

# ELECTRIC RAILWAY JOURNAL

Law-Hill Publishing Company, Inc.

MAY, 1931

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If  
your tracks were all as level  
as a billiard table

If your tracks could be made as level as the top of a billiard table, your operating costs would be much lower and running schedules easier to maintain.

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# Westinghouse

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# ELECTRIC RAILWAY JOURNAL

MORRIS BUCK  
Engineering Editor  
GEORGE J. MACMURRAY  
CLIFFORD A. FAUST  
J. W. McCLOY  
LOUIS F. STOLL  
Publishing Director

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

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Washington  
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Pacific Coast Editor  
ALEX McCALLUM  
London, England

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JOHN A. MILLER, JR., Editor

Pages 233-284

## Interpreting Trends

RECOGNIZING the importance of analyzing trends revealed by company reports, the JOURNAL is presenting the figures of operating revenue, operating expenses and net income in a new form in this issue. In addition to the latest month's figures, monthly reports going back for a year are included, enabling a comparison of the corresponding month of the previous year with the latest report and a study of revenue, expense and net income trends through a full year. To subject the tabulation to quick and clear interpretation, per cent changes of all figures are calculated and included.

Study these reports—they tell accurately what is happening.

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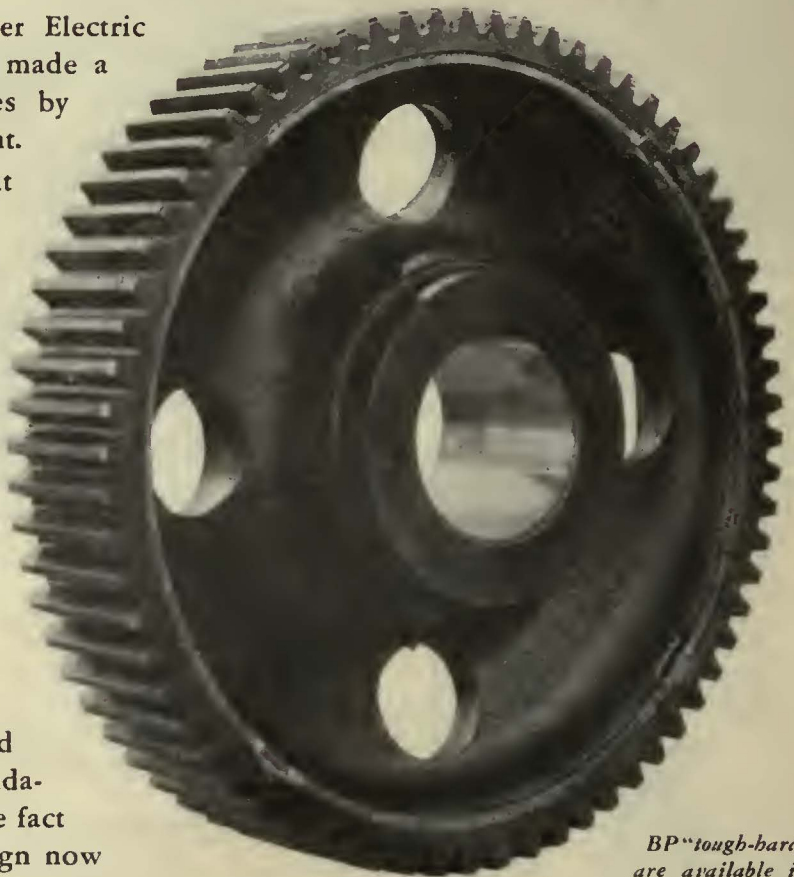


*Many cars of the Brooklyn & Queens Railway are equipped with Westinghouse - Nuttall non-resonant BP "tough-hard" gears.*

# THEY'RE QUIETER - NOW

**T**HE urgent desire for quieter Electric Railway operation is being made a reality today on many properties by the use of improved car equipment. Sharing in this accomplishment on some 40 properties are non-resonant Westinghouse-Nuttall BP "tough-hard" gears. That these gears have contributed effectively to noise-abatement is indicated by the repeat orders from many of the original purchasers. An increasing number of new users affords further evidence of their effectiveness.

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*BP "tough-hard" gears are available in both helical and spur types.*

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*Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops*

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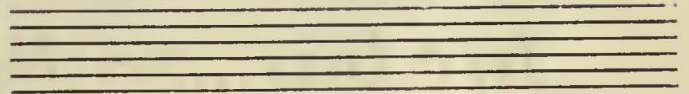
# Westinghouse



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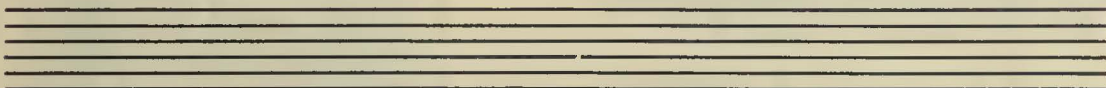
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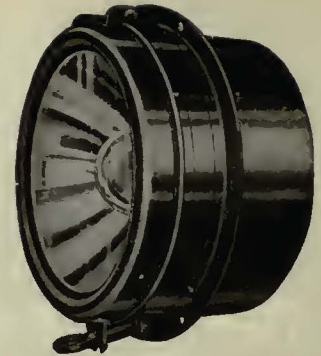
Catalog No. 7 is full of quality equipment for all types of cars and trolley-buses. Let us send you a copy.



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Golden Glow Railway Car Headlights



Keystone Trolley Catchers



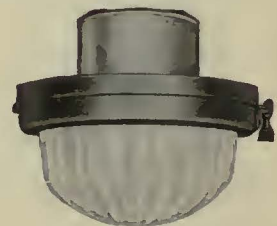
Faraday Push Buttons



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Faraday Car Signal Systems



Type T Lighting Fixtures



Type 129 Hunter Sign—mechanism



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A wheel that's good for your neighbor may be all wrong for you. We know what's best for both of you. We have it—and can ship from stock immediately.

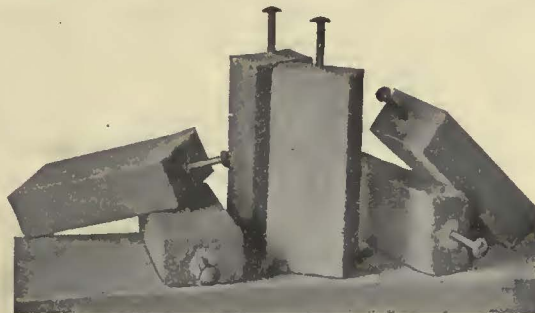
Buy your rail grinding wheels and bricks from the world's rail grinding equipment headquarters.

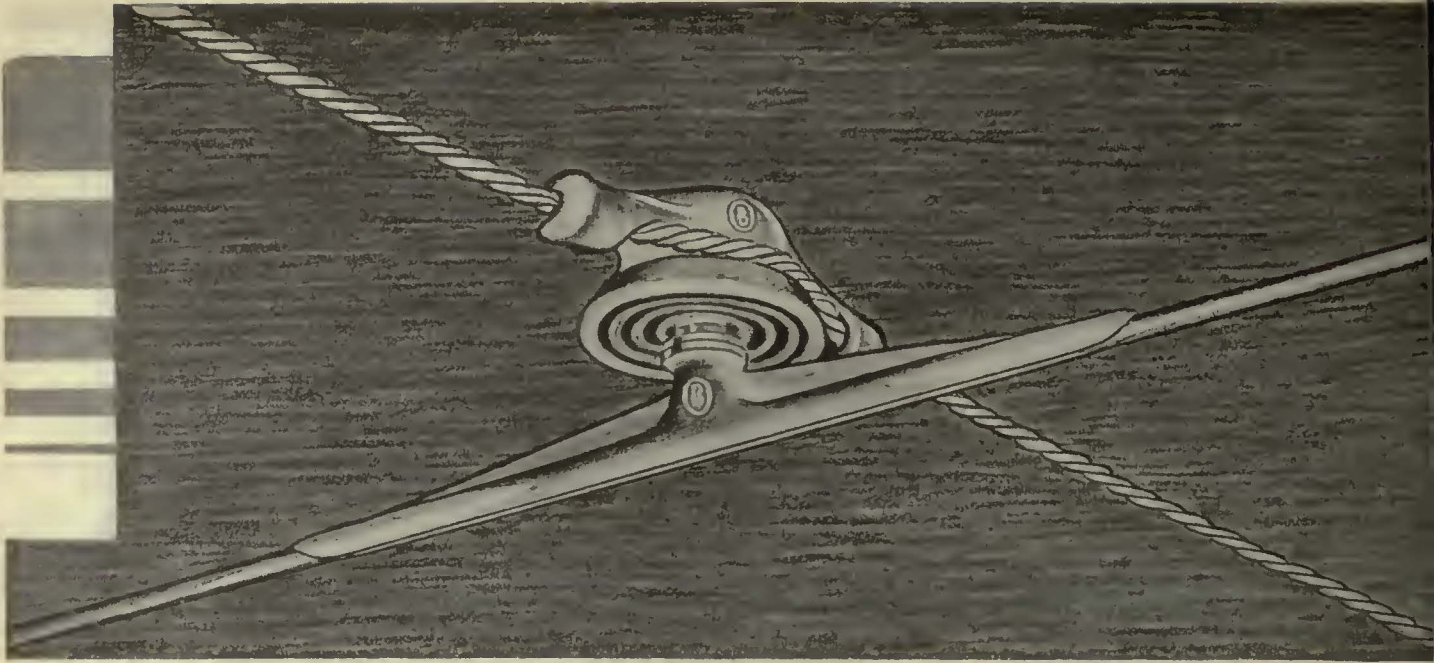
## **Railway Track-work Co.**

3132-48 East Thompson Street, Philadelphia

### AGENTS

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H. F. McDermott, 208 S. La Salle St., Chicago	Equipment & Engineering Co., London
Railway & Welding Supply Company, Toronto, Ontario	





# LOCALIZES, THEN ABSORBS the "HARD SPOT"

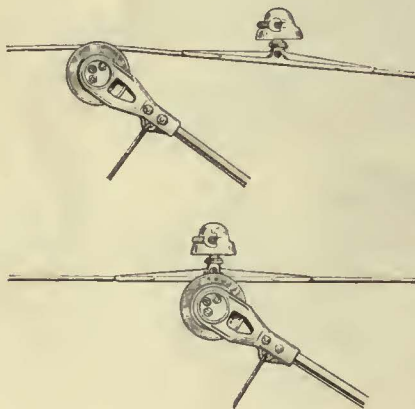
Overhead superintendents who recognize the importance of, and are sincerely searching for shock-free suspension assemblies will not stop with the adoption

of Improved Marathon Ears. Although the Marathon Ear is quite generally accepted as providing the smoothest underrun and as being the most economical to use, it is equally well known that the most satisfying performance is enjoyed only when the hanger, too, is soft and shock-free.

The O-B Spring-Lock Hanger functions in a manner that eliminates the hard spot of the suspension assembly. As the trolley wheel approaches or leaves, the hanger permits the ear to tilt upwards to form a straight line with the upthrusted wire, thus eliminating the bump between the yielding wire and the inflexible ear. The underrun at the boss section consequently becomes the pivoting point, and the tendency to bump is transferred from the ends to the center portion of the ear.

But even this bump is never allowed to develop in the Spring-Lock Hanger; for a steel spring, which is inserted between the hanger stud and the hanger body, absorbs the shock. Thus, the wheel rides the ear as firmly and as smoothly as it does the wire. Arcing is virtually abolished; hence pitting and wear are reduced to a minimum.

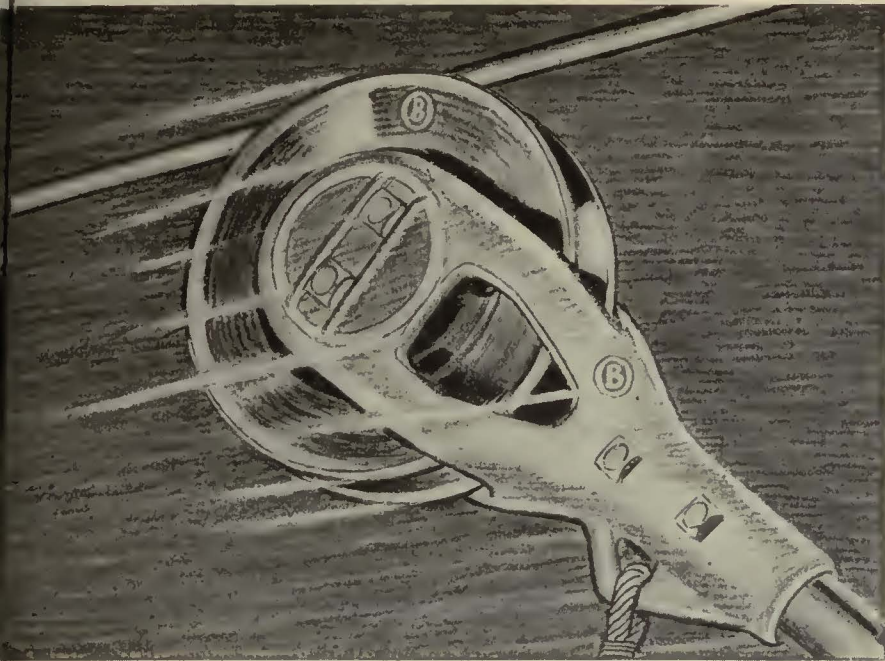
Those familiar with the excellence of the Marathon Ear will not be long in discovering the equally economical advantages of Spring-Lock Hangers. Others are urged to experience without delay the gratifying reductions in costs which follow the use of Marathon Ears and Spring-Lock Hangers.



*Illustrating pivoting action of ear suspended from Spring-Lock Hanger as wheel approaches, and passes. The "hard spot" under boss of ear is absorbed by a spring cushion in the hanger.*







# GETTING TO THE BED-ROCK of CURRENT COLLECTION COSTS

Recent investigations reveal that substantial savings are effected in the costs of current collection equipment when old type trolley wheels are replaced with O-B Wheels. In addition to this saving, the general opinion is that wear on wire and overhead materials is also considerably reduced.

In reaching these conclusions, it was revealed that an O-B Wheel gives two to six times the mileage of other wheels; and that maintenance costs of O-B Wheels is negligible in comparison with the cost of lubricating and maintaining old type wheels. Reduction of wear on wire and overhead results because the O-B Wheel, with its large axle, permits a tension which insures a firm, continuous contact with the wire. This reduces burning and pitting, the primary causes of wear.

O-B Wheel axles outwear old style axles not only because of their larger area, but also because of their graphite lubrication. Graphite is an excellent conductor; hence, a constant, low-resistance path is provided between wheel and axle which eliminates much of the cause of axle pitting. Furthermore, a composition-graphite washer at each end of the wheel hub provides a direct path to the harp and relieves the axle of much of the current load. All of these exclusive features contribute to greater mileage, to higher efficiency, and to maximum economy of O-B Wheels.

Your O-B salesman will gladly co-operate in arriving at a better understanding of the advantages of O-B Wheel operation. Or, if you prefer to experience these advantages personally, a trial installation will gladly be arranged.

OHIO BRASS COMPANY, MANSFIELD, OHIO  
Canadian Ohio Brass Company Limited, Niagara Falls, Canada  
1400CL



Page 13 of New Products Supplement No. 4 gives a comprehensive description of Spring-Lock Hangers. Full details of O-B Trolley Wheels may be obtained by referring to page 106. Write for a copy.

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INSULATORS  
LINE MATERIALS  
RAIL BONDS  
CAR EQUIPMENT  
MINING  
MATERIALS  
VALVES

# St. Louis Safety Council Approves One-Man Cars



Here it is

Pneumatic

Door

Control

Brings

Results

### Safety Council Approves One-Man Cars

The St. Louis Safety Council after a study of the use of one-man cars in St. Louis and many other cities has approved their use on lines of the St. Louis Public Service Company.

In its quest, the committee sent out to safety councils in many cities a questionnaire about the use of one-man street cars, their effect on accident rates and the nature of the districts served by such cars.

Eighteen cities sent detailed replies. All but Chicago were using one-man cars in congested districts under traffic conditions comparable with those in St. Louis. The reports revealed that in eleven of the cities traffic accidents involving street cars had decreased after one-man cars were installed, the percentage of decrease ranging from 10 to 50 per cent. No city noted an increase in such accidents. Accidents involving the boarding or alighting of passengers from street cars had decreased as much as 67 per cent in some cities. The reports revealed that in most cities when one-man cars were installed they were opposed by riders, but that antagonism disappeared after a fair trial of the new cars.

In its report, the Safety Council committee stated that it was the unanimous opinion of the committee members that "specially designed one-man cars can be operated under normal conditions as safely as two-men cars, if the running time is not too fast and if strict operating rules are enforced relative to starting the cars while fares are being collected, particularly in the downtown district."

