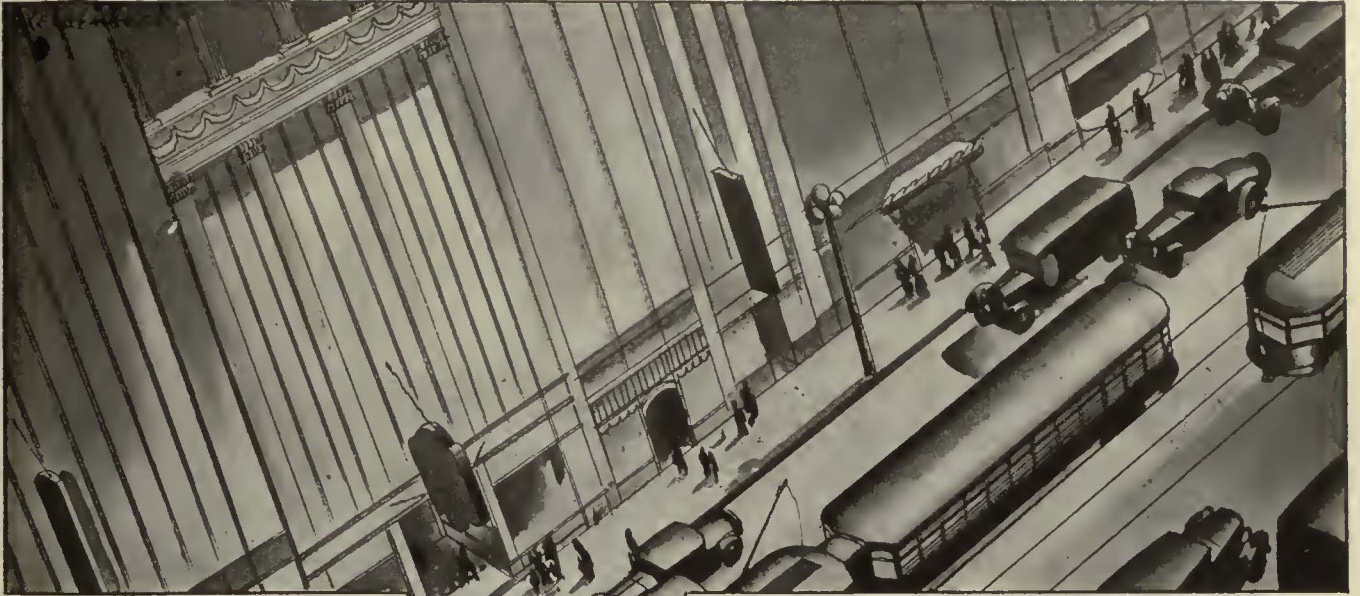
BBETTER and faster service with Safety Cars brings in more gross revenue . . . Economy is realized by centralizing operating responsibility in one man whose duties are safeguarded by devices that interlock car control, door operation, and brake manipulation . . . Since operating cost deductions are less, a greater net revenue remains.

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

Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH





WHEELS

*have to stand the test
of modern demands*

TRAFFIC conditions today—peak loads, rapid acceleration, emergency stopping—all these throw a tremendous burden on equipment, particularly the wheels.

Carnegie Wrought Steel Wheels are built to withstand the stress of modern traffic. Wrought Steel is obtained through rolling and forging. A 10,000 ton hydraulic press (twenty million pounds!) refines the steel—insures a homogeneous structure, free from irregularities that might cause trouble. A rolling process further refines and toughens the wearing surfaces. The result is a wheel of exceptional endurance—of exceptional safety. A wheel fit for any service.

Before you invest in new wheels, investigate the many advantages of Wrought Steel. Literature on request.

CARNEGIE STEEL COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

83



CARNEGIE

WROUGHT STEEL WHEELS



Second lap of great lubrication test has started



The touring tests will give both motor oil and gasoline severe service as the cars must be operated at high speeds to maintain schedules.

MAY 17th marked the start of the second lap of the most comprehensive motor oil test ever to be made. The thirteen popular cars which ran up a total 116,000 miles in the tests conducted by the A. A. A. at the Indianapolis Speedway, are now speeding along on individual tours of the middle west. These cars will travel thousands of additional miles before they return to Chicago in October.

Each car is equipped with a finely balanced instrument board which records oil and water temperatures, tests deceleration and accelera-

tion, shows engine speeds and registers gasoline consumption at various speeds. Constant records of gasoline and motor oil performance in each car will be kept throughout the tours.

During this road test the cars will operate under conditions as severe as those under which motor coaches operate. Each car must maintain its schedule, requiring fast running time over all types of roads. Thousands of observations will be recorded and the facts obtained added to those already gathered from the tests at the Indianapolis Speedway.

USE POLARINE MOTOR OIL



Lubrication Study Conducted by the Contest Board of the American Automobile Association

- 1 During the entire test the engines and chassis of all cars were lubricated effectively.
- 2 Polarine showed a very low rate of oil consumption.
- 3 Carbon: only 6.23 grams per cylinder at 30 miles per hour, using heavy grades, average for all cars. Carbon decreased 33% at 55 miles per hour.
- 4 Cylinder wear: Less than one one-thousandth of an inch in any car for the entire test.
- 5 Effect of speed on oil consumption: Speed is the chief factor affecting oil consumption. All oils tested at 55 miles per hour showed consumption seven times greater than at 30 miles per hour.
- 6 The thirteen cars used in the test were regular stock models of latest design, bought by A. A. A. representatives from dealers' floors.
- 7 Over 600,000 observations were recorded.



At the Speedway the cars were run in a series of tests at various rates of speed. Each test was run at a predetermined speed which was maintained.

NEVER before such facts about motor oil. Here is proof that Polarine does an outstanding job of lubrication.

Think of these cars being whipped through more than a year's average mileage in 24 days. Consider the task Iso-Vis and Polarine were obliged to perform in providing constant effective lubrication at a maintained speed of 55 miles per hour for one thousand miles. And note the splendid manner in which these motor oils met the tests.

The Motor Coach Operator who

uses Polarine Motor Oil is assured of positive thorough lubrication. He has unrefutable evidence of just what efficient lubrication Polarine will give. And Polarine has many times demonstrated its great lubricating qualities in motor coaches throughout the middle west.

Test Polarine in one of your motor coaches, check the performance and cost.

We will gladly submit further proof that it is to your advantage to use Polarine Motor Oil.

For best performance
from your
motor coach motors
use Polarine with
Red Crown Gasoline.

STANDARD OIL COMPANY

(Indiana)

910 South Michigan Avenue

Chicago, Illinois 1206-

WITH RED CROWN GASOLINE

These Timken Advantages Will Increase Your Car-Day Profits



The advantages of Timken Tapered Roller Bearings in electric railway cars may be classified under four main heads—Efficiency, Protection, Comfort, Economy.

Timken Bearing *efficiency* means that anti-friction requirements are met 100%; that starting resistance is reduced 88%; and that lubrication is negligible.

Timken Bearing *protection* means that hot boxes are eliminated; and that radial, thrust and combined loads are carried with a wide margin of safety under all operating conditions.

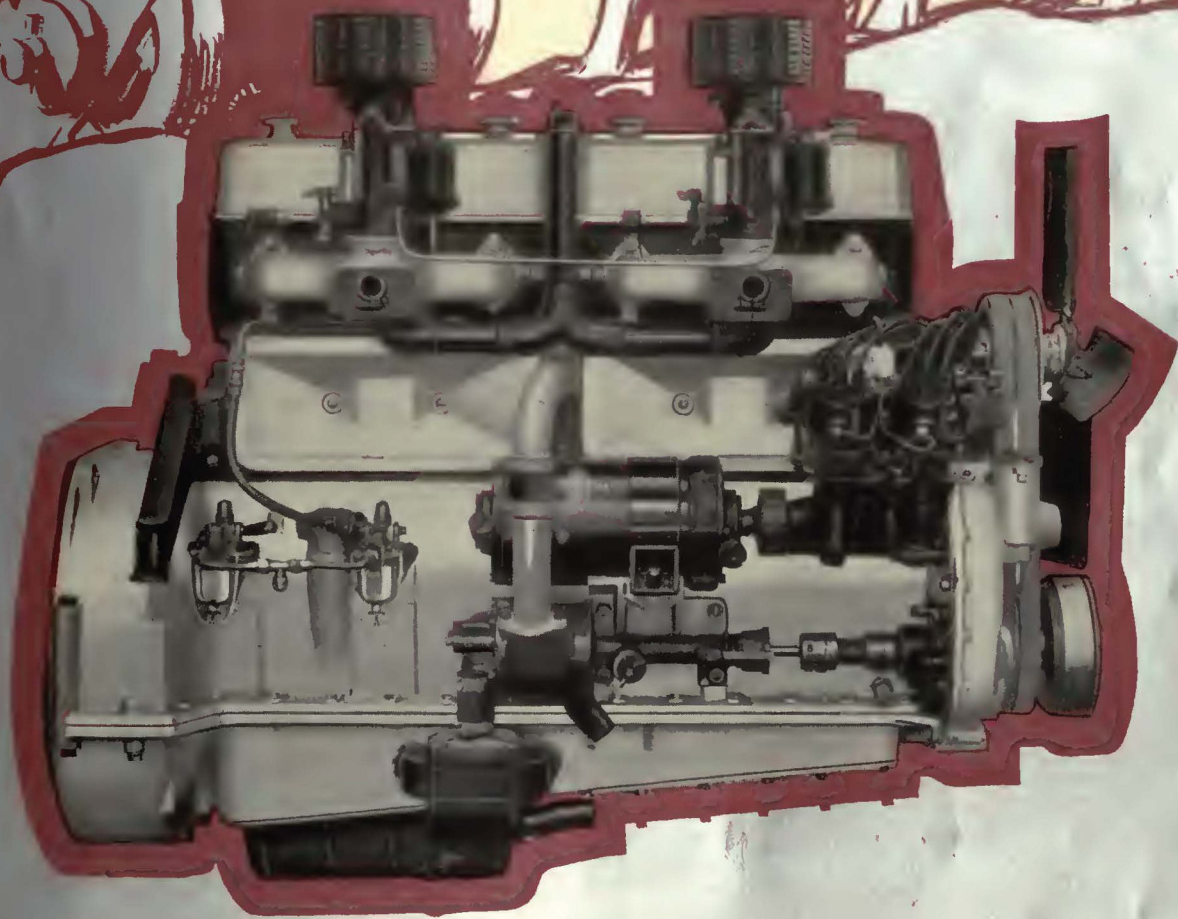
Timken Bearing *comfort* means smooth, steady, quiet running; freedom from jolts and jars; minimized side-sway.