Less Accidents

Faster Schedules

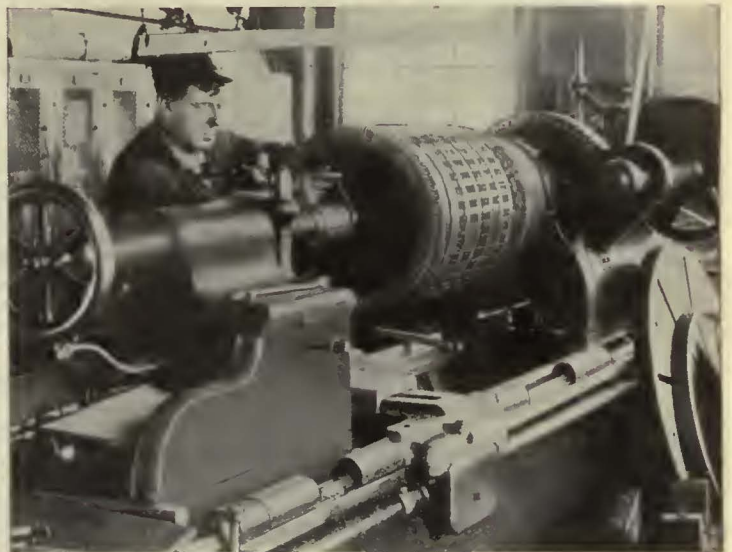
Lower Operating Costs

Reprinted from "Electric Railway Journal News"

## NATIONAL PNEUMATIC COMPANY



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Electric Railways find many uses for G-E Glyptal. Highly resistant to heat, it protects with a hard, smooth, enduring film that adds useful life.

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Possibly you have a problem which cannot be solved with ordinary materials. G-E Glyptal may prove adaptable to your needs. Talk over your problem with your nearest General Electric Merchandise Distributor or write Section

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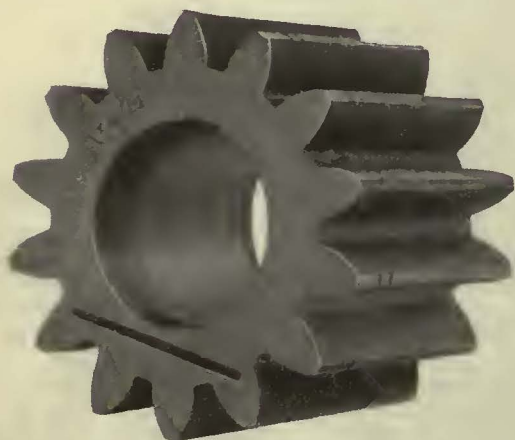
## GENERAL ELECTRIC



GLYPTAL



# Service Records in Original Equipment



*These G-E Pinions  
averaged 330,000 miles*

**T**HE high quality of General Electric pinions, together with carefully supervised maintenance methods, resulted in this phenomenal record of pinion mileage made by the Des Moines Railway Company. All of these pinions were standard G-E Grade M, long-addendum tooth form, meshed with standard G-E Grade M short-addendum gears, which are still in service.

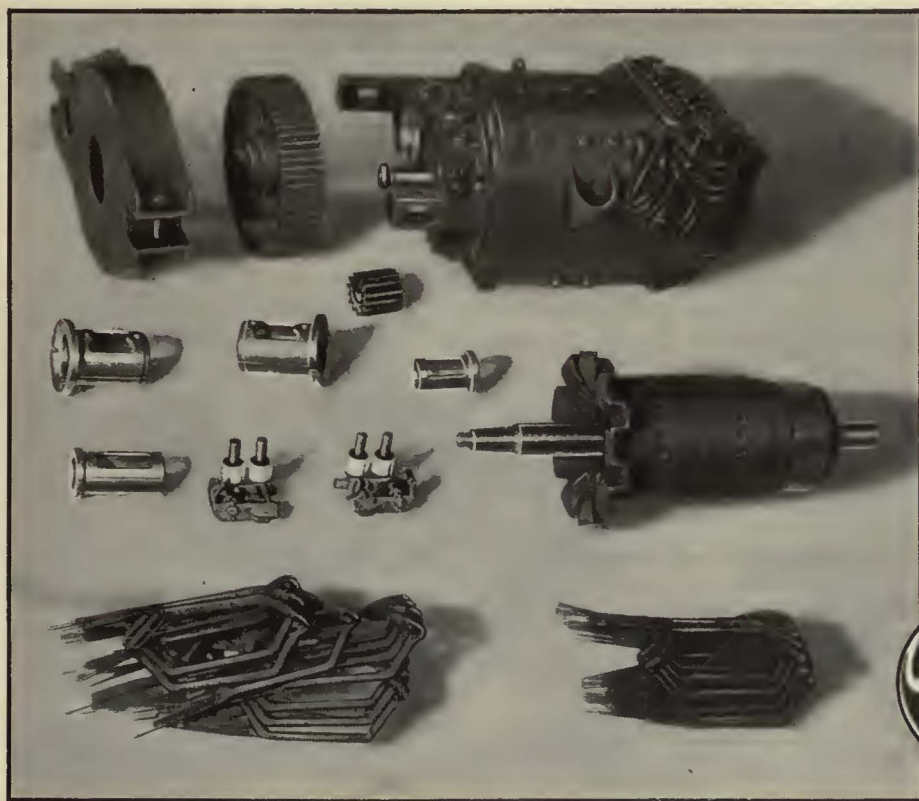
Pinion No.	Grade	Diametral Pitch	Miles
357	M	3 $\frac{1}{2}$	207,318
367	M	3 $\frac{1}{2}$	238,460
331	M	3 $\frac{1}{2}$	278,642
342	M	3 $\frac{1}{2}$	289,637
339	M	3 $\frac{1}{2}$	290,213
325	M	3 $\frac{1}{2}$	306,660
395	M	3 $\frac{1}{2}$	323,129
297	M	3 $\frac{1}{2}$	327,311
243	M	3 $\frac{1}{2}$	355,338
154	M	3 $\frac{1}{2}$	361,873
39	M	3 $\frac{1}{2}$	369,029
198	M	3 $\frac{1}{2}$	396,997
22	M	3 $\frac{1}{2}$	436,635
26	M	3 $\frac{1}{2}$	452,092
Average.....			330,952

# GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

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General Electric renewal-parts stock rooms are modern department stores for the railway industry. It will pay you to take advantage of their services. Buy from a single source. It simplifies accounting and storekeeping. It insures original equipment quality.



GENERAL  ELECTRIC

330-165

# ELECTRIC RAILWAY JOURNAL

New York,  
May, 1931

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

Volume 75  
Number 5

JOHN A. MILLER, JR., Editor

## Not Every New Idea Is a Panacea

IT IS only human nature to seek panaceas. Especially in an industry which has encountered as many difficulties as has local transportation, and one which has experienced a plunge from the serene security of monopoly into the scramble of competition, it is perhaps natural to hope for a panacea in every new idea that gives promise of solving certain baffling problems.

When the length of haul on street railways was increasing rapidly, and labor costs began to mount, there was a trend toward increased size and weight of cars. In an endeavor to carry more people in a single unit, train operation was adopted. Many managers then felt that this offered an almost universal solution of the problem of longer hauls and higher wages with fixed fares. But increasing the size of unit proved not to be a panacea. Increased weight raised power and track costs. Schedule speeds and headways suffered. Distinct limitations in large units became apparent.

Ultimately, there was a swing to the other extreme. Hordes of jitneys began to impair railway revenue. Their chief attractions seemed to be fast and frequent service. To meet this condition the small, one-man single-truck safety car was developed. For the purpose for which it was designed it proved successful. But in a short time, an excellent idea was again carried too far. Short headways, lightweight cars and one-man operation seemed to offer a combination that could be universally applied, and managements were importuned to replace all other types of equipment with the new unit. Although this new vehicle served an extremely useful purpose, and probably saved many properties from bankruptcy, its limitations soon began to be recognized.

Next the jitney grew into a bus, and began to improve in performance and reliability under the initiative and technical skill of its sponsors. Again it was natural that enthusiasts hailed the new vehicle as a universal solution for urban transportation problems. At one time, double-deck buses were advocated for widespread replacement of street cars in large cities. Subsequently, the 40-passenger single-deck bus was developed, and the replacement of all rail service was again freely predicted. But experience is proving that the bus, though widely useful, has distinct limitations.

Most recent among transportation vehicle innovations is the trolley bus. Though virtually abandoned a decade ago because of technical imperfections, it has subsequently been improved to a point that promises to make it an important new agency of transportation. Combining some of the best features of the trolley and the bus, it offers a number of definite advantages in the way of performance and economy. If wisely applied to the solution of specific problems within its range of usefulness, it will serve as a valuable new tool. But if it is looked upon as the long-sought panacea for making all transportation operation profitable, it will prove a costly disappointment.



## Transit Turmoil in Philadelphia

NAMING of receivers for the Philadelphia Rapid Transit Company has again focused nationwide attention on the transportation situation in that city. This latest development comes as a result of the equity action brought by the city for an accounting and for the ousting of Mitten Management. The opinion by Judge McDevitt holds that virtually all of the charges of waste and extravagance made against Mitten Management and the P.R.T. have been proved, and not only directs the separation of Mitten Management from further relations with P.R.T. and its subsidiaries, but urges action by the receivers looking toward recovery of \$8,000,000 alleged to have been misspent. No question of the company's solvency has been raised. In fact, the court specifically stated that the company is solvent, but the proceedings already have had a depressing effect upon the holdings of thousands of small investors and employees.

The present debacle is a far cry from 1910 when Mr. Mitten took over the management of the broken-down street railway system in Philadelphia. No one can deny that in the interim Mitten Management has raised the quality of transportation service to a high level. For its work in building up the property physically, for its accomplishment in maintaining satisfactory relations at all times with its men, for its many campaigns in the interest of safety and for the heed it has given to progressive ideas for service improvement, the management deserves the greatest credit.

Its endeavors to promote co-ordination of facilities have been in line with the most modern thinking. Entry into the field of taxicab operation was a step in this direction. In so far as the law may have blocked the efforts of the company to bring about effective co-ordination, the fault lies with the state. In so far as that end may have been sought by devious devices, however, the fault lies with the management.

Judge McDevitt's decision makes spicy reading, but on that very account seems rather inopportune, particularly in the light of the aroused state of public feeling on this subject. Reference by the court to "marionettes" and to "rubber-stamp officials" meets the demand for colorful writing but style in judicial opinions should be secondary to the substance.

From the findings of the court it appears that the Mitten objectives were well conceived but some of them were not so well achieved, and that difficulties arose when ideals degenerated into deals. So far, the court's remarks have been met in rejoinder only with the statement that nothing in the adjudication, even if sustained, would diminish the assets of P.R.T. To conclude that this is the best that the management can do in defense of its acts is to prejudice the case. It is evident, however, that there is much to be explained and if it is not explained satisfactorily the entire industry will suffer from the repercussions.

### The Street Car an Aid to Traffic Movement

**B**EAUTIFUL in its simplicity is the idea that the elimination of street cars will speed up the movement of traffic. If all the people who now ride the street cars would be content to remain quietly at home perhaps this happy result might be accomplished. But if they should stubbornly insist on going to work, going shopping, and going out to places of amusement, what means of transportation would they use? Obviously the proponents of this method of relieving traffic congestion expect them to use private automobiles. It is equally obvious, however, that the advocates of street car elimination have not considered how this would affect the traffic situation.

For example, let us consider conditions on a street with a movement of 5,000 persons per hour in one direction. Studies made in numerous cities show that approximately 3,500 of these people will be carried by street cars and 1,500 in private automobiles. To do this will require 70 street cars and 900 automobiles under ordinary conditions of loading. To carry the same total number of people by private automobiles alone would require 3,000 vehicles, or more than three times as many as are now using the street. This increase in the number of vehicles is vastly greater than could possibly be accommodated in the extra traffic lane gained by the

elimination of street cars, so that congestion on the remaining roadway space would be very materially worse than it is at present.

That is the fatal defect in the theory. It is the obstacle which stands solidly in the way of increasing the speed of traffic movement by the elimination of street cars. It is the reason why traffic engineers have all come to the conclusion that the street car is indispensable. If the man who rides in his private automobile only knew it, the street car about which he growls and grumbles is really his best friend, for without it, congestion would be intolerable.

### Maintenance Men as Business Builders

**N**EW cars, new track and faster schedules are always desirable, but what we need now is more customers, and this thought should take first place in our minds today." With this challenge the president of an equipment men's association recently closed a stirring address in which he urged all maintenance men to take an active part in building up business. There is no doubt that maintenance men are keenly interested in solving the difficulties now facing the railways and that they are in a position to contribute much valuable aid. With the constant pressure to reduce maintenance costs to a minimum, it would not be surprising if the efforts of this department were directed entirely to cutting expenses. It is particularly encouraging, however, to find maintenance men contributing also to the problem of securing more riders.

Of course, the primary way in which maintenance men can aid in selling transportation is by doing the best possible job in keeping the physical plant in order. By bearing in mind that smooth track means a pleasant trip and well-maintained vehicles mean dependable service, those in charge of maintenance work can do much toward popularizing public transportation and holding customers.

But they can do more than that. For one thing, the maintenance men can exert a potent influence by talking to their friends on every possible occasion about the advantages of using electric railway service. They may be able to help also by suggesting ideas to the publicity department. Perhaps a human interest story could be developed, telling how the men in the track, overhead and equipment departments keep the "wheels moving" and showing the amount of money expended for materials, particularly in local markets. It is not improbable that many of the shop, track and line men also have thought out ways and means of increasing business. Individual consultation or conferences of various departments at frequent intervals no doubt would prove very productive of worth-while ideas.

Every individual in the maintenance department must be shown that he is an actual partner in the business of rendering transportation, that he has a definite responsibility to the public and that the security of his own job



depends on the success of the company. He must be shown that his duties are not discharged when he has completed his specialized task, but that he has another duty in selling rides.



## Where Transportation Planning Fails

PROGRESS in solving urban transportation problems has been extremely slow compared with that which has been made in solving many other problems connected with modern city life. Providing water supply, sewage disposal, fire protection, and the like, have presented difficult problems as cities have increased in size. But the modern engineer has achieved notable success in solving them. On the other hand, the success that has been achieved in meeting the transportation needs of the inhabitants of modern cities has been distinctly limited. Generally speaking, it is more difficult today to move from place to place in any large city than it was a generation ago.

In recent years the types of transportation within urban communities have multiplied rapidly. Walking was the original means of urban transportation, and the horse-drawn vehicle is of almost equal antiquity. Street cars are about 100 years old, although the motive power has undergone numerous changes during this period. Comparative newcomers in the field of urban traffic are the private automobile, the motor bus and the motor truck. It is their advent, of course, that has created the complicated problem which we have been struggling to solve.

Numerous plans have been suggested as means to improve existing conditions. Many of these plans have been extremely ingenious. Considered only from the standpoint of the particular conditions which they were intended to remedy, they have had much to recommend them. When put into practice, however, most of them have proved disappointing. Certain defects may have been remedied only to create others equally bad. For example, it has been the experience in numerous places where sidewalks have been narrowed to provide more room for vehicular traffic, that the pedestrian traffic has overflowed the small space remaining for it, and its presence in the roadway has become a greater obstacle to the expeditious movement of vehicles than was the previous sidewalk.

Lack of recognition of the inter-relationship of all kinds of urban transportation facilities is the primary cause of the failure of many well-meant plans. Independent planning of individual facilities is bound to be unsatisfactory. This is clearly brought out in an article on "Co-ordinated Planning" by Frederic A. Delano, appearing elsewhere in this issue. In the past it has been customary to consider one problem at a time. By that method we have got nowhere. Only when the transportation problem is considered as a whole will real progress be made.

## An Ounce of Willingness

DESCRIBING the qualifications of a lawyer he wished to employ, a certain prominent American business man is reported to have said: "I don't want somebody to tell me what I cannot do. I want somebody to tell me how I can attain the objective I have in mind." In that statement lies an important suggestion for the transportation man. He is the recipient of numerous requests to do this, that or the other thing in regard to the service under his direction. Many of these requests are impractical. But if he simply tells the proponents of the idea that he cannot do what they want, he will almost certainly fail to satisfy them even though he explains his reasons fully. On the other hand, he cannot allow himself to be led into unsound practices simply to please the public. What he can do, however, is to confer with them with an open mind to see if some way cannot be found to accomplish in a modified form the essential purpose of the suggestion. Under such circumstances an ounce of willingness is worth a pound of explanations.



## Responsibility for Service to Airports

TRANSPORTATION service to and from flying fields is far from being adequate and satisfactory, according to recent comment in *Aviation*. That paper points out that many flying fields established in the open country enjoy no organized transportation service at all. It sees an opportunity for bus lines using small units operated on more or less flexible schedules.

Passenger traffic to and from airports is extremely variable. Regular scheduled bus or car service on a route passing close to the flying field might be adequate to take care of casual traffic, but it requires no great stretch of the imagination to understand that regular schedules would hardly meet the needs arising from the arrival and departure of large transport planes at uncertain hours.

A recent case before the California Commission, reviewed elsewhere in this issue, goes to substantiate this idea. There the commission frankly said that airplane passengers demand a special type of transportation service to and from fields, and awarded the right to perform such service to an independent bus operator, although Motor Transit and Pacific Electric Railway both said that their regular scheduled services were adequate. The commission, however, protected the existing carriers by specifying that the operator who was successful in establishing his claim would not be permitted to give intermediate service.

Whether or not special bus service to airports would be profitable depends of course on their location, the volume of traffic and various other factors. *Aviation* suggests that the airports might subsidize the service. Perhaps that would be the best solution of the problem. Certainly the established local transportation company cannot be expected to furnish airport service at a loss.

# Co-ordinated Planning of Transportation Facilities

## *Vital to Civic Progress*

By

FREDERIC A. DELANO

Chairman Regional Plan of New York and Environs  
Chairman National Capital Park and Planning Commission

TRAFFIC and transit problems have become an integral part of city and regional planning. The whole problem of housing and zoning, the growth of the city and its future development, are necessarily wrapped up in it. No city can grow without adequate transportation facilities. The increasing concentration of population in our urban centers has complicated the problem. It has been further complicated in recent years by the multiplication of the kinds of transportation service available. Whereas horse-drawn vehicles once adequately met all the transportation needs of our urban population, today the horse has almost disappeared and we have a medley of electric surface cars, rapid transit lines, automobiles, motor buses, taxicabs and motor trucks. To make adequate provision for any one of these types of transportation is a real problem. To provide for them all, each in its proper relation to the others, is a vastly more intricate problem. But this is the task which we must undertake if we are to have orderly civic development. Independent planning for different kinds of transportation is not enough. We must have co-ordinated planning.

Many of the difficulties in dealing with current problems are due to the prevailing unwillingness to look beyond them to what lies ahead. The idea is fallacious that the problems of today can be solved without study of trends of growth, and planning for the future. The policy that should be pursued in the interest of posterity is the one that will be of most help to the present generation.

Generally speaking, city planning may be inspired by one of three policies. The two that are easiest to follow are: first, that practical policy which does not extend beyond the concrete and the present, and second, that idealistic policy which is based solely on the abstract and the future. Under the former policy, proposals are made to flow with the current created by established habits and vested interests; and under the second they are confined to what ought to be, without regard to the

Development of new types of service does not mean that we can get along without the older types. Each has a place, and a definite relationship to the others. Independent planning of individual facilities is unsatisfactory. The transportation problem must be considered as a whole

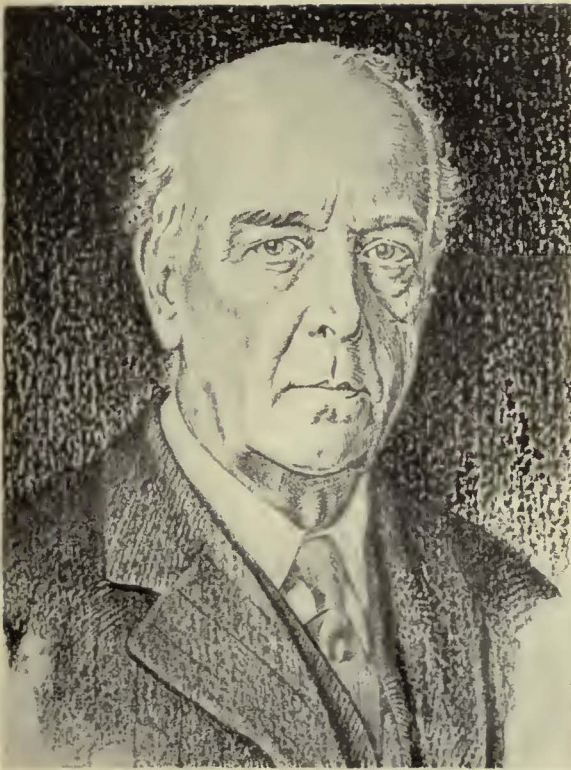
limits imposed by unalterable conditions. The one policy lacks soul, and the other flesh and blood, and those who follow them find planning a simple exercise.

The third policy seeks an ideal based on realities—an ideal shaped by the processes of reason and not by the play of fancy. This involves greater labor but seems to present the only possibility for improving conditions of life and society.

Such observations as these apply particularly to the problem of providing adequate transportation facilities. In planning for the future we must have regard to circumstances as they now are, but we must also be alert to seize the openings toward better things that appear on the horizon of the future. An ideal, to be a worthy one, must be capable of being expressed in action; and it must be action based on a study of future trends and possibilities as well as past events.

The electric railway industry was founded about 50 years ago, and has had a tremendous development. It is not so long ago, say 20 to 25 years, when this young giant was coming into full manhood and extending his field broadly. The cities had by then been covered with a network of lines. Promoters were finding it possible to extend out all over the countryside and their inter-urban lines were giving the steam railroads a hard rub. They chose in many instances to parallel existing steam railroads and by means of better and more convenient service, to take away a large share of the established business of the trunk lines. Yet admittedly they built up new business, too, and opened up new territory.

Today the situation is greatly changed. The advent of the automotive age has brought along with it the



### *Frederic A. Delano*

**A**S CHAIRMAN of the Committee of the Regional Plan of New York and its Environs, Frederic A. Delano has participated actively in the most far-reaching civic planning project of modern times. In this work the provision of adequate transportation facilities has been one of the major problems. As a member of the Parks and Planning Commission of Washington, D. C., Mr. Delano has had first hand experience with similar problems in different surroundings. To the consideration of these problems he brings a wealth of transportation experience. Beginning as an apprentice machinist in the shops of the Chicago, Burlington & Quincy Railroad, he occupied positions of steadily increasing importance until he became president of the Wabash Railroad. He also served for six months as a member of the Federal Reserve Board and was a Colonel in the Transportation Corps of the Army in France. With this broad background of experience, he brings out many pertinent facts concerning the place of transportation in city planning.

enormous good roads development, for which the expenditures in 25 years have exceeded the entire investment in steam and electric railroads since their inception. Paving projects have transferred city streets from mudholes into boulevards, so that today unpaved streets are a rarity. These changes have, in a measure, turned the tables on the successful venture of a quarter-century back in the electric railways.

But progress always is ruthless. Success for the moment does not carry with it any guarantee that it will continue over an extended period. All business is hazardous. This is a fact that is not always comprehended by those who make our laws. In the clipper ship era a merchant might make 100 per cent profit on a single voyage—or he might lose his ship and its entire cargo. Today we have made progress in diminishing such haz-

ards, but no safeguards can afford protection against changing conditions. The clipper is now a thing of the past, although ships still sail the seas.

Notwithstanding this, I do not believe for a minute that the day of the electric road, urban or interurban, is over. Undoubtedly there is a definite place for it, as well as for free-wheel transportation, such as the automobile, the taxicab and the motor bus. The electric railway superseded its horse-drawn predecessor by virtue of its greater speed and comfort. But the electric car, although far in advance of the times when it was first introduced, has been allowed to lag behind as compared with the notable progress of automobile transportation. This has not been because the electric car is incapable of improvement or better adaptation to the needs of the present, but because its operators have not paid sufficiently close attention to the changing public demand.

Obviously the motor bus has offered difficult competition—that of a commodious vehicle traveling on a free highway with no obligations of construction or maintenance costs. The new vehicle, designed after the experience of years of street car progress, with its comfortable seats and comparative freedom from noise, was a pleasant contrast to the rather antiquated type of street or interurban car in widespread use. Accordingly it gained immediate recognition from the traveling public. Then, too, as the highways were straightened and widened and otherwise improved, the speed of the bus was increased while that of the street car or the interurban car remained unchanged. Today the bus frequently can and does make better speeds than the car.

Despite all these facts, it is becoming increasingly evident to thoughtful citizens that the electric railway has not outlived its usefulness, but that each instrument of transport has its proper place and its inherent limitations. The electric street car and the interurban still afford the best vehicle of mass transportation within limited distances, say 25 miles. The motor bus is the best for moderate traffic density, and as an adjunct or feeder to the rail lines, electric or steam.

But the electric lines must in their turn tear a leaf from the experience of the motor bus and seek to improve their own method of transport by making it decidedly more comfortable and less noisy, as well as speedier, and at the same time safer, than the free-wheel vehicle. To accomplish these purposes, electric railway men must give thought to a complete redesign of their vehicle and its driving mechanism, making it (a) lighter; (b) less high and clumsy; (c) less noisy; (d) capable of accelerating faster and operating at higher speeds.

It is recognized that high-speed mass transportation cannot be maintained with safety except on private rights-of-way, or as is done in a number of cities, on a section of the main thoroughfare set aside for this purpose. Examples of this latter method may be seen in the center parkways in Boston, Washington, New Orleans, and a number of other cities. Such segregation of traffic is justified only when it truly serves the public interest, and gives the greatest good to the greatest number. As it can be readily shown that one street car carries the number of passengers represented by two buses, or 25 private cars and taxicabs, the justification should be easy enough where, but only where, the density of traffic served warrants the existence of surface street car lines.

Furthermore, the safety of citizens requires that more attention be given to allocating the streets to certain def-

inite uses, for it is not desirable or necessary that every street should be a main thoroughfare. From this it follows that the main thoroughfares should be so laid out that they can carry a maximum volume of business, and they must be protected so that they can carry this maximum volume with safety. This may mean the reduction of crossing traffic wherever possible, the avoidance of left-hand turns, the denial of the right of "parking" on these main thoroughfares. By thus limiting the uses of the street, it should be possible through the adoption of regulations or with the assistance of signals, to contribute to the safe and yet speedy passage of vehicles on these main thoroughfares. Where it seems desirable to reserve these highways for free-wheel vehicles, the

electric railway lines can be placed in a parkway, provided the cross traffic is not too great. Where it is, they can be placed underground, or in an open cut with stations sufficiently close to make travel convenient.

If the managements of electric railways will pay heed to the changing demands of the public and adopt the necessary improvements to modernize their service they can continue to hold an important place in the community transportation system. It will never again be an exclusive place such as it was years ago. The other facilities which have been developed are immensely valuable in their own way. The heart of the problem in planning for the future is to correlate the services of all facilities so that each is of maximum usefulness.

## Double Mirror Arrangement Promotes Safety on One-Man Cars



By J. H. MIDDLEKAMP  
*Assistant Engineer*  
*Brooklyn & Queens Transit Corporation*

This arrangement of mirrors gives the operator an unobstructed view of the center exit. The center mirror, marked *C*, is used for operation in the opposite direction, and shows the image, which is transmitted to the front mirror.

**B**ECAUSE safety is a factor of extreme importance in transportation service, many special devices have been introduced on one-man cars for the protection of the passenger resulting in making these cars safer than most two-men cars. The Brooklyn & Queens Transit Corporation is now installing a combination of mirrors on its one-man cars to provide the operator with a clear, unobstructed view of the center exit doorway and the street area for a distance of about 4 ft. outside. The arrangement is very simple, but it required a long period of experiment and study before the optical problems were solved.

As shown in an accompanying illustration, the arrangement consists of a large mirror over the center exit and a smaller one above and in front of the operator. Since the cars are designed for double-end operation two sets of mirrors are installed in each car.

The mirror adjacent to the center door, marked *B*, is limited in size by the available headroom and other clearances. It was found that a mirror of 12-in. diameter

was the largest practicable at this location. To reduce the reflection of the area in the vicinity of the door to an image of this size a high-grade, spherically convex mirror was required. This type produces distortion which is symmetrical and therefore not confusing to the eye.

At the front of the car a 6-in. plane mirror, marked *A*, was located to reflect the image transmitted from the doorway mirror to the operator. The path of vision between these mirrors is designed to pass over the heads of all passengers regardless of how many are standing between the operator and the exit. The center mirrors are attached rigidly to the car roof, while the front mirrors may be adjusted for each individual operator.

Two 36-watt lamps were removed from the inside of the car adjacent to each door and installed in the bottom of the door engine box directly over each exit. They provide sufficient light for the mirrors to be effective at night. As a safety precaution, it is intended to install this combination of mirrors also on cars equipped with automatic mechanism controlling the center exit doors.

# Receiving Clerk's Office Made Theftproof



Operators of Oklahoma Railway deliver their receipts to the clerk through a narrow slanting steel slit



The mirror permits personal contact with the operator and the screen prevents the receiver from putting his head in line with the opening

COMPLETE protection against hold-up or robbery is placed around the receiving clerk of the Oklahoma Railway as a result of the construction of a new vault in which his office is located. The vault is walled by a combination of concrete and steel 8 in. thick, and is equipped with manual as well as automatic alarms which sound in the police headquarters that are located less than a mile away.

The window into which the street car and bus operators turn their money is a narrow steel slit extending into the vault at an angle so that a gun cannot be pointed at the receiver. This slanting window looks into a mirror in which the receiving clerk and the visitor may see each other. A screen thrown across the corner of the vault prevents the receiving clerk from putting his head directly in front of the opening. Protection against attempt at entry by blasting a hole through the walls of the vault and then cracking the safe inside is also provided. Tampering with the walls will set off the alarms.

Entrance into the vault is made through a double

steel door consisting of two sheets of  $\frac{3}{4}$ -in. steel plate. One door opens inside and the other outside. Both have heavy Yale locks. After these doors are closed at night and the clerk is placed inside, it is impossible to open them without sounding an alarm automatically to the dispatcher's office of the railway company and to the city police station.

The receiving clerk enters the vault at 6 o'clock at night, taking with him two other company employees, who, with him, search the vault and certify that no one is inside except the clerk. He then remains until the following morning when the operators of an armored truck take his receipts for the night to a city bank.

Telephones are installed in the vault, also comfortable beds and a convenient wash room. Two electric fans, guarded by heavy steel slats, provide constant ventilation. One large window to the vault is made of heavy steel slats, the outer tier slanting upward and the inner tier slanting downward, through which air may enter almost unobstructed, but which prevent entry of almost anything else.

# Modern Improvements in

# CAR TRUCK DESIGN

**R**ECENT departures from the conservative standard car truck for city service are numerous and permit greater riding comfort, more economical operation and increased speed as compared with what was possible in the cars of only a few years ago. While there have been a few spectacular experiments, much of this development has not attracted wide attention, although it has been a great factor in improving the performance of the cars being built today. Most of the experimentation has been in connection with designs for double-truck city cars, but single trucks have likewise undergone a searching investigation. In this article, a review is given of the most outstanding double-truck developments.

Principal aims of truck designers have been to get a reduction of weight, particularly the unsprung portion carried directly by the wheels, without sacrificing motor power but with an improvement of riding qualities. In practically every instance, two means have been adopted to attain this result:

1. Substitution of a flexible motor suspension for the nose suspension commonly used.

2. Great increase in the armature speed of the driving motors.

Along with these major changes has come a material reduction in the weight of the car body for a given carrying capacity. This change has made possible the use of a lighter truck with motors of smaller rating for the same speed and acceleration, and to a considerable extent has simplified the problem of truck design. It also has permitted a reduction in wheel diameter and over-all

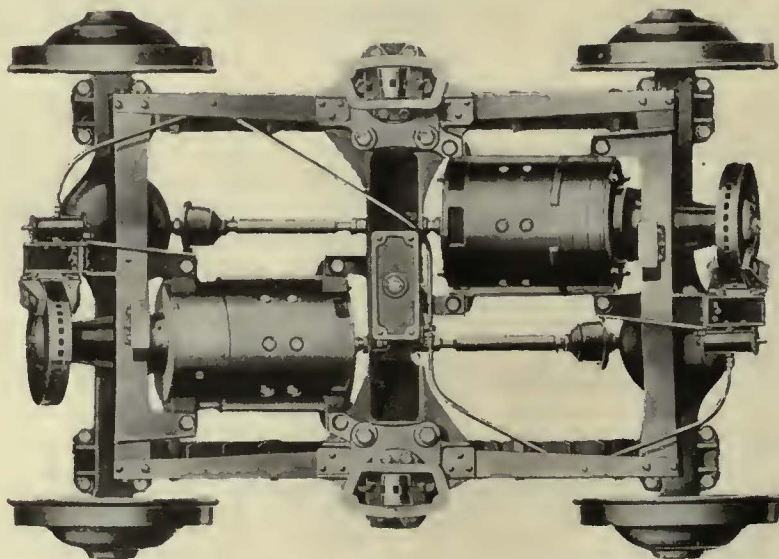
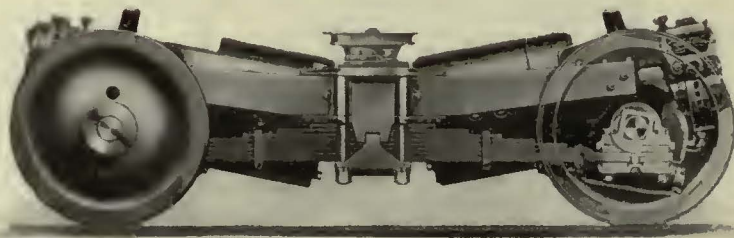
Various high-speed drives making use of flexibly suspended motors have reduced weight, especially the unsprung portion. New types of braking mechanism are being tried

height of the truck. Use of high-grade steels and special materials, which have had such a marked effect in reducing the weight of the car body, has likewise made it possible to retain the needed strength in the members of the truck with a material reduction in weight.