Timken Bearing *economy* means that power is conserved; that lubricant is saved; that maintenance attention is reduced; that wheel life is lengthened; and that maintenance costs knock the bottom out of former lowest levels.

It's all in the exclusive combination of Timken tapered construction, Timken positively aligned rolls, Timken-made steel and Timken precision of manufacture.

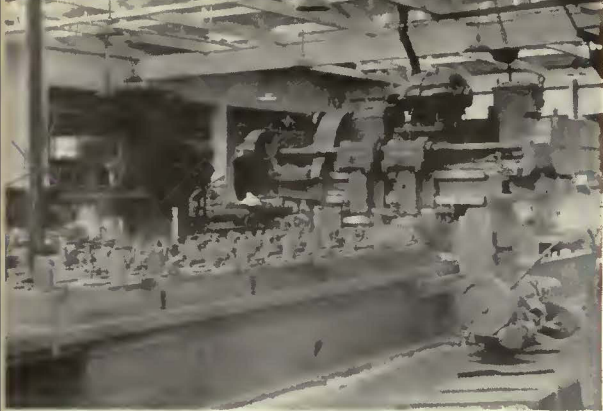
With Timken benefits in your favor you can meet every modern operating requirement and make more money. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered* *Roller* **BEARINGS**



The last word in POWER ...
Dependable • Economical • Quiet

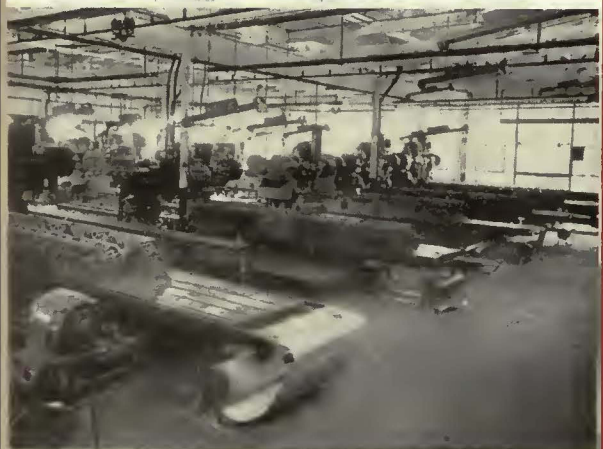
as used in **Yellow
Coaches ...**



One of the many special purpose machines employed—milling the top and bottom surfaces of the crankcase in one operation.



A row of specially developed milling machines. Left, crankcase milling. Center, head milling. Right, cylinder block milling.



Careful consideration has been given to proper lighting, ventilation and layout to insure ideal working conditions.



The plant is completely equipped with all modern labor-saving and material handling devices. Work in process progresses directly and automatically from one production or assembly line to the next.

» » *Motor Coach performance and satisfaction centers in the power plant.*

The General Motors Truck Company has developed engines of extraordinarily advanced design, assuring effortless, economical and sure performance of Yellow Coaches.

The paramount importance of the power plant has resulted in centering the production of its motor coach engines in its own plant at Pontiac—a plant unequalled in machine equipment and methods for both *quality* and quantity production.

These engines are produced in a separate plant, a large factory in itself—144,000 square feet equivalent to 200 feet in width by 720 feet in length. The one aim of this plant is production of good engines—*the best engines*.

Over four million dollars are invested in the engine plant and its machinery, special tools, dies, patterns, gauges and test equipment to accomplish the production of the best engines possible.

In this great specialized engine plant, production flows smoothly. Major inspections check every operation for accuracy and quality. Testing at frequent intervals assures correct manufacture.

Men, methods and equipment are all keyed to the higher standards imposed by the severe requirements of revenue transport service.

Reciprocating parts are balanced and checked to infinitesimal sensitivity, on machines specially developed in General Motors laboratories.

Engines undergo a thorough block test, are then torn down and inspected. Parts must show evidence of perfect functioning before reassembly and re-test for final inspection.

This care is the operator's protection against road failures. Such failures measured in terms of thousands of miles are ordinary—but when hundreds of thousands of miles between failures are produced, the fact becomes truly exceptional.

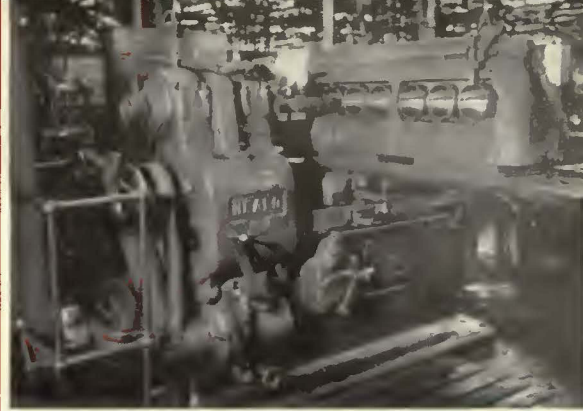
Not one, but thousands of Yellow Coaches powered with Yellow engines, are regularly producing such records.

Forty 33-passenger Yellows, equipped with "616" engines, recently completed 2 million miles in seven months with 5 road failures, all minor items.

Again, five similar coaches made 300,000 miles, averaging 325 miles per coach per day, with but 3 road failures.

More recently, eight type "250" coaches operated 500,000 miles in six months, or 359 miles per coach per day, with but 3 road failures.

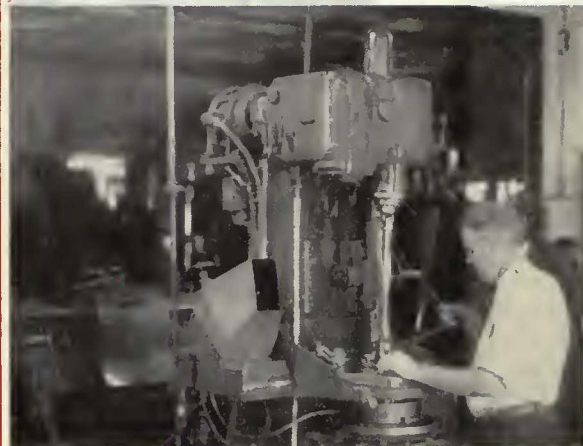
These are regular performance results of stock engines, in cross country service, where all failures chargeable to either bodies or chasses were included.



After careful testing, cylinder blocks are bored, ground and lapped to size. Maximum allowable limits are one-thousandth of an inch.



Every production line ends at a major inspection bench, where the work is rigidly checked for accuracy and finish.



One of the many special testing and balancing machines employed. This machine is for balancing flywheels.

YELLOW COACHES

Basically Similar but of different h.p. range

The first of the new group of overhead valve engines of advanced design developed for use in Yellow Coaches was the now famous 150 H.P. type "616."

The unusual performance characteristics of this engine received almost instant recognition—passenger car acceleration, high torque at low engine speed, unusual hill climbing ability, complete absence of vibration, overheating and irritating valve noises, and surprisingly small fuel consumption for so powerful an engine.