Motor suspensions and methods of drive must of necessity be considered together. In general, the latest practice is to mount the motors in some form of yoke or

cradle carried by the truck frame and free from the axle, the connection to the latter being made through a flexible coupling. A gear case is employed which can rotate around the axle through a short arc without throwing the motor pinion out of alignment.

Spring suspensions have been simplified and improved so that the car body is carried with greater flexibility and with transmission to it of less of the road shocks from uneven track. Most of the current truck designs retain the pedestal mounting of the journal bearings, with helical springs for support of the truck side frames. These, in turn, carry the bolster through springs, which are either of the semi-elliptic type, as in

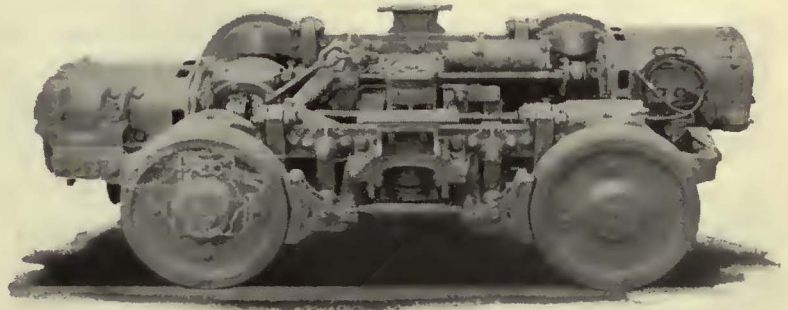
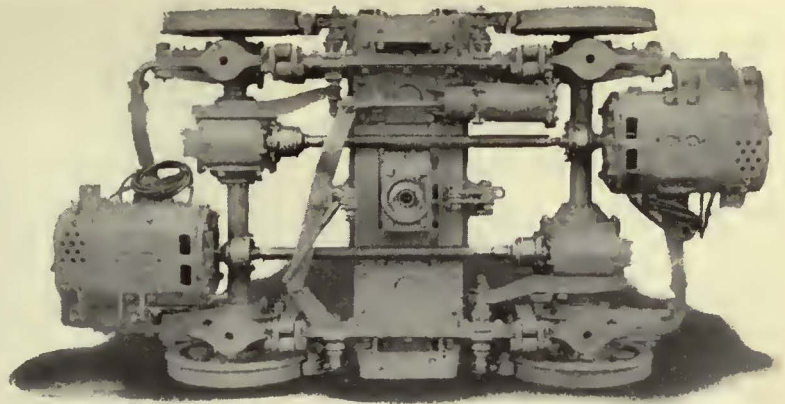


Timken's Latest Worm-Drive Truck, the 52-B, Has Continuous Axles

The worm-drive unit is underslung, with its shaft supported on roller and ball bearings. Self-ventilated disk brakes carried on extensions of the armature shafts are actuated by air.

# Give Superior Performance

By  
**MORRIS BUCK**  
Engineering Editor  
*Electric Railway Journal*



## Worm Drive Is the Feature of the Brill 85-E Truck

Motors are mounted on brackets extending out from the side frames, with long drive shafts crossing to the opposite axles. Wheel brakes are actuated by air cylinders mounted on the truck.

the Cincinnati truck, or a combination of semi-elliptic and helical, as in the recent Brill designs. The Timken truck, however, carries the axles at the extremities of two semi-elliptic springs, one on either side, the bolster being attached to the centers of these springs. Minor vibrations are smoothed out by the use of rubber shackle mountings for the leaf springs where they are attached to the axles.

### GEAR RATIOS AND ARMATURE SPEEDS

Conventional spur gearing is limited to a rather narrow range of speed ratios. With the large power that has to be transmitted and the strength of teeth required, most of the street car speed reductions making use of a single pair of spur gears have ranged between the limits of 2 to 1 and 4 to 1. Employing them in connection with the standard 33-in. wheels that were in use for many years, the armature speeds were of necessity low and the motor weights per unit of output correspondingly high. In order to remove this speed limitation a number of changes have been made in the more recent types of drive. First of all, the adoption of smaller wheel diameters, used at the outset to reduce step heights, has permitted a corresponding increase in armature speeds. For a number of years wheels of 26 to 28 in. diameter have been used with ordinary spur gear drive. The latest trucks usually have 26-in. wheels, although some of the trucks with W-N drive have wheels with a diameter as small as 22 in.

This reduction in size of wheels has not been sufficient to satisfy all the demands of the modern designer, so in addition other more radical methods have been resorted to. These involve a change in the method of drive so as to permit of a still larger speed reduction. In some instances recent trucks have had reductions of speed through the gearing as great as 10 to 1.

Practically all the motors used with the newer drives are of the self-ventilated high-speed type developed by the electrical manufacturers for use with automotive units, either gas-electric buses or trolley buses. Arma-

ture speeds have been increased until now it is not uncommon to find motors with 1,800 r.p.m. at the one-hour rating, as compared to speeds of 600 to 800 r.p.m. in motors of the old standard type for use with single-reduction gears on 33-in. wheels. Some of these new motors are built with cast-steel frames, while others are distinguished by the use of rolled-steel frames. Due to the effective ventilation and the efficiency the output per unit of weight is high. What is of even greater importance, the continuous motor rating has been increased in a larger proportion than the one-hour rating, so that a given motor is able to handle a heavier duty cycle in relation to its size. It has been possible to reduce the weight almost in proportion to the increase in armature speed. Not only is the total motor weight to be carried much less, but the problem of designing a flexible suspension for the motor is considerably simplified. This gain in the motor is, of course, available for any type of drive which permits of the necessary armature speed.

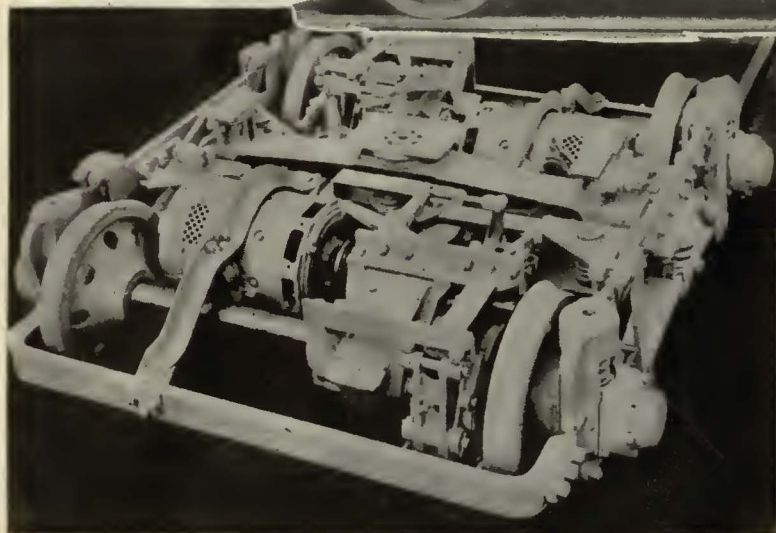
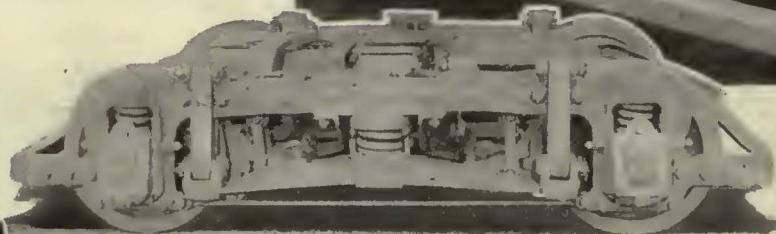
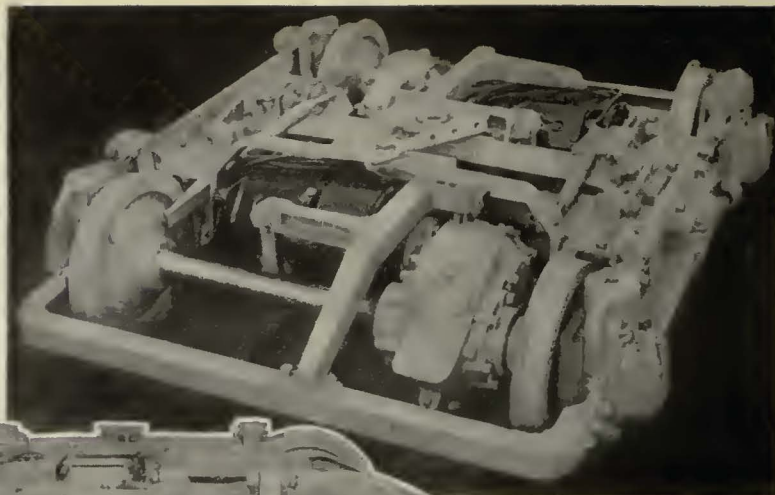
### NEW METHODS OF DRIVE

Three methods of drive have been developed and used with success on recent trucks. These make use respectively of the worm gear, the double-reduction spur gear and the single-reduction spur gear. Bevel gears have not been tried to any extent in this country, although they have been used with success on a large number of cars in Paris for several years, and they have also been adopted in other European cities.

Several designs of car drives have contemplated the use of gear sets in which more than one axle is driven from a single motor, but so far as is known none of these is in practical use in this country. Complications that arise when two axles oscillating with different moments and at different times are coupled to a single

driving shaft have proved great and the plan has not been found satisfactory.

Single and double-reduction spur gears necessitate a mounting of the motors with their shafts parallel to the axles, while worm or bevel drive calls for a motor mounting with the shaft perpendicular to the axles. Since the space available for motor mounting is approximately cubical, there is comparatively little difference in the size of motor that can be adapted for use with one or the other method. Worm drive, however, does permit mounting the motor at a greater distance from the driven axle, since the shaft may cross the



Two Different Motor Suspensions Are Shown for the Brill 177-E1 Truck

Both of these types use the W-N double-reduction drive, the principal difference being in the use of plain bearings and wheel brakes in one and of roller bearings and drum brakes in the other.

center line of the truck, or may even pass over the opposite axle if necessary.

#### DEVELOPMENTS WITH WORM DRIVE

Worm drive was introduced in this country about five years ago in an experimental unit designed by W. L. Harwood, of the Springfield Street Railway, and in another by J. R. Blackhall, of the Chicago & Joliet Electric Railway. The design has been carried on and developed by the Timken-Detroit Axle Company, which has brought out a number of changes from the original truck. All the worm-drive units that have been constructed by this company make use of an axle assembly somewhat similar to that of an automobile. Both solid and differential axles have been used. The chief reason for the use of a differential was ease in negotiating curves. However, the wear on the tires due to slippage is not nearly so important with steel wheels as with rubber, and the recent Timken trucks all have been built with solid axles.

A worm-drive truck of quite different design is the Brill 85-E. In it the motors are carried on the truck frame so that they are entirely outside the axles, the drive shaft extending across one axle to the opposite one. This arrangement removes the space limitations for the motor and results in a long drive shaft in which the vibrations of the wheels produce relatively little angularity, making the drive quite flexible. The worm is carried on top of the axle instead of below, as in the Timken design, and is covered with a small case anchored to the truck frame by means of a yoke which holds it in approximate alignment and removes strain from the drive shaft.

#### ADVANTAGES OF DOUBLE-REDUCTION GEARING

Double-reduction spur gearing was tried in the early days of the electric railway, but soon was given up entirely in favor of single-reduction gearing. At that time electrical design had not advanced sufficiently to make practicable a high-speed motor, and the spur gears themselves were crudely cut and inefficient. Since then there have been many radical improvements such as better electrical and magnetic design, new forms of gear teeth, use of helical gearing, and improved methods of manufacture that make for greater precision and increased life of parts.

Employment once more of the double-reduction gears was visualized by engineers of the Westinghouse Electric & Manufacturing Company to be a means of increasing the motor speed and at the same time of permitting a flexible motor support. As a result, the W-N drive was brought out by that company as a complete unit for installation in place of the single-reduction gear on any modern truck. The unit consists of a gear mounted on the car axle and driven by a pinion on a short shaft held in alignment by the gear case. The short shaft also carries a gear which meshes with a second pinion on another short shaft to give the double reduction. The latter shaft is arranged to carry a coupling of flexible type to which the motor shaft is attached. The



entire gear unit is held to the car axle so that it can rotate to a slight extent, thus giving flexibility. The motor can be carried on the truck frame, being supported entirely by the springs.

#### NEW TYPES OF SINGLE REDUCTION GEAR

One of the successful single-reduction gear drives making use of high-speed motors is that developed by the Tool Steel Gear & Pinion Company, and being tried out by the Philadelphia Rapid Transit Company. This has a reduction of 7.2 to 1, permitting a motor speed of double that ordinarily possible with single-reduction gearing, and approximating the speed reached in the worm and double-reduction types of drive. The motors are carried in yokes held to the truck frame and drive through a flexible coupling to a short shaft carrying the pinion, and which is held in alignment by means of the gear case.

An altogether different design of single-reduction drive has been developed by the Lehigh Valley Transit Company in an experimental equipment. This makes use of an individual motor on each wheel by carrying both gear and car wheel on a sleeve rotating on a stationary axle. The two sleeves on the one axle are kept spaced by a collar. Since each motor has to transmit only half the ordinary amount of power, as it drives one wheel only, the gearing design was simplified considerably.

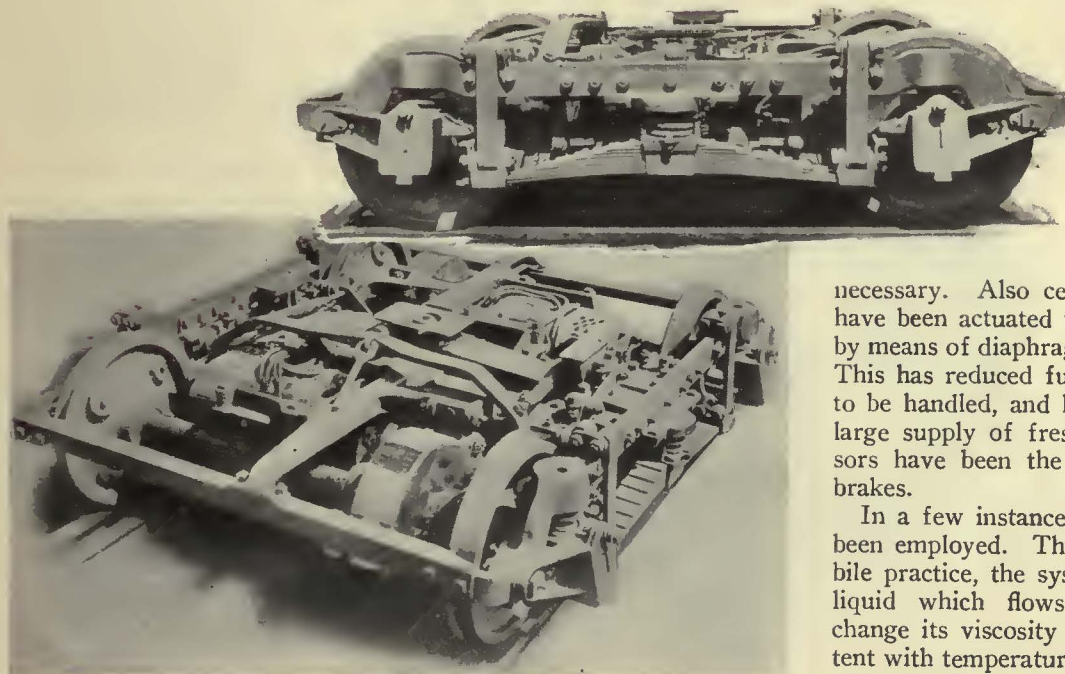
#### RADICAL CHANGES IN BRAKE RIGGING

Brakes have undergone several radical changes in the new types of trucks. At first there was a trend toward abandonment of the iron or composition brake shoes pressing on the tread and flange of the car wheel, although in some of the latest designs it is being used again. The arguments against the use of the wheel brake are that it is open to dirt and water, making the

braking effort variable. It also causes rapid wear of the wheel treads and may change their contour considerably. Acting at a slow speed, greater surfaces and pressures are required than with an armature shaft brake. On the other hand, the wheel brake eliminates separate drums or disks and permits some simplification of the brake rigging. Dissipation of the heat from the car wheels is less of a problem than from small drums or disks, usually largely covered by other mechanism.