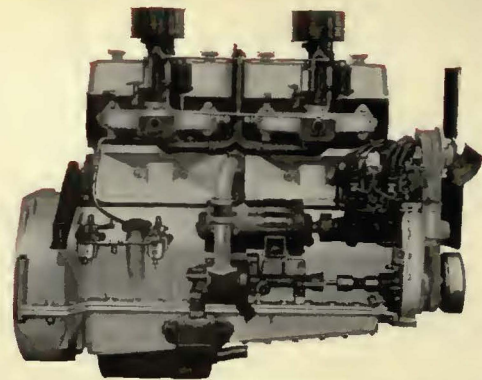
Its design included many new features; zero-lash automatic valve adjuster, down draft carburetion, harmonic balancer, oil cooler, and easy accessibility to all engine accessories.

The performance records which have been established with this engine since its introduction, both in cross country and city service, for low maintenance, long life, economy, dependability and freedom from failure have demonstrated beyond all possible doubt its truly extraordinary value for highway transport service.

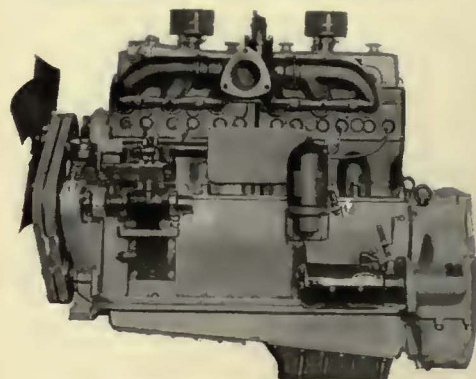
Three new engines of basically similar design but of smaller cubic inch displacement and H.P. range have now been developed to meet the specialized requirements of each class of transportation service. Within their power ranges each of these engines have almost identical performance, torque and power curve characteristics. All are of the same basic design, with many parts interchangeable.

A comparison of the four engines follows:—

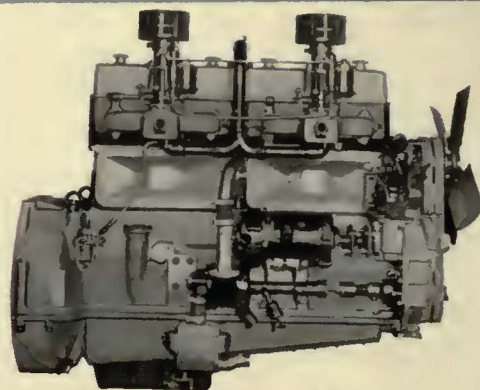
Engine Type	331	468	525	616
Bore and Stroke—Inches	3 $\frac{3}{4}$ x5	4 $\frac{1}{4}$ x5 $\frac{1}{2}$	4 $\frac{1}{2}$ x5 $\frac{1}{2}$	4 $\frac{7}{8}$ x5 $\frac{1}{2}$
Displacement—Cu. Inches	331.4	468	525	616
N.A.C.C. Rating H.P.	33.8	43.4	48.6	57.0
Maximum Horse-Power	87	115	130	150
at R.P.M.	2800	2300	2300	2300
Maximum Torque—Ft. Lbs.	230	340	380	450
at R.P.M.	800-1400	1000	1000	1000



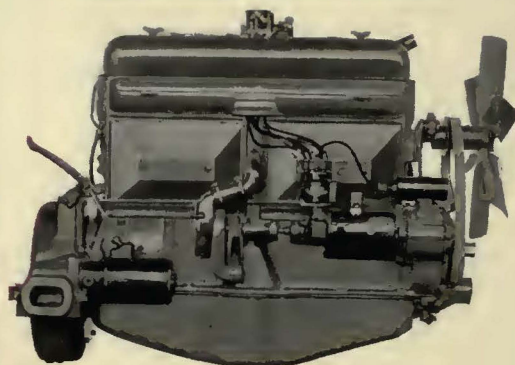
The 150 H.P. Type "616" Engine



The 130 H.P. Type "525" Engine



The 115 H.P. Type "468" Engine



The 87 H.P. Type "331" Engine

GENERAL MOTORS TRUCK CO., Pontiac, Michigan
Subsidiary of Yellow Truck & Coach Mfg. Co.

AN ADDITIONAL INCENTIVE TO WEEK-END PASSENGERS

...SELL THEM WEEKLY AND SUNDAY PASSES

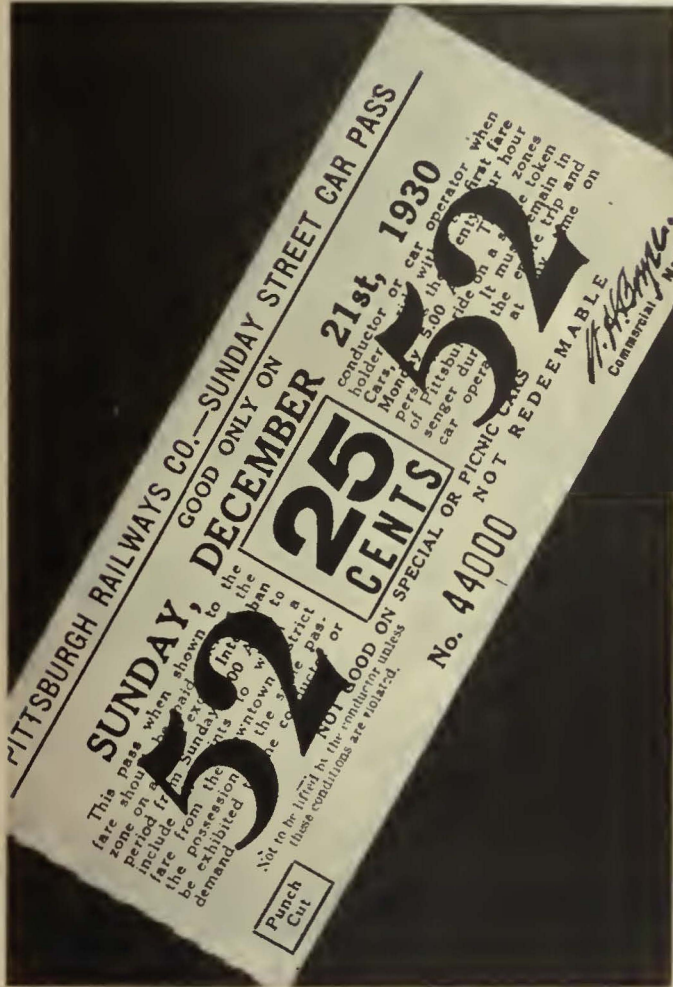
The revenue-increasing ability of Weekly and Sunday Passes is being proved right now on many properties.

One case brought out the seemingly remarkable fact that off-peak riding due to the new weekly-pass had increased over 400%.

On the same property, Sunday Passes increased Sunday riding 600%!

Actually there is nothing amazing about it. It is simply the result of two "complexes" of the riding public—the bargain instinct and the urge to make use of "left-overs." In other words a person with a weekly pass having a few rides left will let his family use the pass or will himself use it up on the last few days during off-peak hours. The Sunday pass, in connection with judicious timely car card suggestions, will increase Sunday riding for the same reason.

Let us give you complete details.



GLOBE

TICKET COMPANY

PHILADELPHIA

Factories:

Philadelphia Los Angeles Boston New York Atlanta

Sales Offices:

Cincinnati Pittsburgh Baltimore Cleveland
St. Louis Des Moines

IN THE CRUCIBLES OF SCIENCE

Alloy production at Illinois Steel Company is a matter of infinite care, of precision standards from which no deviation is countenanced. Through the entire production process, the metallurgist watches, guides, and controls that the quality of Illinois Alloy Steel may always be uniform.



Illinois Steel Company

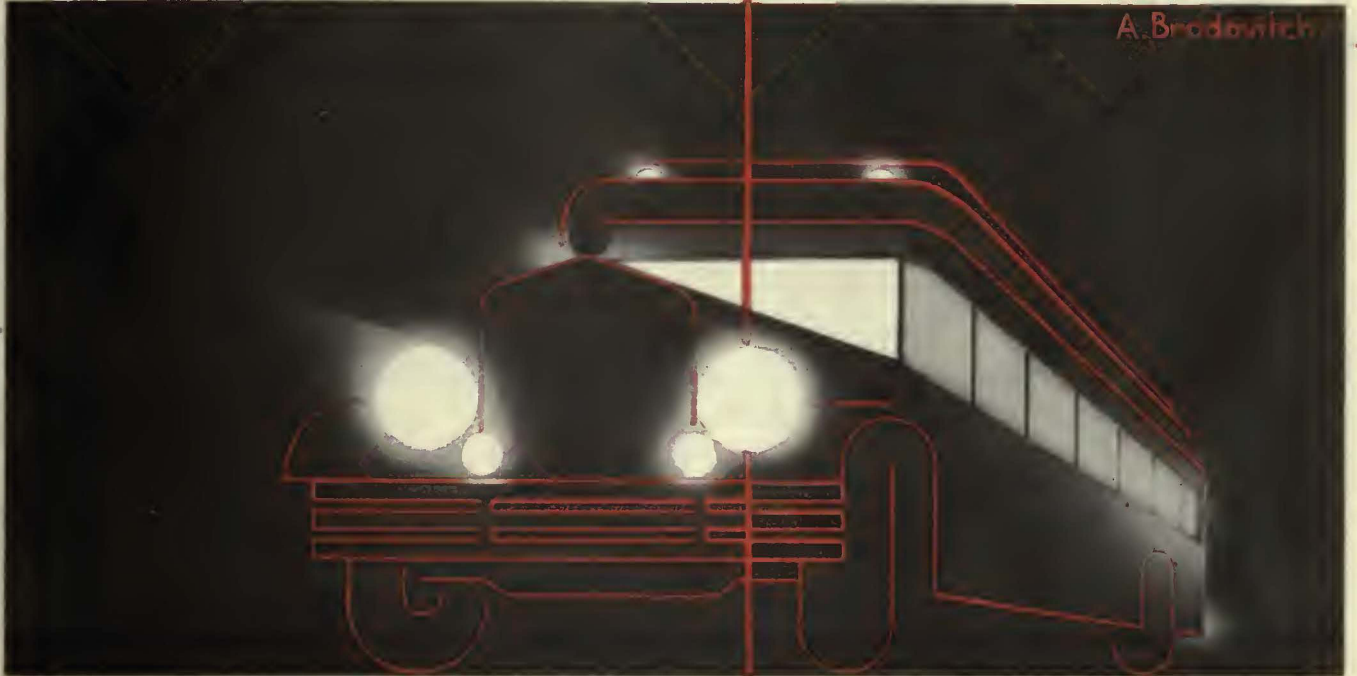
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Ill.

ILLINOIS *alloy* STEEL

KEEP BUS LIGHTS
BURNING BRIGHTLY
WITH

EXIDES



STEADY LIGHTS MAKE
FOR STEADY PATRONAGE

Exide-equipped buses assure patrons of bright, steady lights at all times. These powerful batteries also provide current for strong running lights and dependable starting and ignition.

“Especially built for tough bus service” is why Exides are so dependable, have such a long life, are economical to operate. It’s also why most of the leading motor coach manufacturers have made Exides standard equipment. Why don’t you standardize on Exides, too?

If you want to know more about Exide Motor Coach Batteries, write us. No obligation.

Exide

MOTOR COACH
BATTERIES

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World’s Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto



For bright, steady lights — this rugged Exide Motor Coach Battery. Note the tough composition container that will not splinter or rot from exposure to weather, or acid.



Insulate with Empire Tape for positive protection

GREAT dielectric and mechanical strength are combined in this varnished cambric tape. It's seamless, bias cut and made in long continuous lengths. For wrapping cable joints, coils and other conductors, manufacturers and repairmen have found it an ideal tape.

It's one of the some hundred electrical insulations with which the Mica Insulator Company fills the needs of industry. One characteristic is common to all these insulations—a uniform,

unsurpassed quality—which is the result of more than 37 years of specialization.

The Mica Insulator Company provides an electrical insulation for every purpose. Catalog 87 gives the characteristics and suggested uses, in detail. Send for a copy.

MICA INSULATOR COMPANY
New York: 200 Varick St.; Chicago: 542 So. Dearborn St.; Cleveland, Pittsburgh, Cincinnati, San Francisco, Seattle, Birmingham, Los Angeles, Montreal and Toronto, Canada. Works: Schenectady, N. Y.; London, England.

MICA INSULATOR COMPANY

Electrical Insulations



A COMPLETE LINE FOR EVERY PURPOSE



Let . the public be .. pleased



Let . operating *and* maintenance
costs go .. down



Let . the axles be

TIMKEN

FRONT *and* WORM DRIVE REAR



THE TIMKEN DETROIT AXLE COMPANY · · DETROIT · MICHIGAN



MECHANICAL TIE *or* **WOOD TIE**

Carey
Elastite
 MADE IN U.S.A. REGISTERED TRADE MARK U.S. PATENT OFFICE

RAIL FILLER

Protects Paving next to Tracks

The deterioration of paving next to tracks is primarily caused by rail vibration. Carey Elastite Rail Filler, placed in the web of the rail as shown by the above photographs, provides a resilient cushion against vibration which would otherwise be transmitted to the adjacent paving. Paving "kick-ups" are thus prevented, with a consequent reduction of paving maintenance expense.

Elastite Rail Filler is an asphalt compound reinforced with tough fibres. Resistant to moisture and unaffected by climatic extremes of temperature, it requires no attention after its installation. The labor cost of its application is reduced to the minimum because the material is preformed to fit any type rail.

The value of Carey Elastite Rail Filler has been proven by installations in every part of the United States. We will gladly supply samples, prices and full information on request.

THE PHILIP CAREY COMPANY --:-- Lockland, Cincinnati, Ohio
 Branches in Principal Cities

BUILT-UP ROOFS
 ASPHALT PRODUCTS
 ELASTITE EXPANSION JOINT
 WATERPROOFINGS
 ROOF PAINTS

Carey
PRODUCTS
 EST. 1892

HEAT INSULATIONS
 ASBESTOS MATERIALS
 CAREYSTONE CORRUGATED SIDING
 ASFALTSLATE SHINGLES
 BUILDING PAPERS

Fills a Special Summer Need



KOOLMOTOR OIL

Cools as it lubricates

Lowers consumption at sustained high speeds

KEEP bus motors *cool* in summer to cut operating costs . . . to maintain schedules . . . to stop road failures . . . to protect passengers against delays and inconvenience.

KOOLMOTOR Oil—the *perfect* Pennsylvania motor oil—is ideal for heavy-duty, hot-running bus engines because it *cools* as it lubricates—*absorbs* searing heat and *carries it away* from hot fric-

tion surfaces and bearings and at the same time decreases oil consumption at sustained high speeds.

You will need your buses this summer—they will be in great demand for excursions, outings, picnics, etc. You cannot afford to have them idle—laid up for repairs—thus reducing your profits. Protect them—keep them at work earning profits with KOOLMOTOR—the oil that *does more than lubricate*—the oil that *cools* as it lubricates.

Our representative will gladly call and explain, in more detail, why KOOLMOTOR is your special need for summer operation.

CITIES SERVICE COMPANY
60 Wall Street -- New York City



ONCE - ALWAYS

Friday, 8 P. M., Eastern Daylight Time, WEAJ and 37 Associated Stations on N.B.C. Coast-to-Coast Network—Cities Service Orchestra, Cavaliers and Jessica Dragonette.

Cities Service Oils and Gasolene

"STANDARD" STEEL



STANDARD PRODUCTS

Steel
Axles

Steel
Springs

Armature
Shafts

Rolled
Steel
Wheels

WE leave no stone unturned to assure the longer life, greater dependability and lower maintenance cost of locomotive and car wheels, tires and forgings made of "Standard" steel. We control in our own plant all the operations and processes of manufacture from raw material to the completed product. This includes the making of the steel, the cooling and solidification of the billet, the forging of the billet, and the reforging, heat treatment and final exact machining and testing. Only in this way can we be sure that all "Standard" parts are worthy of the name and the confidence they enjoy with their many eminent and satisfied users.

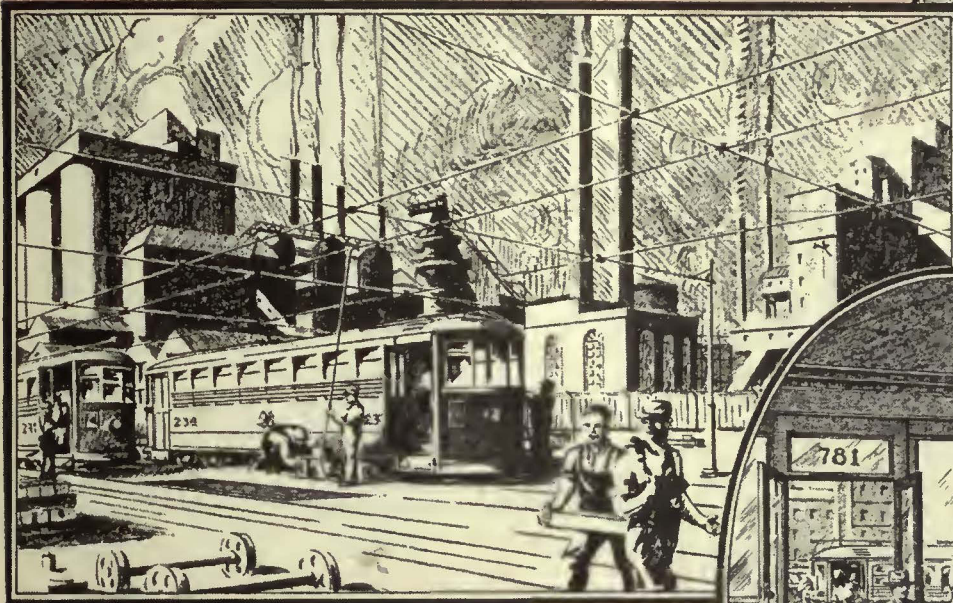
STANDARD STEEL WORKS COMPANY

GENERAL OFFICES & WORKS: BURNHAM, PENNA.