In place of the wheel brake, numerous types of band and disk brakes have been tried. The first band brakes were similar to those in use on automobiles five or more years ago, consisting of bands of sheet steel lined with fabric strips, and pressing on the outside of a cast-iron drum attached to the car axle. While these brakes were found efficient the amount of space taken was considered greater than could conveniently be devoted to the purpose, and they were subject to fluctuations in effectiveness due to dirt and wheel wash. Later types have used the internal expanding construction, which also was developed in automobile practice. In this brake two or more molded shoes are pressed outward against the inside of a drum by means of a cam rigging. This type of brake uses about the same axial space, but it has the advantage that it can be placed adjacent to, or even inside, the wheel. Disk brakes, where pressure from shoes is exerted on one or both sides of a disk attached to the axle or the motor shaft, have also been used in some recent designs.

Air has been retained as the force for actuating the brake system in most of the recent truck types. With the small amount of shoe travel required, due to better machining standards and a reduction of clearances, the volume of air needed to effect a full application of the brakes has been so greatly reduced that large-capacity compressors of the ordinary type have been found un-



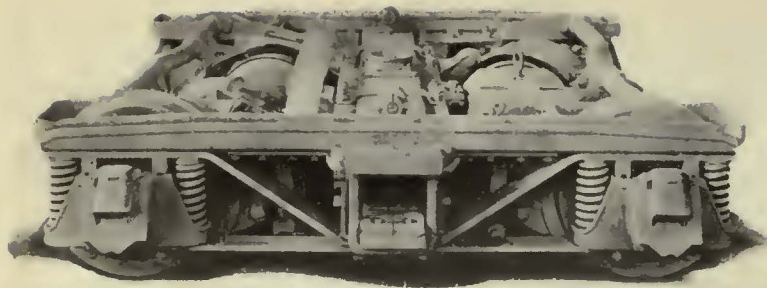
The 84-E Truck Is Adapted for High-Speed Single-Reduction Gearing

This truck is similar to the 177-E1 and the same type of motor suspension. The gear unit, made by the Tool Steel Gear & Pinion Company, is connected to the motor through a flexible coupling. Both air and magnetic brakes are used.

necessary. Also certain of the air brakes have been actuated through a closed system by means of diaphragms instead of cylinders. This has reduced further the volume of air to be handled, and has made unnecessary a large supply of fresh air. Small compressors have been the rule with these recent brakes.

In a few instances hydraulic brakes have been employed. These also follow automobile practice, the system being filled with a liquid which flows freely but does not change its viscosity to any considerable extent with temperature. The volume of liquid to be handled is small, and little difficulty has been experienced. They have not been used to any extent as service brakes, but mainly for final stopping.

Dynamic and electro-magnetic brakes, both of which are actuated by electric cur-



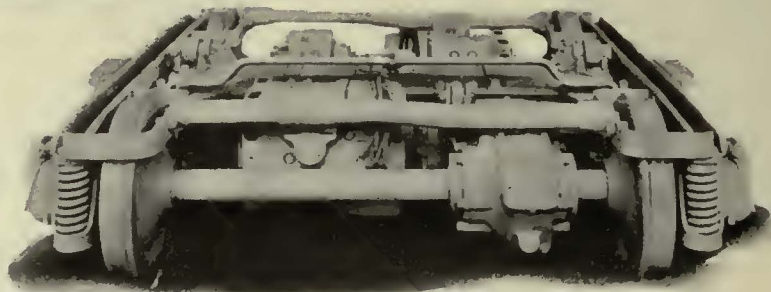
**This Cincinnati Truck Incorporates W-N Drive with a Novel Motor Mounting**

Arch bar construction with pressed-steel reinforced side frames, wheel brakes and wing pedestals with flexible spring support are features.

rent, have found considerable adoption. In the dynamic type the motors are short-circuited through a resistance. Usually the fields are connected to the line so that the armatures rotate in a strong magnetic flux, the resistance in the armature circuit reducing the current flowing. By this means very powerful braking effort can be obtained. No special equipment on the track is needed. Electro-magnetic brakes have been attached to the trucks so as to pull against the rails, the shoes either touching the rails directly and giving a frictional drag, or merely increasing the attraction between the car and the rail, allowing greater pressure on the wheel or drum brakes.

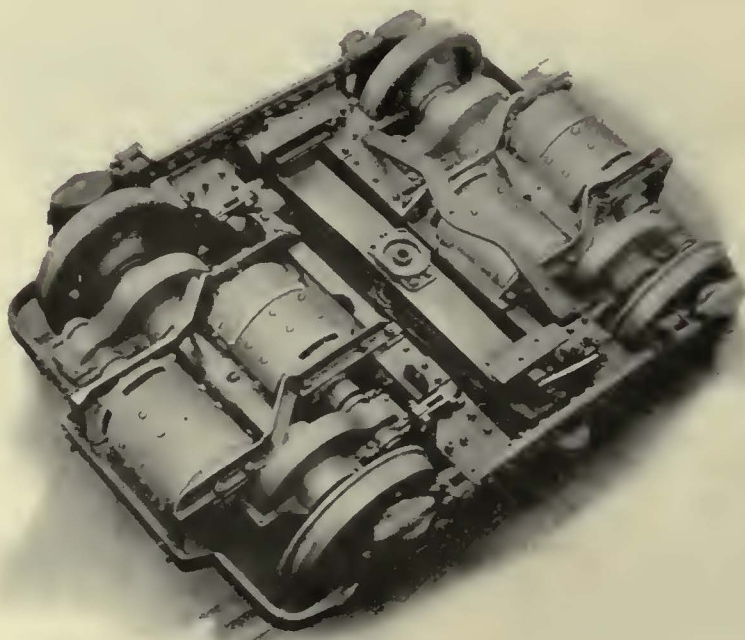
Air or electric brakes have in general been used for service applications, and any of the several types have been used as auxiliary emergency or holding brakes. In a number of designs the magnetic brakes have been arranged so that they are set automatically as an emergency feature. Hand or hydraulic brakes have been used for holding the car after it has come to rest when its speed has been reduced to a low value.

All of the changes in design have had the net result of reducing greatly the truck weight. Small wheels in themselves are much lighter than standard 33-in. wheels. Motor weights, as explained previously, have been reduced about in proportion to the increase in armature speed. The car bodies of today weigh little more than half as much as bodies of the same size built ten years



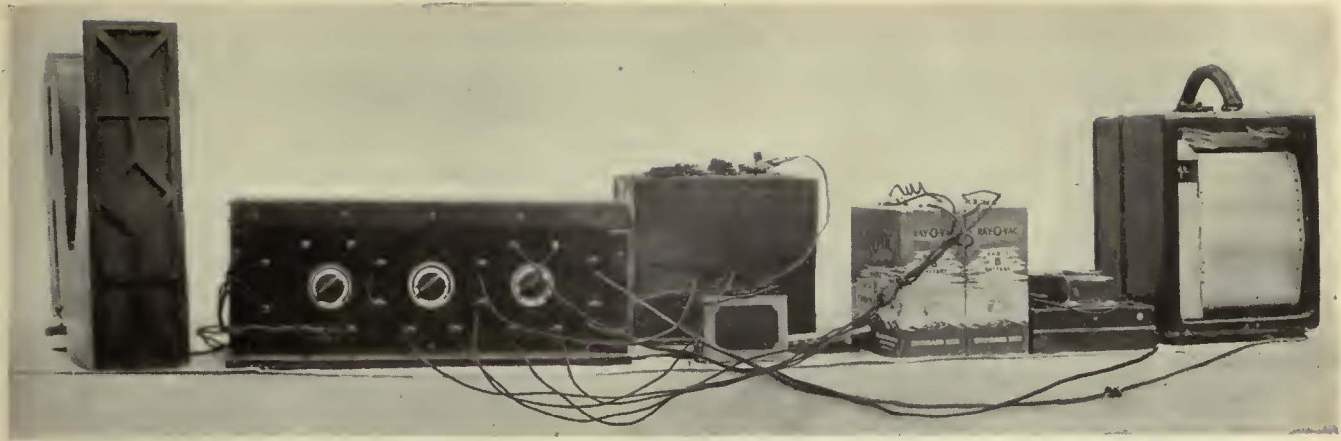
ago. Altogether, the weight carried per wheel is only slightly over half what it was with the former standard cars. Naturally the truck members have been reduced in size and in weight.

On the other hand, the introduction of special drives has added somewhat to the weight of the truck. The double-reduction gear sets or the worm-drive axles have more parts than the single-reduction type and require considerable stiffness in order to prevent undue wear on the drive units. The superior riding qualities obtained by taking the weight of the motors off the axles and suspending them from the truck frame, so that their weight is carried through the medium of the spring system, are so great that the relatively small additional weight involved seems fully justified. If the same results can be obtained with the new types of single-reduction drive they should be on a par with the others in this respect. In general, all of the changes inevitably point to superior riding qualities, quietness, and reduced cost of maintenance.

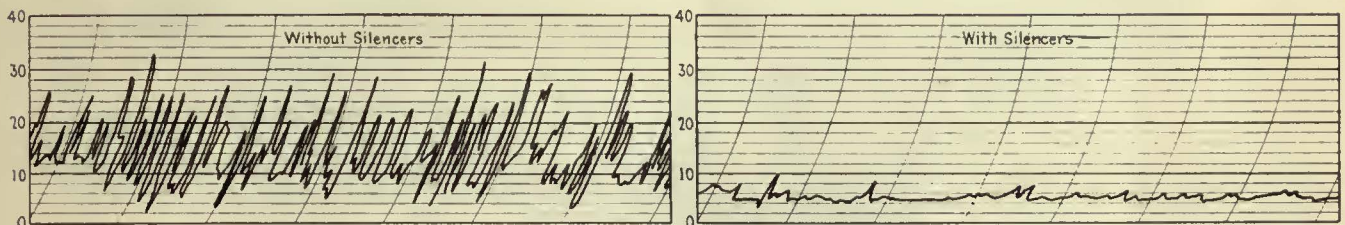


**The Allentown Split Axle Drive Is Mounted on a Modified Brill Truck**

Two motors for driving individually the wheels on each split axle are mounted in a common cradle supported by the truck frame. The connection to the driving pinion of the single-reduction gearing is made through flexible couplings.



Apparatus developed by Boston Elevated Railway for recording comparative amplitude of various noises encountered in operation



Noise test of six turnstiles with and without silencers

# Noise Recorder Developed at Boston

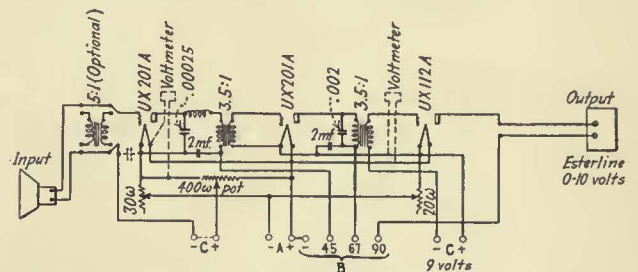
By J. WALTER ALLEN

Electrical Engineer Boston Elevated Railway

INDUSTRY has for some time been cognizant of the deleterious effect of noise and has made numerous improvements, such as the use of sound-absorbing materials in buildings, cars, buses, etc., and by the use of rubber and other resilient materials. Noise, in the commonly accepted definition, is an aggregate of sounds composed of many fundamental frequencies and harmonics of various degrees of energy content. Acoustical engineers have found that the human ear is not affected to the same degree by sounds of equal amplitude but of different frequencies, and that its response to sounds of varying amplitudes follows approximately a logarithmic curve. During the past few years considerable effort has been expended in analyzing the various types of noise and in expressing this analysis in a visual manner.

About four years ago, the Boston Elevated Railway was experimenting with certain modifications of surface car equipments in the hope of reducing operating noises. For the purpose of comparing the noise made by the experimental car and that made by a similar car with standard equipment, use was made of a special radio interference equipment, which was designed to obtain a graphic record. As there was insufficient amplification, however, readings were taken with a Weston voltmeter in the output circuit. The averaged figures gave a fair indication of the results sought, but it was felt that graphical data would be very desirable. This led

to further experiments, as a result of which a new noise recording apparatus has been designed. The noise recorder consists of a three-stage audio amplifier into which is fed electrical impulses generated in a magnetic type of microphone, which impulses are amplified, rectified and finally recorded on an automatic Esterline



Wiring diagram of noise recording apparatus used at Boston

recording voltmeter, as shown in accompanying illustrations.

Reference to the wiring diagram shows that a means is provided to bias the first tube and for fine adjustment the use of a 400-ohm potentiometer is available. During the experiments, however, it was found that if a voltage of 4.5 volts was maintained across the filaments of the tubes and plate voltages of the values as indicated, no external "C" bias was required for the

first tube, the potentiometer being sufficient for good results. The second tube works only on the normal bias of the "A" battery. By the use of a 9-volt "C" battery bias of the last tube, the pen of the recorder floats practically on the zero line with no input.

This apparatus has been used to compare the noises of different types of cars passing certain points; in analyzing the clicking at trolley ears of different design; the study of the benefits of shockproof trolley poles; to compare the noise of pneumatic tools with and without mufflers, and in an analysis of the advantages gained

through the use of silencers on a battery of turnstiles. Accompanying charts show the results of two tests of six turnstiles, the first being made with the machines as normally operated, and the second, after they had been equipped with silencers.

No attempt has been made to calibrate the curve to be read in decibels or other scale of noise units, as all tests required to date have been of a comparative nature only. This device, although crude as compared with later laboratory testing equipments, was built at small expense and the results with it have been entirely satisfactory.

## Trolley Wire Life Prolonged by Regular Ear Renewal



Public Service line crew renewing trolley ears. Periodic renewal has prolonged life of trolley wire approximately 50 per cent

**R**ENEWAL of trolley ears at stated intervals, regardless of wear, has prolonged the life of trolley wire approximately 50 per cent on the Essex Division lines of Public Service Co-ordinated Transport, Newark, N. J. Under the present plan, the frequency of renewal depends upon the amount of service operated over a particular line. Each section of line, however, has a definite interval for ear renewal and when the work is begun on one section it is continued without interruption until that section has been completely re-equipped with new ears.

Another factor which the management believes has been influential in reducing the number of trolley wire breaks has been a change from the 16 in. ears, formerly used, to 9 in. ears.

Standardization of the height of trolley wires above

the pavement has also tended to prolong the life of the trolley wire. The present standard height is 18 ft. Arcing of trolley wheels due to high wire and slow acting trolley catchers has been practically eliminated as a result of this standardization.

Another important factor in improving overhead line maintenance has been the substitution of hard gray fiber material in place of wood in section insulators, switches and crossings. Experience of this company indicates that the fiber lasts about three times as long as wood.

An indication of the results being accomplished by the changes in methods and materials used for overhead line maintenance is found in the record of more than 1,000,000 miles of car operation during the month of March without a single trolley wire break.

### THIRD PERIOD OF Electric Railway Journal Maintenance Contest BEGINS MAY 1



Recently constructed building in Chicago, used for special inspection and repair work on trolley buses

## *Trolley Bus*

# Maintenance Practices

As operating companies gain experience fewer troubles develop and costs become lower. Railway personnel is generally employed in maintenance of trolley buses with additional specialists for certain jobs

## *Becoming Standardized*

By

**CLIFFORD A. FAUST**

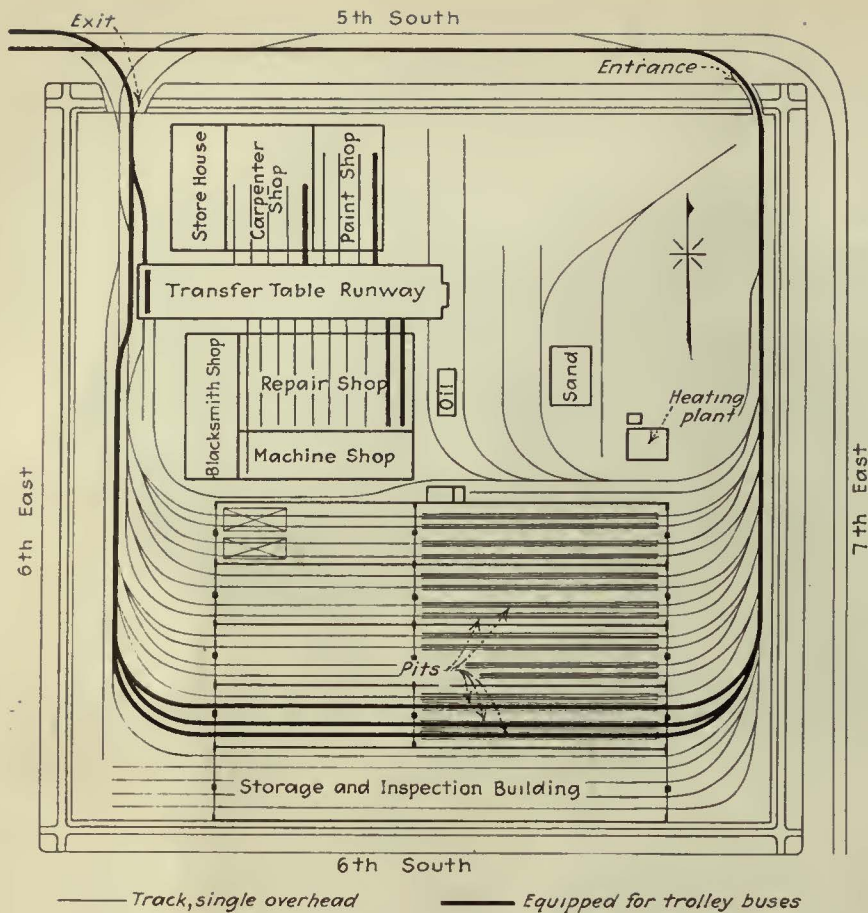
Assistant Editor  
*Electric Railway Journal*

**A**FTER groping in the dark for a time for satisfactory standards and systems of trolley bus maintenance, American operators are now following practices which are fairly uniform. Regular mileage intervals for inspections, light repairs and overhaul have been set up and forces trained for the special care of the vehicles. As a result, fewer difficulties are being encountered, pull-ins are being reduced and maintenance costs are being lowered materially.