CHICAGO
NEW YORK
PHILADELPHIA

ST. LOUIS
RICHMOND

AKRON
PORTLAND
SAN FRANCISCO



COLLIER SERVICE

Car Cards as an advertising medium are working continuously to stimulate business activity. By working to increase trade they have helped to maintain electric railway traffic. They are a medium of traffic promotion.

Added to this they have been a dependable source of income to the operating companies for decades.

**BARRON G.
COLLIER
INC.**

NEW • YORK • CITY

The Blunt Truth about A Certain Gasoline

NEARLY two years ago, the Standard Oil Company of New York introduced Socony Special plus Ethyl—the *first* of all the oil companies serving the bus industry of New York and New England to add Ethyl to a premium fuel.

Socony engineers have not been content with their achievements of two years ago. They have bettered and improved Socony Special plus Ethyl so that week by week, month by month, it outsells any other premium fuel in Soconyland.

It is not remarkable that Socony should have this two-year margin of leadership. Socony engineers have always had one great and exclusive advantage. They are

specialists in the conditions and needs of Soconyland. They know its roads, its temperature, its weather, its hills. Socony products are made for New Yorkers and New Englanders for use in New York and New England.

That is why we say that Socony products are “tailor-made” for Soconyland. That is why, everywhere in New York and New England, SOCONY is “Standard.”

If you want—and you undoubtedly *do* want—a gasoline two years ahead in anti-knock performance, in quick starting, in acceleration, in power, in mileage, in economy, try Socony Special plus Ethyl. It is specially made for you as a Soconyland bus operator.

SOCONY SPECIAL *plus* ETHYL



Tailor-made for Soconyland



Socony is "Standard"




TO BEAUTIFY AND TO BE LASTING!

The graceful, tapering form which makes NATIONAL Tubular Poles an adornment to a city street, results also in a proportioning of weight and strength where both are needed most. Refinement of design has not led to weakness, but incorporates both beauty and durability.

The material used in NATIONAL Poles is a steel specially adapted for the conditions of line-pole service and proved by many years of use. The effect of strains and shocks of traffic, the fury of the elements and attacks of corrosion is reduced to a minimum by installing these strong, durable poles. Available in varying designs and dimensions. Beauty, safety, and economy are served by specifying them. Write for Bulletin 14, on poles made from—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY · PITTSBURGH, PA.

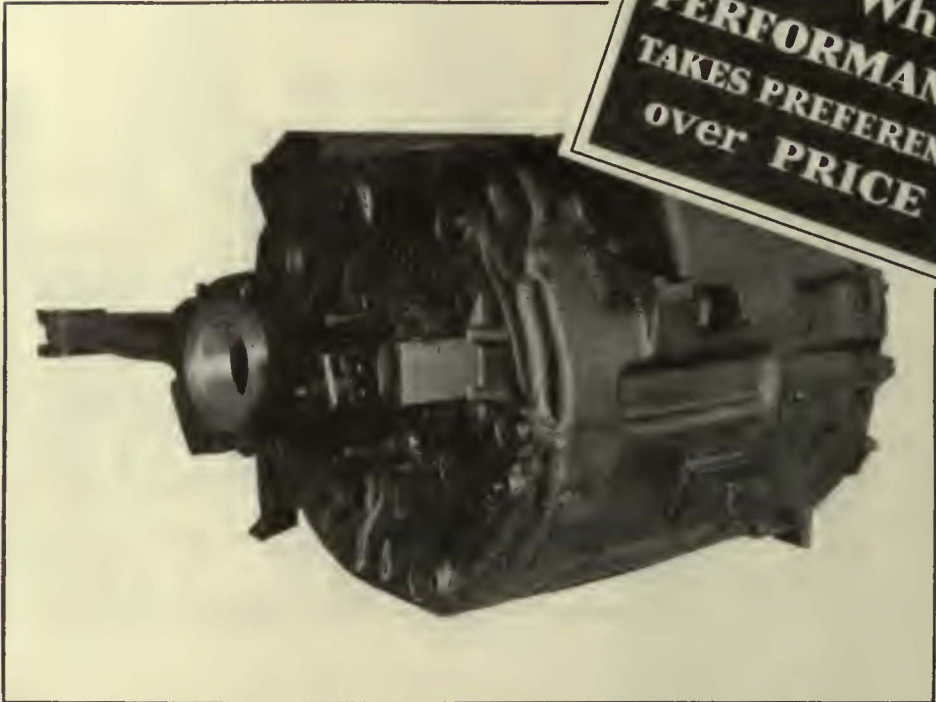
Subsidiary of United  States Steel Corporation

NATIONAL POLES

WESTINGHOUSE ELEC. & MFG. CO.

Another prominent user of SKF Bearings in the Railway Industry

Where
PERFORMANCE
TAKES PREFERENCE
over **PRICE**



SKF ON MOTORS FOR READING ELECTRIFICATION

ON 28 Westinghouse motors of multiple unit cars soon to be placed in service by the Philadelphia & Reading R. R. for its Philadelphia suburban electrification, SKF Roller Bearings are used for assured PERFORMANCE. Two 300 H. P. motors on each car... and two SKF's on each motor insure the dependability of high speed schedules.

Performance is the only thing that counts when the demands of the present day call for operation at the lowest cost per mile per passenger. SKF Bearings on these heavy duty motors meet every expectation of reliability, ruggedness and little maintenance through a long life under severe service conditions... with marked economy.

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

SKF

2726



SELF ALIGNING BALL BEARING

DEEP GROOVE BALL BEARING

DOUBLE ROW DEEP GROOVE BALL BEARING

CYLINDRICAL ROLLER BEARING

SPHERICAL ROLLER BEARING

ALIGNING THRUST BEARING

ALBERT D. LASKER

Chairman of the Board, Lord & Thomas and Logan



● "For the past thirty-two years I have been in the advertising business. During the first sixteen years there was no Audit Bureau of Circulations and no assurance that the advertiser was getting value received in circulation. During the last sixteen years the Audit Bureau has functioned with increasing effectiveness. That its work is of first importance in the mind of the advertiser is evidenced by the vast sums invested in publications audited by it."

Albert D. Lasker

● By its own bootstraps advertising lifted itself into the confidence of business. And the leaders who helped in the process were the same men who worked the hardest for audited circulations of advertising media. It was through their efforts that the A. B. C. was founded.

To take the guess work and money wastes out of media selection, was and is today the sole purpose of the Audit Bureau of Circulations. Advertisers, agencies and pub-

lishers have joined in its support.

Through an independent, highly organized traveling staff it now audits annually the circulation records of almost every important publication in America. It publishes the full facts in terse, standardized form.

Careful advertisers and seasoned agency men use these printed A. B. C. reports as a safeguard to advertising expenditures. Through A. B. C. information, they win

more readers per dollar, better distribution of the advertising audience, more intensity of reader interest. Such are the details by which markets are profitably won.

What is the cost of Bureau reports? Purely nominal! Any advertiser may have them always at his finger tips, simply by joining the distinguished and growing group that now holds membership in the A. B. C. Write for complete facts about Bureau benefits.



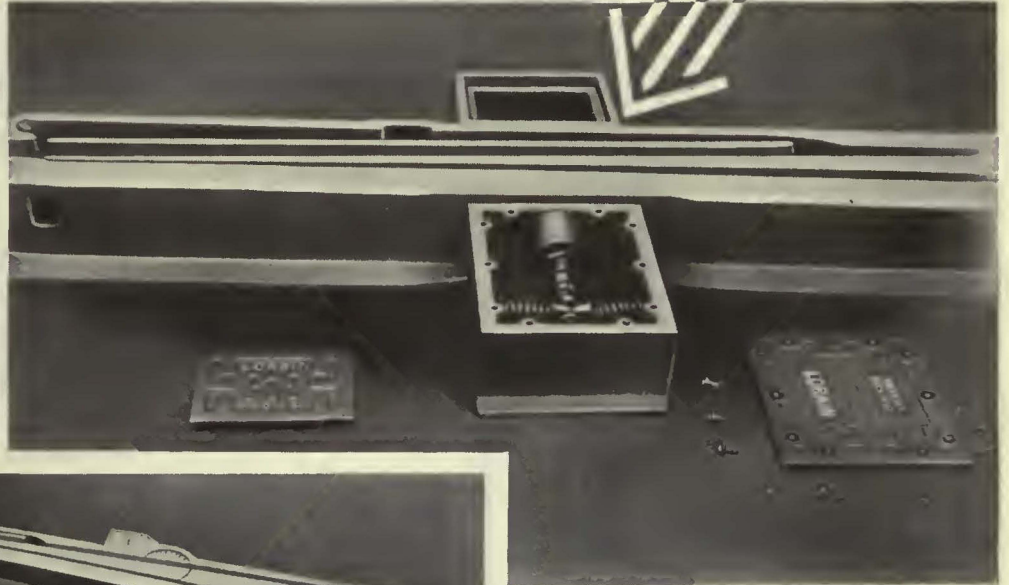
**An advertisement by the
AUDIT BUREAU OF CIRCULATIONS**

Executive Offices • • • Chicago

Here is protection for

Tongue Mechanism~

**LEHECKA
WATER-
TIGHT
TONGUE
HOLDING
DEVICE**



ANOTHER develop-
ment of LORAIN is

this device which can be set to hold the tongue securely in either position or for spring switch movement. The water-tight box in which the mechanism works is kept full of oil, an important feature as it reduces the wear on mechanism parts which are kept lubricated. Foreign matter, such as sand, dust, etc., is also excluded. Drainage of the switch-bed is provided for by the small box on the opposite side.

THE LORAIN STEEL COMPANY

General Offices: 545 Central Avenue, Johnstown, Pa.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Sales Offices: Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco, Calif.

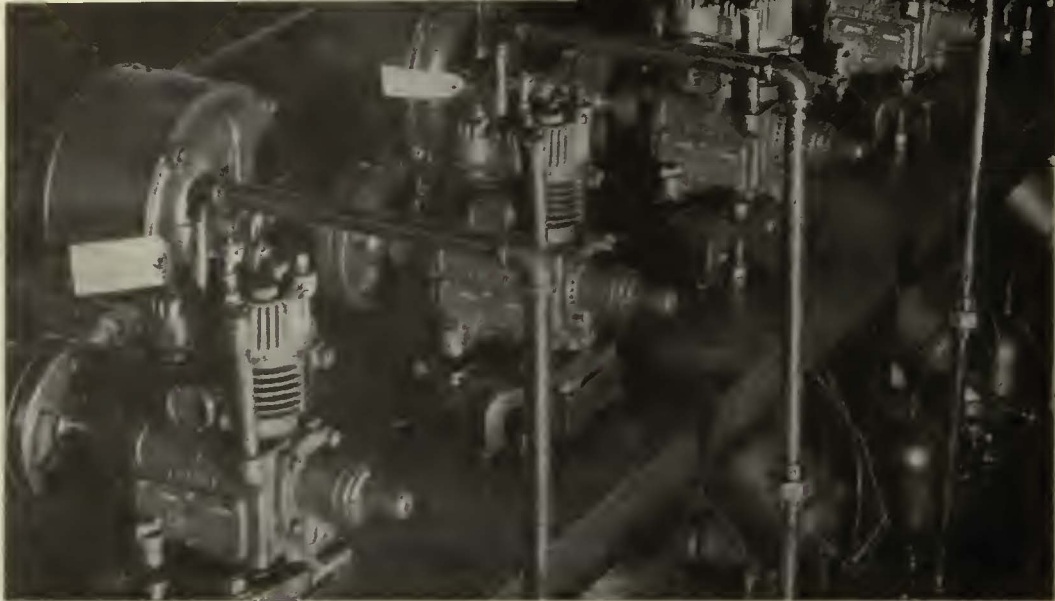
Export Distributor: United States Steel Products Company, 30 Church St., New York City, N. Y.

Ask the nearest
Lorain Sales Office
for Quotation

LORAIN

SAFETY

IN THE MAKING



From the drawing board to its final mounting on the chassis, the Bendix-Westinghouse compressor is ever a source of pride to those responsible for its development and manufacture ★ This sturdy unit, the heart of the Air Brake, is designed to more than meet the most rigid requirements of actual service ★ Each step in its production is constantly guarded with the same precise care you would expect of the watchmaker ★ Inspections . . . no end, and an actual operating test round out its program ★ How well the Bendix-Westinghouse Compressor merits the extreme care which attends its manufacture is best written in its years of never-failing service as a part of the braking system which safeguards the world's most prominent, heavy duty highway transport vehicles ★ Should you desire more specific information regarding the history making dependability of this remarkable unit, merely address the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6289

BENDIX WESTINGHOUSE

AUTOMOTIVE AIR BRAKES

Which will
she ride? . . .

*a lot depends
on the seat*



KARPEN

It's the Seating that Counts

THE SEATING THAT COUNTS

It's the seating that counts... and there are three counts by which you judge good seating—comfort, beauty and enduring service. Sit in a Karpén seat and you have the measure of its comfort—look at it and you know its eye value. Add then check the third vital factor, *durability*, by asking transportation managers about Karpén's thirty-five year record of successful seat building, covering millions of miles of bus, truck and service.

S. KARPEN & SONS.
 Commercial Vehicle Equipment Co., Inc.
 1000 Broadway, New York, N. Y.



No. 318



No. 17



No. 10



No. 100



KARPEN

It's the Seating That Counts

“ASK R B & W—THEY KNOW”

BOURKE-WHITE PHOTO



•
**complete information
 on bolting
 material from our
 Engineering
 Service**
 •

“WHAT should be the physical characteristics and the allowable working stresses of the bolts used in our product?” Requests such as that come to R B & W from manufacturers all over the world. Users of bolting material have come to know that, no matter what technical or scientific questions they have, they can get the information from R B & W.

In a recent request for counsel, a maker of forgings used on pressure vessels stated he had sought advice

from three other sources that might be expected to know the answers to his questions, but they went unanswered until he wrote R B & W.

Foreign users of bolting material, acknowledging the superiority of the American product as made by R B & W, frequently visit or write us for guidance.



Write to headquarters for bolting material information when you need assistance in planning or re-designing your bolts—make use of the vast fund of information collected by the R B & W Engineering Service from actual experience in all branches of world industry.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

ROCK FALLS, ILL.

PORT CHESTER, N. Y.

CORAOPOLIS, PA.

Sales offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

BY THIS SIGN YOU WILL KNOW THEM



TRADE MARK

**SYMBOL OF A COMPLETELY
OWNED OPERATION FROM
TREE TO LOADED CAR**

This Warranty Mark signifies Dense Long Leaf Yellow Pine, correctly seasoned and uniformly graded, and it is branded on every piece of Jackson stock.

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Detroit, Mich.

JACKSON LUMBER Co.

Manufacturers

Lockhart, Alabama

A CROSSETT WATZEK GATES INDUSTRY



Trolley Retrievers for the Trolley Bus

We have recently completed a new series of Earll Retrievers for the new Trolley Buses. The same simple construction and sturdy action is used as in our universally-used trolley types.

They draw the pole down below the danger zone at the first jump. They are non-binding, sure in action, and require practically no maintenance other than a few drops of oil per month.

Chicago Surface Lines use Earll trolley bus retrievers.

Avoid damage to overhead—install Earll Trolley Retrievers. *Send for details.*

Made by

C. I. EARLL, York, Pa.

CANADIAN AGENTS:

Railway & Power Engineering Corp., Toronto, Ont.
IN ALL OTHER FOREIGN COUNTRIES:
International General Electric Co., Schenectady, N. Y.



News ★ ★ ★ ★

brief, late news flashes for the *electric railway industry*



To supplement the service of the regular monthly issues of *Electric Railway Journal*, a separate NEWS service appears on thirty-nine Saturdays during the year. This supplement keeps you in touch with court decisions . . . fare increases . . . new ordinances . . . association meetings . . . financial announcements . . . equipment purchases.

Subscription Price: For all countries taking domestic subscription rate, \$2 per year. Combination with the monthly edition of *Electric Railway Journal* for \$5 a year domestic rate.

ELECTRIC RAILWAY JOURNAL
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NEW YORK CITY

Enter my subscription to the Electric Railway Journal News. Bill me for \$2.

Name
Address
City State



Plain bolted frog which had been worn out, and quickly reclaimed by welding with TIMANG.



Same frog after being welded with TIMANG Manganese Welding Rod in the track.

WELD MANGANESE TRACKWORK WITH

TISCO
TIMANG
(AIR TOUGHENING)

Welding Rod

MANGANESE track welds made with TIMANG (air toughening) Welding Rod have practically the same hardness—the same resistance to wear—as the parent metal. Moreover, TIMANG welds are ductile, and will not crack in service.



TIMANG Trade Mark is registered in United States and foreign countries. **TIMANG** Steel is protected by U. S. Patent 1,732,202 and foreign patents. Other patents pending.

If you are anxious to lower track maintenance, investigate TIMANG today. Communicate with the nearest TISCO office, or write to High Bridge for TIMANG bulletins.

Taylor-Wharton Iron and Steel Co.