At the outset the trolley bus usually was treated either as a "stepchild," being shifted about from department to department for care, or as a "special pet," receiving particular attention from several departments. In the first

instance it was difficult to set up any regular procedure for maintenance or to establish reasonable costs. In the second instance, no one group became specially proficient in trolley bus maintenance and the extra attention increased the cost considerably. As the use of the vehicle has increased, however, it has assumed a regular place in the maintenance scheme.

On all properties in the United States where trolley buses are now operated they are being maintained by street car personnel, aided by a few specialists to take



Several tracks were converted for trolley bus use in the main shops of the Utah Light & Traction Company



New Orleans trolley bus in front of the Carrollton shops, where the vehicles are maintained

care of tires, steering gear and other automotive parts. Since the bodies are of the street car type, the regular railway body repair men have been found competent to keep them in good condition. Current-collection devices, controls and motors are similar to those used on street cars, so it has been found entirely practicable to have men familiar with the electric equipment of cars take care of these parts.

Carhouses, or buildings adjacent to them, are used by all the operating companies for the storage and repair of their trolley buses. Chicago recently completed a new building adjacent to the North Avenue carhouse for in-

specting and repairing its buses and trolley buses. Detroit is planning to erect a new building in the near future for the exclusive use of its trolley buses. All other companies have double overhead facilities in their regular carhouses. Equipping a carhouse for trolley bus use requires only the addition of a negative wire along the path to be traversed by the vehicle and wheelguards along pits. Aside from the addition of equipment to aid in special work like lubrication or brake testing, no other changes are necessary.

#### ESTABLISHED PRINCIPLES GOVERN TROLLEY BUS MAINTENANCE METHODS

Since the trolley bus possesses certain characteristics of both the street car and gasoline bus, the general principles for determining a system of maintenance have been formulated by using those principles of established practice that apply to the new vehicle. Ordinary street car or gasoline bus maintenance programs are not suitable in their entirety for trolley buses. As for other vehicles, the trolley bus inspection and overhaul periods are based on mileage rather than on time. Individual mileage records for both the vehicles and the units of equipment on each vehicle are necessary for the proper maintenance of inspection, servicing and repair programs. Definite procedures for all maintenance work also should be outlined to obtain the best possible results. For daily and general inspection, lubrication, unit change and overhaul, regular routines should be established.

Daily inspection is being given on all properties operating trolley buses. This is accompanied by a careful record, consisting of inspectors' findings and running repairs. All defects discovered by the inspector are rectified before the vehicle is allowed to return to service.

On every system the general inspection is considered the most important of all the maintenance activities. It consists of a thorough inspection, adjustment and repair to every part of the vehicle. The usual plan is to make notations on a printed form containing space for each item requiring attention. The items should be arranged on sheets in the same order as they are to be inspected. This inspection is ordinarily made after 5,000 miles.

Lubrication schedules, likewise, are based on mileage. Certain parts, of course, must be lubricated more frequently, while others can be taken care of at longer intervals. The regular program includes such items as air compressors, distributors, generators, fan bearings, motor bearings, steering mechanism, drive shaft, rear axles and trolley wheels.

Unit replacement has been found advantageous for three systems in getting the most service out of vehicles and their parts. The necessary records involve a certain amount of bookkeeping, but the knowledge obtained of the performance of the various units and their upkeep cost is extremely valuable.

Complete overhaul of the vehicles is made at intervals more frequent than for street cars, but less frequent than for gasoline buses. As yet, however, there is no general agreement as to the mileage for overhaul. This is probably because most of the modern systems are still comparatively new and the matter is still undergoing study.

#### CHICAGO METHODS SYSTEMATIZED

Trolley buses of the Chicago Surface Lines, totaling 89, are stored and maintained at a new building and yard, adjacent to the North Avenue carhouse. The building, constructed especially for trolley bus and gasoline bus use, is designed for special inspections and minor repair work. Ordinary daily inspection is conducted outdoors in the storage yard, while heavy repairs and overhaul are made in the company's main car shops. In future additional trolley bus depots will be established in other locations for storing and maintaining part of the vehicles. Details of the practices of this company were given in an article published in the February issue of the JOURNAL.

At the end of each day's run, the trolley bus operator turns his vehicle over to a special inspector and, at the same time, reports in writing the condition of the vehicle, noting any defects which may have come to his attention. The inspector then proceeds to make his examination, following a definite routine. If no repairs are needed, the vehicle is marked "O.K." by the inspector. It is then run around a loop and placed in position, ready to go out again. If work is required the vehicle is run into the shop building, accompanied by the inspector's written report of what is wrong.

In general, repair work on the trolley buses is done by a force of mechanics and electricians who have been transferred from similar work in the car shops. The inspectors, too, are men who have had past experience in the inspection and maintenance of railway equipment. A few inspectors, however, are employed to look after steering gears, tires, axles and other automotive parts.

In addition to the daily inspection, a more comprehensive one is made after 5,000 miles. The thoroughness of this inspection is not left to the discretion of the maintenance personnel, but is carried out according to a comprehensive plan. A set of instructions has been prepared, specifying the tests to be made of the various parts. Each test is numbered and a space is provided with a corresponding number on the inspection report form to be filled in as the test or repair is made. In the main, these instructions are the same for all types of trolley buses, varying only in minor ways to conform with the specifications on the different makes of vehicles used on the system.

#### TROUBLES BECOMING FEWER AT SALT LAKE CITY

Trolley buses of the Utah Light & Traction Company are maintained at the company's carhouse, located at Fifth South Street and Sixth East Street, by a force recruited from the street car personnel. In the main inspection and storage section of the carhouse three lanes were made available for trolley buses by erecting negative wires and converting the pits which extend more than half the length of this building. In addition to

these, two tracks in the repair shop, one in the carpenter shop and one in the paint shop, were equipped for trolley bus use. The transfer table, which serves the three last-named shops, also accommodates these vehicles. In altering the pits 12-in. planking was installed on the inside of each rail and a guard rail erected on the inner edges to guide the vehicles.

At the completion of the daily run, all vehicles are given an inspection and have the interiors cleaned. Any necessary repairs are made immediately. Every 1,000 miles the vehicles are given a general inspection, all details of the equipment being checked carefully. Lubrication of most parts also is made every 1,000 miles. Certain of the automotive parts, however, are lubricated



To obtain the best results, mechanics should follow a regular routine in caring for trolley buses

every 300 miles, while armature bearings of the ball type are lubricated every 3,000 miles. Exteriors of the vehicles are washed every 500 miles, while the interiors are washed every 1,000 miles.

When trolley buses were first placed in operation in Salt Lake City, a few difficulties arose with the equipment. However, as the forces became familiar with them, these troubles were gradually reduced. Analyses of troubles during 1929 and the first half of 1930, as recorded by the pull-in records, road calls and inspectors' reports, show that most of the difficulties have arisen in the trolley assembly, electrical control and brakes. Most of the trolley troubles were caused by stiffly swiveling bases or harps, insufficient pole tension, slack overhead, improperly designed or adjusted equipment, and maneuvering too far from the wires. Improved equipment, careful alignment of harps, proper lubrication and inspection, close adjustment of trolley pole tension and

correct alignment and installation of overhead, have practically eliminated these troubles.

All of the 26 Salt Lake City vehicles are equipped with three sets of brakes—dynamic, air and hand. The principal source of brake trouble came from improper adjustment of the braking cycle. Dynamic braking from the higher speeds of 35 to 20 miles would give prompt action, but when braking from 12 miles or less, the dynamic braking action was sluggish and the operator, becoming alarmed, would give the brake pedal full pressure, apply air too soon and stop the coach with a jerk. Greater familiarity with the brake system is constantly reducing troubles from this source. Tire manufacturers have made trouble from this source almost negligible, according to the management, by greatly improved design, construction and maintenance. Front tire punctures are practically unknown, and rear tire flats do not interfere with operation because the vehicles have dual tires. Tire mileage is on the increase, averaging more than 26,000 miles per tire.

#### MAINTENANCE PRACTICE ON OTHER PROPERTIES

The four trolley buses of the Rockford Electric Company, Rockford, Ill., are housed, inspected and repaired in the company's carhouse at Kishwaukee Street and First Avenue, a short distance from the regular route. One of the tracks in the carhouse, with a pit long enough to accommodate all four vehicles, was converted for trolley bus use. The vehicles, when they are pulled in, make a turn in front of the carhouse and back in over this pit, those needing the most attention being placed at the rear. Thus located, none of the vehicles has to be moved even for repairs prior to being placed in service the next morning. The pit was made suitable for the movement of trolley buses by inserting within the car rail a brace made from 3x5-in. angle iron, trussed to T-iron braces. This angle-iron inset allows trolley buses to be backed along the pit with safety and also permits street cars to be moved over this track into the paint shop at the rear.

All maintenance work in Rockford is done by street car mechanics and electricians. One man, assigned to the trolley buses, makes an inspection every night and takes care of necessary light repairs. Every 1,000 miles he makes a general inspection. A second man is assigned to the lubrication of the vehicles, made every 1,000 miles. The daily and general inspections, which are very thorough,

have kept the vehicles free from trouble. So far they have operated more than 75,000 miles without a single road failure.

In Baltimore, the three trolley buses, operated by the United Railways & Electric Company, are housed and maintained in a carhouse, located midway between the terminals of the line. This building is no longer used for street cars, so that the trolley buses have exclusive use of it. Since only one of the three vehicles is required for regular service, only one mechanic is needed. He gives them a daily inspection and makes all light repairs. He also is responsible for their cleaning. Major repairs, overhaul and painting are taken care of in the Carroll Park shops, to which the vehicles are towed when work is necessary.

As in the other cities, the thirteen trolley buses of the New Orleans Public Service, Inc., are maintained by the street car personnel in one of the carhouses. The Carrollton carhouse, located on one of the two routes and adjacent to the other, is used for all repair work. The unit replacement system, which has been used in New Orleans for some time for street cars and buses, is being used effectively also for many parts of the trolley buses.

At the corner of Main and Gay Streets in Knoxville is a car depot through which most of the street cars loop before starting back to the main business district. The building has several tracks for the storage, inspection and cleaning of cars, one of these being converted for the use of trolley buses. All inspection, light repairing and cleaning of these vehicles are conducted at this point. When major repairs are necessary the vehicles are taken to the Magnolia Avenue shops.

At present the six trolley buses of the Detroit Department of Street Railways are being taken care of at the Coolidge carhouse, a little more than a mile north of the Plymouth Road line. The vehicles are stored in the open but major repairs are made in the carhouse. Plans for a new building, to be constructed for the exclusive use of trolley buses, are now under consideration.

Brooklyn's two trolley buses are being stored and maintained at the Ninth Avenue Car Depot, located a little more than 1½ miles from the line. The vehicles are towed between the depot and the line by a truck.

In Philadelphia, Rochester and Cohoes the trolley buses are also being maintained at carhouses. No special difficulties have arisen in any of these cities, and the methods for each are now well standardized.

### Telling the Story in Six Languages

## TROLLEY NEWS

Published by The United Railways and Electric Co.

VOL. XXII    BALTIMORE, MAR. 4, 1931    No. 3

"INSIDE THE STREET CAR IS THE SAFEST PLACE ON THE STREETS."

True all day, every day, anywhere, in any language. Here it is in five different tongues:—



**FRENCH**  
*L'endroit le plus sûr de la rue c'est dans le tramway*



**CHINESE**  
(Believe it or not!)



**GERMAN**  
*Innerhalb des Tramwagens ist der sicherste Platz auf den Strassen.*



**SPANISH**  
*El lugar más seguro de la calle se halla en el tranvía.*



**ITALIAN**  
*Il carro tramviario è il posto più sicuro sulle strade.*

In a recent issue of *Trolley News* the United Railways & Electric Company of Baltimore used this interesting means of attracting attention to the fact that "Inside the street car is the safest place on the streets"



# TIE-BORING

Survey of 34 electric railways and steam railroads shows increase in use of screw spikes, more companies boring holes for cut spikes and extensive practice of treating ties. The majority bore holes through ties rather than part way

## *Practices Analyzed*

**A**LTHOUGH there are certain trends toward standardized practices in the preparation of ties for use in track construction, there are wide differences of opinion among both electric railway and steam railroad track men as to which are the best. Requirements vary so greatly in different parts of the country and for the several classes of service that specifications are bound to differ in many particulars.

To determine the practices of several representative railways, the wood preservation committee of the A.E.R.E.A., way and structures division, under the chairmanship of C. A. Smith, superintendent of road-way Georgia Power Company, recently made a survey of tie boring methods in use. Results of this study, showing the type of spike, specifications for spike holes and treatment of ties of nineteen electric railways and fifteen steam railroads are summarized in the accompanying table. This tabulation shows that, although cut spikes still predominate, more companies are adopting the screw type of spike, that holes are being bored in ties for all screw spikes and for cut spikes on many systems, that the majority boring ties, drill all the way through and that practically all of the companies use preservatives.

Analyzing the types of spikes used, it is found that of the companies surveyed nine electric railways and twelve steam railroads use cut spikes entirely, five electric railways use screw spikes predominantly, and five electric railways and three steam roads use both types. In Boston, screw spikes are used on the elevated structures, in subways and tunnels, and on T-rail track in private right-of-way. Cut spikes are used for all other track. The screw spike and clip fastening is standard for straight track construction of the Chicago Surface Lines, while hook-head cut spikes are used in special trackwork installations. Since 1928, the Cleveland Railway has been using the screw spike and clip on practically all track constructed with the 122-lb. grooved girder rail. The Indianapolis Street Railway decided last year on the adoption of treated ties, plates and screw spikes for standard track construction. In Toronto, tie plates and screw spikes with clips are used for special track work, while cut spikes are used for straight track construction.

On its main line the Delaware, Lackawanna & Western Railroad uses a double-shoulder tie plate with cut spikes at the base of the rail and screw spikes to hold the tie plates rigidly to the tie. This type of construction was adopted after many years of study and use with both types of spikes. On all branch lines this railroad uses screw spikes exclusively with a special tie plate.

Only eight companies reported that they do not bore the ties for receiving spikes. All of these were electric railways. It is interesting to note that all fifteen steam railroads and three electric railways bore holes for cut spikes. This is an important variation from the older practice of driving the spikes directly into the tie. With the exception of the United Railways & Electric Company of Baltimore, all of the railways boring holes for cut spikes drill all the way through. Baltimore does not bore the hole all the way through because of an experience a number of years ago when screw spikes were used. It was found after a few years that the spikes were almost entirely eaten up by corrosion or electrolysis. This was attributed to a rust streak. Of the ten companies boring holes for screw spikes, four drill all the way through and six part way. Considering the practice for both kinds of spikes, a majority favor drilling the holes all the way through.

The following reasons are given by the advocates of boring all the way through the ties:

1. Since the hole is accessible from either side, maximum opportunity is given for the preservative to enter the wood fiber during the treating process. When holes are bored part way, an air pocket is formed at the bottom, preventing the preservative from entering the full depth.

2. The through hole allows better drainage of moisture that enters through the top and which otherwise would collect in the pocket and cause both rust of the spikes and decay of the wood. It also prevents any accumulation of dirt which would hold moisture.

3. If ballast or other foreign matter enters the hole it can be driven through by the spikes, eliminating construction delays.

4. It prevents damage from freezing of water which might collect in the part-way-through hole.

5. Avoids shattering fiber on the under side of the tie, if holes are not deep enough or if foreign material enters the hole.

6. Prevents the possibility of the treating plant not boring deep enough and requiring further boring on the job, exposing untreated timber.

7. It is possible in laying the ties to use either face. Also, if it is desired to turn the tie over during reconstruction it is not necessary to rebore and treat the tie again.

8. It is easier to inspect the drilling of holes to make sure they agree with specifications.

Advocates of drilling the holes part way claim that

the water which enters from the bottom of a hole bored all the way through causes more damage than the small amount of moisture that might enter from the top. In the case of open track construction, a great deal of water may be absorbed through pumping action. They also say that if the hole is of the proper diameter water cannot enter from the top. In Boston, holes are not bored through on the elevated structure, because a ground might result and interfere with the signal system. It appears that in paved track construction there is less likelihood of water entering the holes. The use of high-grade ties and proper size holes underneath a good paving structure should prevent damage from moisture. It is probably these reasons that account for electric railways adopting the part-way practice to a greater extent than the steam railroads, which use open track almost exclusively.