HIGH BRIDGE, NEW JERSEY

SALES OFFICES: Chicago Houston Montreal New York
Philadelphia Boston San Francisco Scranton Tampa Los Angeles

Trolley Shoes are making history—

When maintenance men get together these days you hear trolley shoe history in the making . . . and the majority of the boys say the greatest contribution toward satisfactory results has been



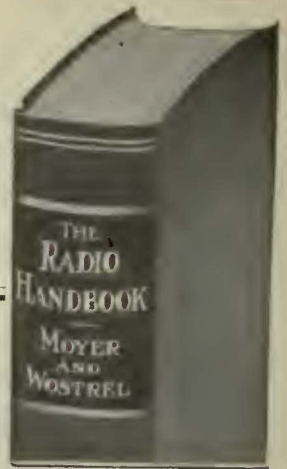
·IONLOYD·

**Reversible
Trolley
Shoes**

Let's talk it over

**Efficiency Products Corp.
1203 Barlum Tower, Detroit, Mich.**

Just published!
The most important radio book of the year



The RADIO HANDBOOK

Including Television and Sound Motion Pictures

by JAMES A. MOYER and JOHN F. WOSTREL

Both of the Massachusetts Department of Education; Authors of *Radio Receiving Tubes, Practical Radio Construction and Repairing, etc.*

886 pages, 5½ x 8, 650 illustrations, flexible, \$5.00

Over 875 pages of latest data on:

- modern transmitters, Piezo crystal, 100% modulation, etc.
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- marine radio equipment, auto alarm, etc.
- automobile radio sets.
- all latest tubes, photoelectric cells.
- television and sound motion pictures, etc., etc.

a complete, modern manual of practical and technical radio information

HERE at last is a handbook that meets the need for a complete digest of authoritative radio data, both theoretical and practical, in one logically arranged and thoroughly indexed volume. From the fundamentals of electricity, magnetism and electron theory right down to full details on latest commercial and industrial applications, this book covers the whole field of radio, with descriptions, definitions, design data, practical methods, tables and illustrations in profusion.

Space does not permit a full description of this book. However, we know this is the book for which you have been waiting. Therefore we make this offer: Send no money, just mail the coupon; examine the book thoroughly for ten days free; then pay for or return it according to its value to you. No other obligation. Send the coupon today.

McGraw-Hill FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York.

You may send me a copy of *Moyer and Wostrel—Radio Handbook*, postpaid, for 10 days' free examination. At the end of that time I agree to remit the price of \$5.00 or return the book postpaid.

Name

Home Address

City and State

Name of Company

Occupation

(Books sent on approval to retail purchasers in U. S. and Canada only.)

E. 6-31

Danger of breakage is minimized with the GUS-2 gas weld bond.

Conductor wires are firmly gripped by the heavy, all-copper terminals dampening cable vibrations. Bonding with the GUS-2 insures full conductivity—the weld with the rail can easily be made six times the conductor area. Notice the conductor extends through the terminal so that the cable ends are easily fused into the weld metal. Type G-1, the alloy rod used to apply these bonds, produces a sound, tough weld at low resistance.

Write for your copy of Circular No. 18. It describes this and other gas weld bonds in detail.



GUS-2
ALL COPPER
GAS WELD
BOND

*Takes the Shocks of
High Speed Service*

Electric Railway Improvement Co.

2070 East 61st Place, Cleveland, Ohio

For Higher Speed With Safety

use

"UNION"
AUTOMATIC
SIGNALS



Union Switch & Signal Co.

SWISSVALE, PA.



FABRICATED STRUCTURAL STEEL

For all
kinds of
BRIDGES
and
BUILDINGS

AMERICAN BRIDGE COMPANY

Subsidiary of United States Steel Corporation

Manufacturers of



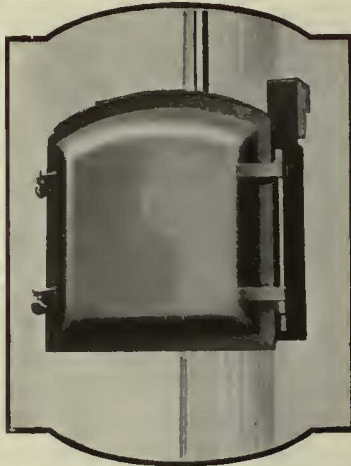
STEEL STRUCTURES

for every purpose

General Office: 71 BROADWAY, NEW YORK, N. Y.

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On Time



Schedules can be maintained with unflinching regularity when Nachod Headway Recorders automatically supervise the line. They tab, in print, the exact time that each car passes the points of installation, thus, giving you a daily report of all car movements. Simple in mechanism ... dependable ... durable. No adjusting ... just daily winding and change of record. Write for particulars and prices. Nachod & United States Signal Co., Inc., Louisville, Ky., Manufacturers of Block and Highway Crossing Signals.

"Nachod Spells Safety"

NACHOD Headway RECORDERS

Strengthening Poles

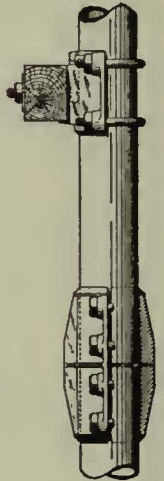
Many tubular poles require strengthening after 20 to 30 years' service. Upper joints under ornamental collars, etc., and poles at ground-line have deteriorated to the danger point.

M. I. F. Reinforcing Clamps for all normal sizes of poles restore the original strength mechanically in the most simple and economical method available. The introduction of trolley buses may also render highly desirable similar reinforcement of existing poles.

M. I. F. Extension Clamps facilitate pole-top extensions required by street-widening, or provision for additional circuits, etc., using pipe of same size or nominally 1" smaller.

Pole Mounts for special jobs of anchoring poles on bridges, rock, concrete, etc.

Send for Sales Bulletin No. 3



"C" Clamp Extension incl. Gain.

Also Insulated Suspension Hangers for signal conductors, etc., and Pole Hardware Specialties for wood poles, including Guy Hooks, Crossarm Gains, Pole Mounts, Cable Suspension Clamps, etc.

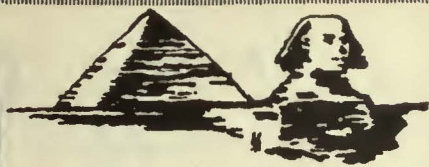
MALLEABLE IRON FITTINGS COMPANY

Pole Hardware Dept. [Factory and New England Sales Office] Branford, Connecticut

New York Sales Office: Thirty Church Street
Canadian Mfg. Distributors:
LINE & CABLE ACCESSORIES, Ltd., Toronto



Durability



The Toledo Torch is built to last a long time. Rigidly built of steel throughout, it's unbreakable, leakproof and good for long, continuous service.

Order from your dealer—
insist on the genuine Toledo



Toledo Torch



The Toledo Pressed Steel Co.
TOLEDO OHIO

Save with Steel

Manufacturers of The Toledo Horse—the ideal highway horricade

PANTASOTE

TRADE MARK

—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE

TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

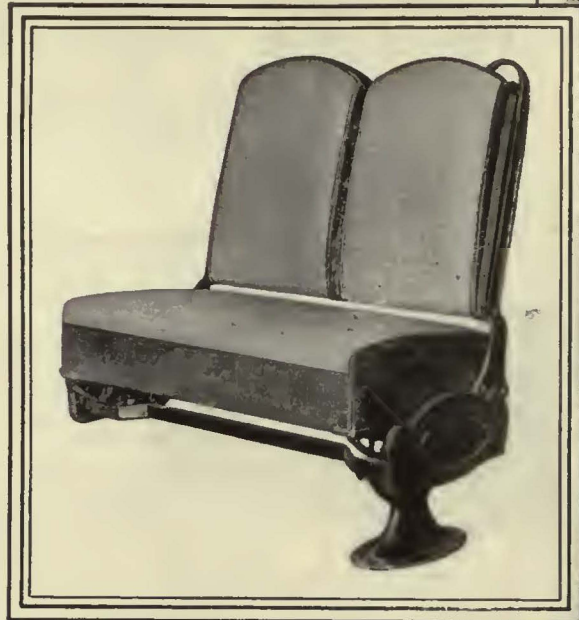
*Standard
for electric railway cars
and motor buses*



*Samples and full
information gladly
furnished.*



The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK



*Attractive — Clean
— Comfortable*

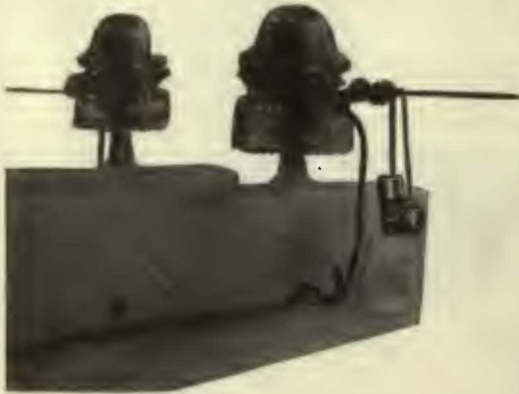
MAINTENANCE engineers will be quick to appreciate the advantages of this Heywood-Wakefield seat. The cane webbing backs and cushions offer a generous measure of comfort, yet they do not soil readily, are practically indestructible, and very easy to clean. The genuine leather facing on the cushion reinforces the seat at the point where strain is most apt to come and allows full bellows action. The individual backs and deep, spring cushions are shaped to allow proper posture and leg freedom. Mechanism rails are set in and the cushion and back frame of this 327 M is glued, and screwed. A note to any of the Heywood-Wakefield sales offices listed will bring complete details on this or any other of the popular and practical bus and electric railway seats in our line.