In Cleveland it was found necessary, using the 7-in. association standard grooved girder rail, to drill the two inside holes on an angle. This company has not been able to find any one who would pre-bore the inside holes on an angle and give assurance of having them located properly, so that all boring of ties is done at the yard. The holes are not bored all the way through, so they can be filled with hot creosote oil.

With the exception of three electric railways, all of the companies surveyed used ties treated with a wood preservative. This treating process is administered, in the case of companies boring holes all the way through, after the holes have been drilled. None of the companies boring part way through reported pre-drilling. Instead, the holes are bored in the treated ties and then filled with creosote oil.

### Tie Boring Practices of 34 Electric Railways and Steam Railroads

Electric Railway	Type of Spike	Spike Holes	Treatment of Ties
Birmingham Electric Co.....	Cut.	None.	Creosoted.
Boston Elevated Ry.....	Screw—Elevated structure, subways, tunnels and T-rail in private right-of-way. Cut—elsewhere.	Ballasted track, holes bored so that spikes will not reach bottom. On elevated, part way. None for cut spikes.	Fill part-through holes with creosote.
Chicago South Shore & South Bend R.R.	Cut, except screw in Michigan City.	Bored through.	Impregnated after boring.
Chicago Surface Lines.....	Screw, straight track. Cut, special work.	For screw spikes. Bored through.	
Cleveland Ry.....	Since 1928, using screw on practically all track with 122-lb. grooved girder rail.	Holes for screw spikes, bored part way. Inside ones bored at angle.	Creosote oil poured into holes.
Connecticut Co.....	Cut.	None.	
Detroit Department of Street Rys.....	Screw and cut on the few wood ties used.	Holes for screw spikes, bored part way.	White oak ties, untreated.
Eastern Massachusetts Street Ry.....	Cut entirely.	No holes.	Ties are treated.
Georgia Power Co.....	Cut.	No holes.	Ties are treated.
Illinois Terminal R.R. System.....	Cut chiefly. A few screw type.	Favor boring part way for screw spikes.	
Indianapolis Street Ry.....	Adopted screw in 1930.	Bore through.	Red oak ties, treated after boring.
Lehigh Valley Transit Co.....	Cut.	No holes.	Most ties not treated.
Memphis Street Ry.....	Cut entirely.	No holes.	
Milwaukee Electric Ry. & Light Co..	Screw.	Bore 5½ in. in 6-in. ties.	Ties are treated.
Philadelphia Rapid Transit Co.....	Screw and cut.	Favor boring through entire thickness.	Most ties untreated.
Pittsburgh Rys.....	Cut.	No holes.	
Third Avenue Ry. System.....	Cut.	Bore holes entirely through.	Ties are creosoted after boring.
Toronto Transportation Commission..	Cut for standard. Screws for special work.	For screw spikes bore holes part way. For standard track favor boring through.	Special work ties treated before boring, holes filled later. Other ties untreated.
United Rys. & Electric Co. of Baltimore	Cut.	Bore holes part way.	
Steam Railroad			
Atchison, Topeka & Santa Fe Ry.....	Cut.	Bore holes entirely through.	Ties are treated.
Atlanta & West Point R.R.....	Cut.	Holes are bored through.	Ties are treated.
Baltimore & Ohio R.R.....	Considering use of cut to hold rail and screw to hold tie plate to tie.	May adopt practice of boring holes. Would bore entirely through.	Treated ties used.
Boston & Maine R.R.....	Cut.	Bore holes through.	Treated ties used.
Chgo., Milwaukee, St. Paul & Pacific R.R.	Cut.	Bore holes through.	Ties treated after boring.
Chicago, Rock Island & Pacific Ry.....	Cut.	Holes are bored through.	Ties are preserved.
Cleve., Cincinnati, Chgo. & St. Louis Ry.	Cut.	Bore holes through.	Treated ties used.
Delaware, Lackawanna & Western R.R.	Main line—cut at rail, screw for tie plate. Branch lines—screw exclusively.	Ties are bored through.	Ties are treated after boring.
Illinois Central System.....	Cut.	Bore through ties.	Preservative used after boring.
Lehigh Valley R.R.....	Cut.	Favor boring through.	
Nashville, Chatanooga & St. Louis Ry.	Cut.	Holes are bored through.	Ties are creosoted.
New York Central R.R.....	Cut.	Holes go through the tie.	Ties are treated after boring.
New York, New Haven & Hartford R.R.	Cut, diamond-pointed.	Holes are bored through.	Creosoted after being used.
Pennsylvania R.R.	Cut, except in some tunnels and bridges.	Bore holes through.	Preservative used.
Southern Ry. System.....	Cut.	Bore holes through.	Both plain and creosoted ties are used.

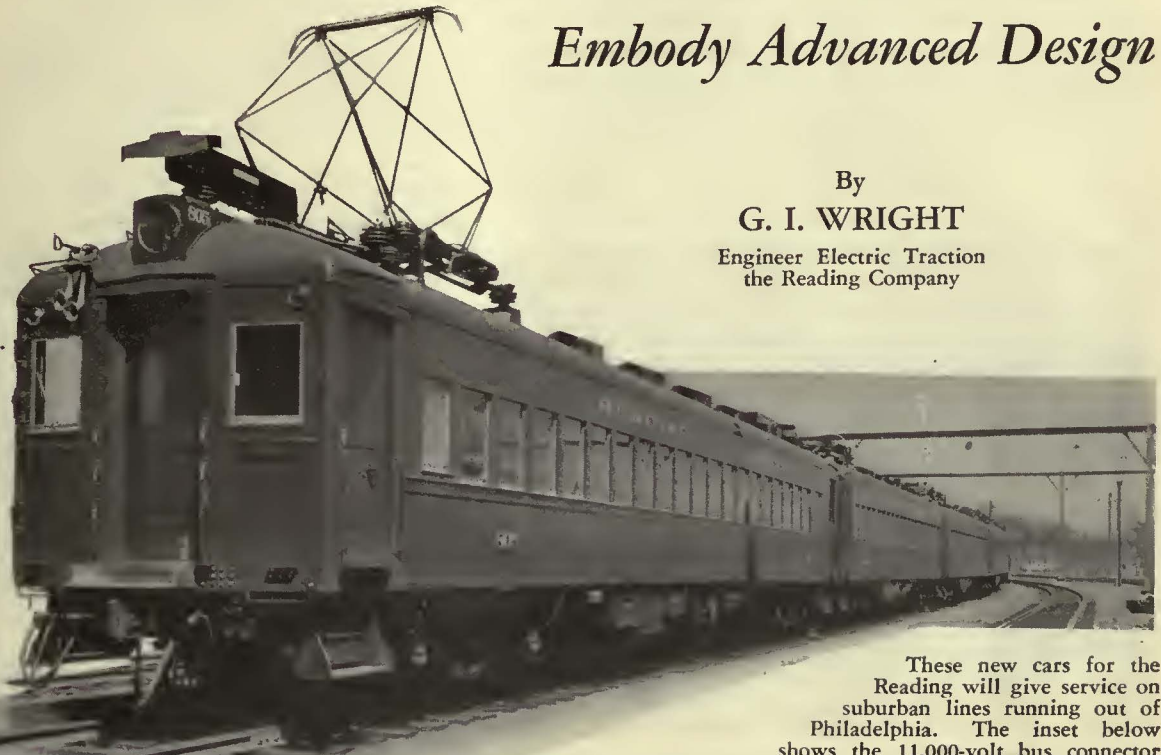
# Cars for Reading Electrification

*Embody Advanced Design*

By

G. I. WRIGHT

Engineer Electric Traction  
the Reading Company



These new cars for the Reading will give service on suburban lines running out of Philadelphia. The inset below shows the 11,000-volt bus connector



**S**EVENTY new multiple-unit motor cars will soon be placed in service by the Reading Company, inaugurating its Philadelphia suburban electrification to Lansdale, Doylestown, Hatboro and West Trenton. These cars are being built by the Bethlehem Steel Company at its Wilmington, Del., plant. It is estimated that 30 more cars will be required for the Chestnut Hill line and another 30 for the Norristown service, making a total of 130 for the complete electrification.

The cars are 72 ft. 11½ in. long over couplers, and without passenger load weigh approximately 126,500 lb., of which some 60 per cent is on the motor truck and 40 per cent on the trailer truck. The order of 70 cars will include 61 passenger cars seating 86, seven combination cars seating 62 and having a 17 ft. 1 in. baggage compartment, and two combination cars seating 38 and having a 16 ft. 8½ in. baggage compartment and a 17 ft. 1 in. railway postoffice space.

Each car is equipped with two 300-hp., 25-cycle motors, which are the largest ever built for this type of service on an 11,000 volt, single-phase line. Aluminum parts were used wherever practicable. The resulting saving in weight, along with the large capacity of the motors, results in high schedule speeds.

A number of new developments, all designed by the Reading Company, are a power bus line connector to save pantograph and trolley wear, a design of ventilating system to save cleaning and maintenance, a motor spring-nose suspension to facilitate changing of motors, a magnetic door latch and thermostat control to conserve

heat, and a flexible air connection to the motors which is self-aligning and self-connecting. Each car is a complete unit, with a control cab at each end. Each is equipped with electro-pneumatic brakes and cab signals.

Careful study of economies due to weight saving was made, with the result that aluminum alloys were adopted for the following parts: Floor, roof, vestibule end, body end and saloon sheets; side and end linings; steps, treads and trap doors; parcel racks, heater guards, platform floor plates; door panels; conduits and fittings; headlights; motor-generator frame; switch group and relay boxes; bus connector parts. A reduction of 6,640 lb. per car was obtained at an added cost of \$1,475. The corresponding estimated annual energy saving is \$232, whereas the interest on the added investment is \$74, making a net annual saving of \$158 per car or \$11,060 for the 70 cars.

The trucks, side sheets, underframing and all stress-carrying members are of steel. The center sill consists of two 9-in. channels with a ¼-in. top cover plate and a ⅞-in. bottom cover plate extending between buffer sills. This center sill forms a duct to carry ventilating air from the blower to the motors. The roof is of the single-deck type covered with aluminum sheets and reinforced to carry a pantograph at one end and a bus connector at

each end. Steel hood sheets were used due to the difficulty of shaping aluminum. Salamander hair insulation is used throughout.

The seating arrangement consists of 37 cross seats spaced on 33½-in. centers and three longitudinal seats, each seating four people. Each car has one toilet.

Signals are electrically operated by push buttons and there are no signal or emergency cords within the car. The emergency cord is located in the vestibule, but is accessible from within the car. Push buttons for the conductor's signal buzzer are located two in the car body, one over each vestibule end door, and one under each corner post. The latter are provided so that while on the station platform the conductor can signal the motorman to start before boarding the train, thus saving stopping time. A Westinghouse double Pneuphonic horn is located on the vestibule hood at each end of the car.

Lighting is by eight dome fixtures with opal glass bowls, each using a 100-watt lamp. These are arranged in two circuits controlled from a panel in the vestibule. A Golden Glow fixed-focus headlight, using a 250-watt bulb, is built into each end hood so as to give a streamline appearance. A four-position switch in the motorman's cab gives him "off," "high," "medium" and "low" control of the headlight. Electric marker lamps are built into each corner of the car.

Taylor flexible trucks are used under 50 cars and Commonwealth trucks under the other twenty. Both have manganese steel pedestal and bolster liners to minimize wear. The motor truck has a wheelbase of 8 ft. 9 in., with 38-in. wheels on 6 x 11-in. axles, while the trailer truck has an 8-ft. wheelbase with 36-in. wheels on 5½x10-in. axles. Plate friction side bearings with 16½x4x¾-in. hardened spring steel wear plates are used. All trucks are interchangeable. A spring nose support makes it possible to remove the motors without removing the truck from the car. The wheels may be dropped with the truck and motors in place, eliminating the necessity of disconnecting the motor leads when changing a pair of wheels. All of the trucks have plain journal bearings.

Westinghouse AMUE-1812 electropneumatic brakes are used. They are set for a braking rate of 1.5 m.p.h. p.s. The air compressor, with a displacement of 35 cu.ft. per minute, is driven by a 7½-hp., 105-volt single-phase motor, and is mounted on rubber pads to eliminate noise and vibration. Both types of trucks have clasp brakes. Considerable effort was devoted to the design of the brake system to prevent chattering and rough stops. It was decided not to use brake shoes that bear on the flanges to obviate the danger of cracking the wheels with the intense heat developed by frequent stops from high speeds at a high rate of retardation.

Each car is equipped with two 300-hp. single-phase motors of the compensated-series commutating-pole type, connected in series. Forty cars have General Electric GEA-620 motors, 28 have Westinghouse 423-B motors, and two have American Brown Boveri EDTM-544 motors. The motor characteristic curves are so matched that any combination of equipment will result in smooth train operation. All motors have roller armature bearings.

The motors were selected on the basis of the hardest service, that of the Chestnut Hill locals, with short runs and severe grades and curves. The average local run between Wayne Junction and Chestnut Hill is 0.57 mile, with a compensated grade and curve resistance of 18.2

lb. per ton. The maximum safe speed with new wheels is 72 m.p.h. The motors represent radical improvements over previous designs and have high efficiency and power factor, with low weight per horsepower and excellent commutation. It is hoped that maintenance costs will reflect these improvements.

The main controller, located under the car, is of the automatic accelerating type, and is remotely controlled through a 32-volt circuit from a master controller in the cab. A current limit relay gives an accelerating rate of 1.25 m.p.h.p.s. up to about 27 m.p.h. The master controller has three notches, low-speed switching, slow running and full running. It also has the dead-man release, and a pedal so that the motorman can hold it in any position and have both hands free. Westinghouse control is used on 66 cars, General Electric and American Brown Boveri on two each.

At each end of the car are two twelve-point train line jumpers, so arranged that the cars can be coupled from either side of the train. Dummy receptacles hold the free ends of the jumpers when not in use. The high-voltage circuit is protected by a pantograph lowering relay. The motor circuits are guarded against faults and wheel slipping by a differential protective relay.

Car heating is with 40 heaters located under the seats. Each has two 325-watt open-coil elements. There are two circuits with one coil of each heater in each circuit. Ten coils are connected in series on 360 volts. Double thermostat control is so arranged that when the motorman has his plug in the master controller the setting is for 65 deg. F., and when the plug is out the setting is 50 deg. A "train heat" switch permits him to change from the 65-deg. setting to the 50-deg. setting at will. The cars will thus reach a medium temperature in the yards before going into service. As the motorman must be in his cab several minutes before time for departure, the change in setting when he plugs into the master controller will allow the train to become warm before starting. Operating rules will require the train heat switch to be cut down to the 50-deg. setting a short time before reaching a terminal, unless the equipment is to remain in service. This should save considerable energy.

Magnetic door latches will hold the body end doors open while the train is standing in a station, but will release them as soon as the train starts. An air cushion door check will then close each door. It is believed this will save considerable heat, as the cars are not fitted with diaphragms, and with short runs it is impossible for the trainmen to keep the side and trap doors closed.

Each cab has a 1,000-watt, 105-volt heater supplied from the same transformer tap as the air compressor. It is placed horizontally under the foot rest so that the motorman can keep his feet warm.

At each end of the car is a motorman's cab with complete control equipment. All cars are equipped with cab signals, but do not have the automatic stop and speed control features. The motorman will have his color indicator in the right-hand corner of the cab about on a level with his face.

Shatterproof glass is used in the motorman's window, and a "Hays Air Push" wiper keeps it clear of water and snow. On the left side of the cab is a gang of eight toggle switches which control cab heat, train heat, vestibule lamps, etc. A drop sash in the side door gives ventilation and permits the motorman to look out to the rear.

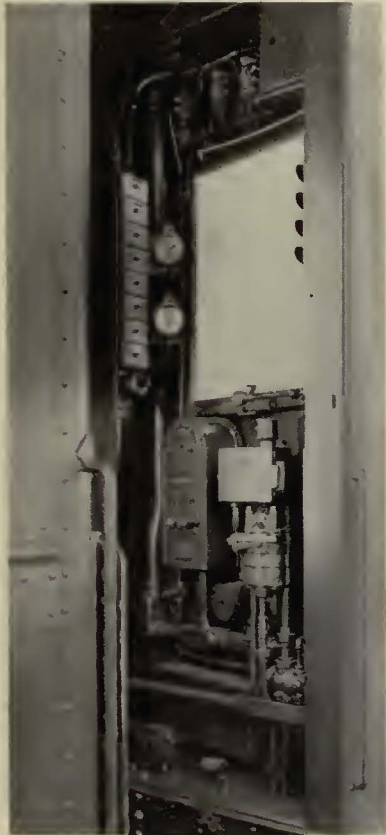
Special attention has been given to the design of a

ventilating system to give under all conditions the 4,000 cu.ft. per minute of air needed to ventilate the motors, transformer and reactor coils. A carefully designed intake and filter keep down the velocity of the air and exclude moisture and dirt. The air is carried from the blower to the motors through the center sill of the car, avoiding the use of a large amount of piping. A secondary intake between the filter and the blower wheel will open automatically should the filter system become plugged with snow, ice or dirt, and will close automatically when the filter is cleaned.