HEYWOOD- WAKEFIELD

HEYWOOD-WAKEFIELD CO., BOSTON, CHICAGO, NEW YORK; G. F. COTTER SUPPLY CO., HOUSTON, TEXAS; J. R. HAYWARD, LIBERTY TRUST BLDG., ROANOKE, VA.; H. G. COOK, HOBART BLDG., SAN FRANCISCO, CALIF.; A. W. ARLIN, DELTA BLDG., LOS ANGELES, CALIF.; RY. & POWER ENG. CORP., MONTREAL, TORONTO, WINNIPEG, VANCOUVER, CANADA.

MODEL C WIRE CONNECTOR

FOR QUICK AND SECURE CONNECTIONS



Only 2 Sizes Required

Size No. 1
No. 2 to No. 14 Wire Inclusive.

Size No. 2
No. 14 to No. 20 Wire Inclusive.

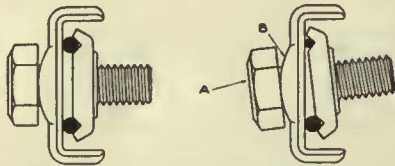
Makes Testing Easy

No Solder

No Sleeves

No Cutting of Line Wires

Every Repair Gang Should Have These

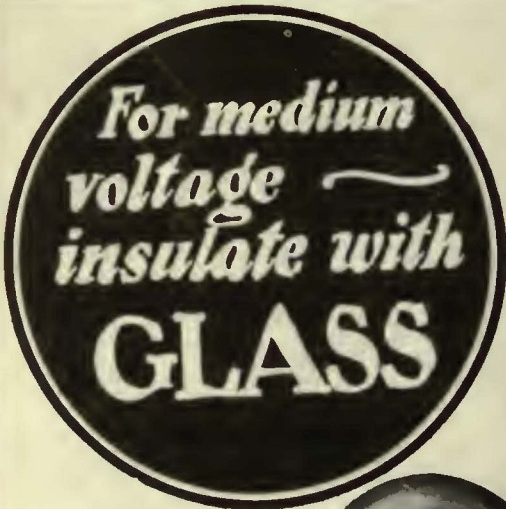


SAMPLE OR BULLETIN NO. 9 SENT ON REQUEST

Patent No. 17828



LOUISVILLE FROG SWITCH & SIGNAL COMPANY
INCORPORATED
LOUISVILLE, KY.



BEST

UP

TO

15,000

VOLTS

Let us tell you why

Send for Catalog.



HEMINGRAY
HEMINGRAY GLASS COMPANY
General Offices and Factory Muncie, Indiana



The Electric Railway Field at your finger-tips

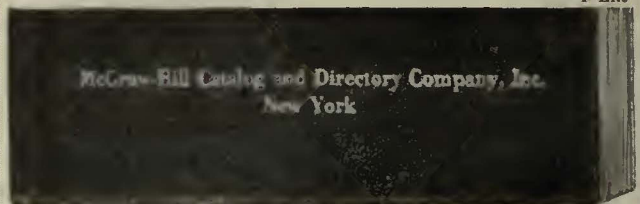
Contents Include:

Names and addresses of the Electric Railway Companies in the United States, Canada and the West Indies, arranged geographically by Post Office address. Names and addresses of officials and principal department heads. Names of subsidiary bus companies. Location of repair shops and power plants. Mileage of the road. Gage of track. Number and kind of cars used. Number of buses operated. Number of garages and capacity. Rates of fare. Transmission and Trolley voltages. Capacity of substations. Index of electric railway company officials, giving company connections.

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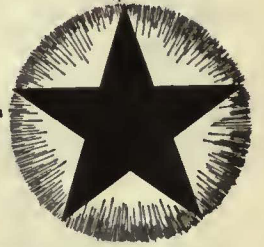
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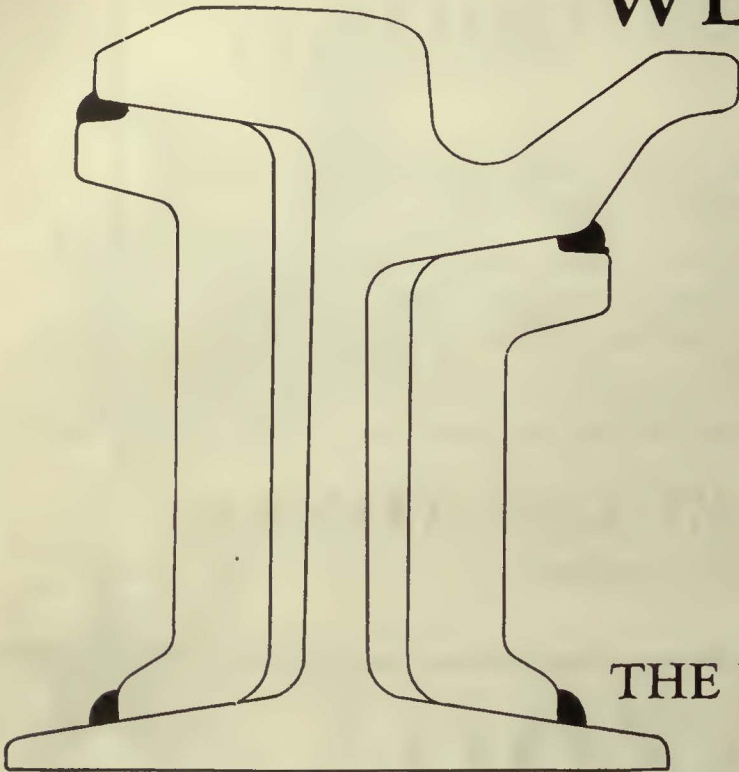
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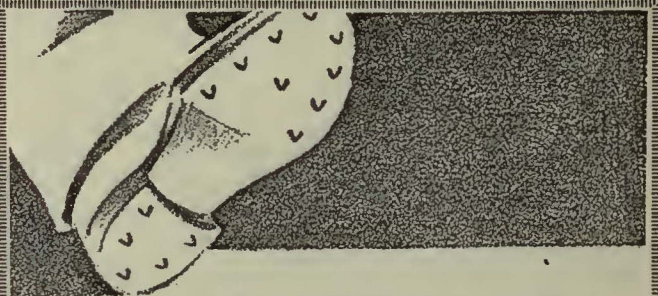
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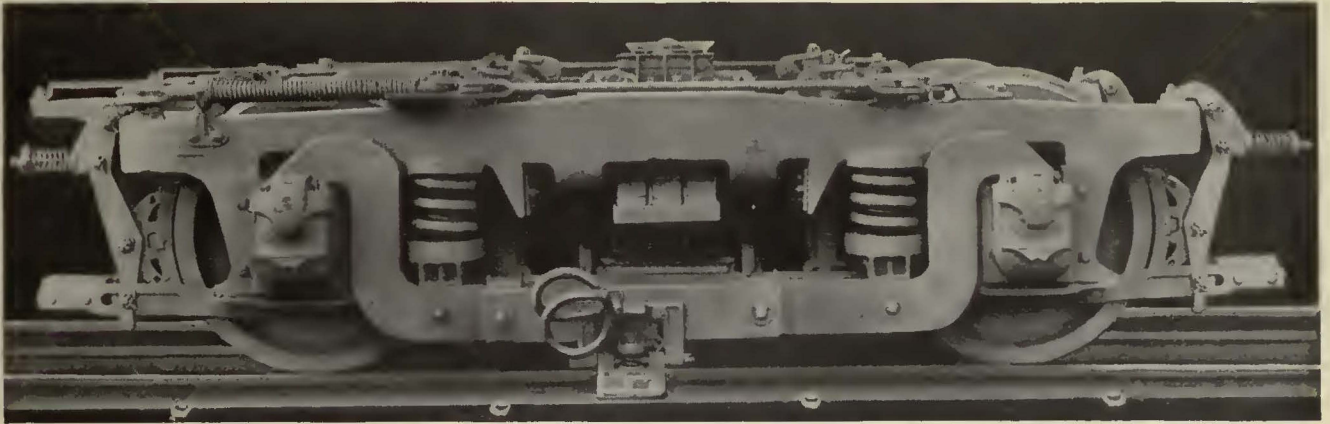
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ELECTRIC RAILWAY JOURNAL

Tenth Ave. at 36th St., New York, N. Y.



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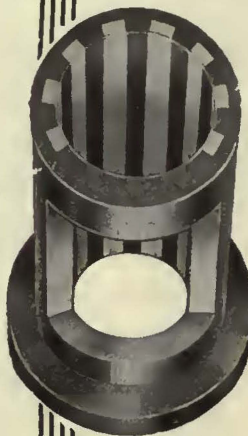
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