A flexible connection carries the air from the center

be used initially, but it is planned to experiment with other materials later. No grease is to be used on the pantograph since there will be steam operation under the overhead system.

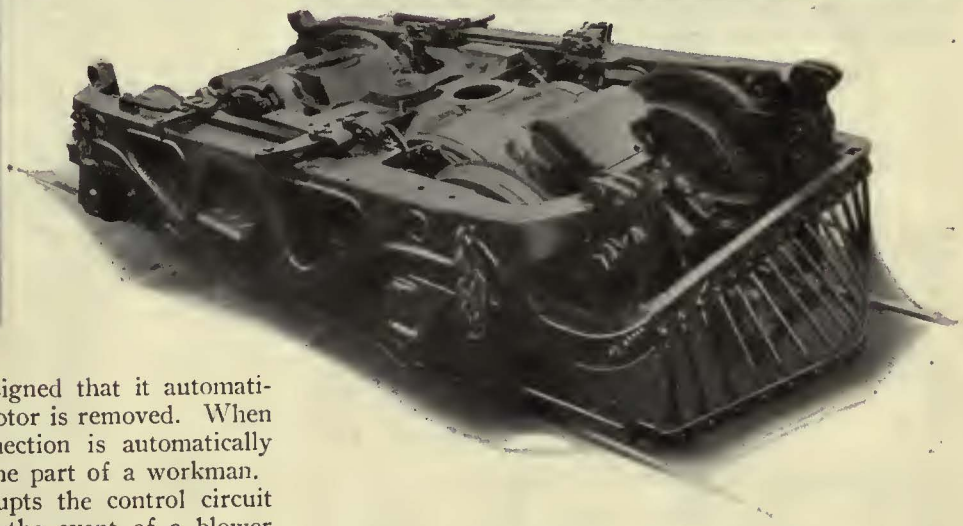
An 11,000-volt power bus connector mounted on each end of each car and operated by compressed air makes it possible to run trains up to ten cars in length with only two pantographs up, saving wear on the overhead system and pantographs, and minimizing the number of pantographs wrecked by getting caught in the overhead. It is planned to have two pantographs up in trains of two or more cars in order to reduce the arcing at the shoe by



Left—All control equipment, including cab signals, is grouped conveniently for the motorman

Right—The car interior is finished in three-tone gray, striped in blue and gold, with sanded nickel finish hardware. Brass window sash and Flexolith flooring also are features

Below—The truck design is such that the axles may be dropped out without removing the trucks or motors from under the car



sill to the motors. It is so designed that it automatically disconnects itself when a motor is removed. When the motor is replaced the connection is automatically restored without any effort on the part of a workman.

A "no-blower cut-out" interrupts the control circuit and cuts out the car motors in the event of a blower failure, making the particular car inoperative unless its blower system is functioning. For shop testing, a switch by-passes the no-blower cut-out when the control box cover is removed.

The "blower-generator" set is driven by a 15-hp., 360 volt motor. It is mounted on rubber bushings to minimize noise and vibration. This motor is started three-phase by cutting in a resistance which is opened by a contactor when the motor comes up to speed. An 1,800-watt d.c. generator, forming part of this machine, supplies energy for the 32-volt control and lighting system. A fifteen-cell 70 amp.-hr. lead battery floats on the line, while a regulator keeps the generated voltage within the narrow range required by the cab signals.

One single-shoe pantograph per car is mounted directly over the motor truck. Steel contact strips will

providing two parallel paths for the current. Each shoe will average about 60 amp. at 11,000 volts during the straight-line acceleration.

Comfort of the passengers, speed and ease of operation, elimination of weight, reduction of maintenance costs, accessibility and reliability of apparatus are the things which were kept in mind in the design of this car equipment.

The design of these cars represents the co-ordinated efforts of the mechanical and electrical traction departments of the Reading Company, with R. A. Hardy, head car draftsman, office of superintendent of motive power and rolling equipment, in charge of the mechanical design, and W. H. Smith, assistant engineer, office of engineer electric traction, in charge of the electrical design.

# Trend of

# REVENUES *and* EXPENSES

PRESENTATION of monthly statistics of gross revenue, operating expense and net earnings for a selected group of electric railway properties is begun in a new form in this article. Early in 1929 the JOURNAL commenced the regular publication of revenue and expense statistics. Since it was desired to show the trends of the transportation business only, care was taken to include only such reports as covered the financial results of operation of electric railway and bus service and to exclude joint operations of railways with other utilities. To this group was added later a number of electrified railroads which are devoted largely or entirely to suburban passenger service.

Heretofore the figures have been presented simply for the current month and for the same month of the preceding year, or for a period of several months immediately preceding and for the same period the year before. In order to determine the trends as shown by the monthly reports it has been necessary for the reader to compare the current monthly report as published with the figures given alongside for the corresponding month of the

Monthly figures for past year compared with figures for corresponding months of preceding year

preceding year. To compare other months it has been necessary to refer to previous issues of the JOURNAL.

In order to make it possible for the reader to obtain trends with greater facility, it has been decided to change the form of presentation of those reports which are regularly available each month, and to include the principal figures month by month for at least a year, along with the per cent of increase or decrease from the corresponding month of the previous year. In this way the reader is able to see at a glance the trends and to make comparisons between various properties and different sections of the country. This has necessitated a radical change in the form in which the reports are presented, and has made it necessary to omit certain portions of the

## 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*	
	\$		Per Cent*		\$		Per Cent*		\$		Per Cent*	
<b>Boston Elevated Railway, Boston, Mass.</b>												
Mar., 1930....	2,987,744	4.66	2,123,571	3.22	178,957	2.85						
Apr.....	2,813,083	3.64	2,073,580	0.96	54,281	61.3						
May.....	2,824,945	5.17	2,084,708	2.50	45,824	69.2						
June.....	2,550,775	3.93	1,937,134	3.05	113,749	252.1						
July.....	2,371,152	6.04	2,108,071	0.61	424,295	48.6						
Aug.....	2,280,322	7.81	2,113,183	1.66	631,494	46.9						
Sept.....	2,470,918	3.78	2,091,718	0.52	316,296	59.9						
Oct.....	2,811,399	4.04	2,157,474	1.29	35,272	64.9						
Nov.....	2,579,899	10.33	2,066,206	2.66	186,317	389.5						
Dec.....	2,850,330	8.20	2,178,896	2.24	20,516	107.1						
Jan., 1931....	2,840,159	8.43	2,082,456	26.2	57,600	70.6						
Feb.....	2,534,828	8.33	1,952,032	6.23	114,127	733.0						
Mar.....												
<b>Capital Traction Company, Washington, D. C.</b>												
Mar., 1930....	353,563	8.31	279,879	2.27	45,692	36.6						
Apr.....	375,237	1.51	290,560	1.54	57,675	15.73						
May.....	369,413	5.11	285,970	3.10	53,985	16.72						
June.....	340,623	5.25	271,761	3.80	40,884	16.70						
July.....	306,527	9.02	272,490	4.65	4,935	78.5						
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	1.48	58,638	17.6						
Nov.....	346,054	2.70	273,481	1.54	42,659	21.05						
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	6.68	30,521	1.87						
Mar.....												
<b>Brooklyn-Manhattan Transit System, New York, N. Y.</b>												
Mar., 1930....	5,153,556	39.3	3,596,977	22.72	849,685	19.11						
Apr.....	5,074,571	23.82	3,578,817	23.35	802,168	51.1						
May.....	5,229,829	21.65	3,600,727	22.46	929,201	35.4						
June.....	5,070,028	21.6	3,591,743	20.90	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	6.64	465,144	14.91						
Sept.....	4,834,251	2.49	3,453,431	4.62	667,323	6.20						
Oct.....	5,036,775	2.68	3,522,553	4.22	758,817	2.78						
Nov.....	4,769,083	4.37	3,366,923	6.98	689,470	2.34						
Dec.....	5,065,484	2.66	3,464,963	4.25	814,788	2.05						
Jan., 1931....	4,452,706	6.48	3,475,330	7.01	674,029	5.80						
Feb.....	4,453,655	3.79	3,159,903	6.96	583,468	2.40						
Mar.....	5,028,562	2.66	3,475,847	3.37	814,360	4.18						
<b>Chicago Surface Lines, Chicago, Ill.</b>												
Mar., 1930....	4,792,936	12.6	4,529,014	6.54	484,312	47.6						
Apr.....	4,981,987	7.42	4,077,371	2.02	764,786	10.76						
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	3.06	680,219	16.82						
Sept.....	4,568,564	9.50	3,789,472	4.40	713,323	12.94						
Oct.....	4,879,570	10.79	3,933,416	7.35	799,118	11.69						
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	6.37	718,129	21.00						
Feb.....	4,234,704	10.90	3,665,038	6.04	601,726	16.4						
Mar.....												
<b>Department of Street Railways, Detroit, Mich.</b>												
Mar., 1930....	2,032,503	16.79	1,741,742	15.17	149,881	43.6						
Apr.....	1,994,861	14.80	1,727,974	12.47	138,595	44.6						
May.....	1,974,359	16.21	1,608,353	17.30	243,875	105.4						
June.....	1,787,953	18.60	1,511,572	14.45	159,027	16.4						
July.....	1,549,503	27.4	1,452,871	14.20	41,888	113.6						
Aug.....	1,516,209	29.1	1,426,941	18.67	52,773	118.4						
Sept.....	1,510,161	26.3	1,436,175	12.69	61,711	119.2						
Oct.....	1,579,476	25.84	1,458,238	14.91	22,933	91.8						
Nov.....	1,481,136	23.35	1,333,571	13.38	4,890	97.8						
Dec.....	1,610,179	22.69	1,440,503	21.67	23,052	77.8						
Jan., 1931....	1,550,656	23.64	1,421,575	20.95	12,759	91.4						
Feb.....	1,431,468	25.58	1,323,683	18.96	28,509	118.1						
Mar.....	1,696,308	16.68	1,415,021	18.68	133,347	11.0						

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

information which previously have been included. The new tables present the gross operating revenue, the operating expenses and taxes, and the net income, along with the per cent of increase or decrease of each. Some twenty companies are included, and it is hoped to expand the service to include as many companies as will make their reports public in this manner. It is planned to continue the presentation month by month in this form, the latest figures being added to the tabulation each time and the oldest figures being dropped.

Since the revenues and expenses are the items of major importance they form the principal basis of comparison. Their movement from month to month and from year to year is a reflection of the state of the business and of the ability of the management of each property to meet the conditions imposed on it.

Net income, which is the resultant surplus after meet-

ing operating expenses and charges, unlike the other figures, does not move along such stable lines. It represents the result of two conflicting trends—the fluctuations in gross revenue and in the results obtained by the management in meeting the demands imposed by such fluctuations. Coupled with this is the influence of any change in charges due to the variation in rates from time to time or by the issue or retirement of obligations. Hence, the net income is subject to much wider fluctuations than either the revenues or the operating expenses. Furthermore, since the charges usually are on an annual basis, it is the practice of many companies to allocate them approximately by months and then make an adjustment in the month when the actual figure for the period is obtained. Accordingly, the figures for net income are likely to be less stable than those for revenues and expenses. They do, however, form a guide as to the

### Trend of Revenues and Expenses by Months (Continued)

Operating Revenue \$ Increase or Decrease Per Cent\* Operating Expense and Taxes \$ Increase or Decrease Per Cent\* Net Income \$ Increase or Decrease Per Cent\*

Operating Revenue \$ Increase or Decrease Per Cent\* Operating Expense and Taxes \$ Increase or Decrease Per Cent\* Net Income \$ Increase or Decrease Per Cent\*

Eastern Massachusetts Street Railway, Boston, Mass.						
Mar., 1930.....	711,460	3.92	479,649	1.21	159,907	30.4
Apr.....	651,636	9.02	446,282	3.06	47,051	53.03
May.....	663,941	7.87	451,941	8.04	53,076	34.2
June.....	619,456	9.64	435,292	6.43	28,672	58.4
July.....	617,220	10.11	461,048	7.27	3,926	91.22
Aug.....	624,332	9.42	444,429	10.33	28,399	62.0
Sept.....	612,237	7.12	448,470	0.88	21,771	70.8
Oct.....	623,872	8.48	467,773	4.92	15,811	71.9
Nov.....	590,856	10.90	449,032	1.60	205	97.62
Dec.....	670,964	12.08	516,913	1.71	20,841	84.0
Jan., 1931.....	700,961	7.63	472,079	2.88	36,145	66.3
Feb.....	639,344	6.62	434,904	2.83	33,058	60.9
Mar.....						

Illinois Terminal Company, Springfield, Ill.						
Mar., 1930.....	579,969	3.66	424,086	1.60	111,120	20.04
Apr.....	590,334	1.65	423,704	5.90	131,438	19.13
May.....	608,403	4.65	427,471	2.78	142,226	10.42
June.....	566,548	8.98	444,338	0.00	86,421	36.0
July.....	601,515	11.03	475,856	3.24	87,602	35.7
Aug.....	661,520	7.65	466,816	12.07	152,827	12.15
Sept.....	654,477	5.26	454,818	9.66	160,897	14.62
Oct.....	691,672	2.54	506,107	2.41	148,701	11.61
Nov.....	542,672	11.03	430,907	6.24	80,529	23.1
Dec.....	577,425	13.69	421,987	14.26	127,588	5.66
Jan., 1931.....	509,641	20.77	395,953	19.80	87,742	9.83
Feb.....	498,067	5.89	388,126	13.22	84,381	2.26
Mar.....						

Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.						
Mar., 1930.....	81,589	8.60	69,327	2.83	13,265	12.45
Apr.....	71,000	13.63	65,916	5.64	21,349	19.65
May.....	79,126	6.80	65,512	0.00	13,182	32.2
June.....	72,865	15.19	65,324	25.80	12,940	172.9
July.....	60,907	21.02	64,134	11.68	24,217	110.0
Aug.....	64,592	18.82	62,484	8.19	12,690	36.45
Sept.....	72,267	11.61	63,549	5.42	8,497	495
Oct.....	75,708	17.80	66,353	0.69	18,447	227
Nov.....	72,024	13.82	66,314	0.23	21,171	168.3
Dec.....						
Jan., 1931.....	79,764	15.78	67,438	7.38	13,133	236
Feb.....						
Mar.....						

Interborough Rapid Transit Company, New York, N. Y.						
Mar., 1930.....	6,436,421	2.44	4,164,759	9.60	199,385	129.1
Apr.....	6,276,781	2.03	4,109,557	9.63	161,204	126.7
May.....	6,287,149	0.41	4,095,439	9.22	144,798	122.2
June.....	5,832,071	1.85	4,027,730	10.58	218,727	342.5
July.....	5,382,547	1.53	4,078,983	2.52	521,582	73.6
Aug.....	5,183,166	4.59	4,211,083	5.06	763,432	178.1
Sept.....	5,684,267	0.17	3,983,368	7.78	131,270	204.2
Oct.....	6,315,679	1.13	4,162,660	0.87	161,417	207
Nov.....	5,965,365	4.96	3,869,340	0.00	272,021	122.1
Dec.....	6,477,864	0.52	4,194,315	3.96	293,152	47.4
Jan., 1931.....	6,123,645	4.42	4,538,833	10.83	348,973	66.0
Feb.....	5,570,354	3.27	3,653,798	2.10	321,587	10.36
Mar.....	6,293,013	2.24	3,973,704	4.61		6.65

Galveston-Houston Electric Railway, Houston, Tex.						
Mar., 1930.....	42,390	14.80	28,956	6.15	59,154	117.1
Apr.....	41,348	12.15	27,417	10.00	61,938	106.5
May.....	41,686	15.21	27,945	12.21	65,653	101.8
June.....	45,659	20.34	28,273	10.93	74,054	114.5
July.....	46,757	9.65	29,248	3.52	78,159	123.5
Aug.....	47,425	11.42	28,402	8.12	82,135	146.1
Sept.....	42,823	16.49	28,052	14.83	84,893	144.2
Oct.....						
Nov.....	36,974	12.49	44,183	65.2	93,685	126.9
Dec.....	36,166	15.00	27,949	1.79	99,343	112.9
Jan., 1931.....	33,291	20.15	25,597	9.18	105,000	110.4
Feb.....	32,281	19.80	22,990	9.64	111,369	110.0
Mar.....						

Jacksonville Traction Company, Jacksonville, Fla.						
Mar., 1930.....	95,864	10.18	81,077	8.26	65,995	39.2
Apr.....	91,163	6.41	80,115	7.57	65,138	39.5
May.....	89,731	9.29	80,106	7.92	66,663	39.8
June.....	79,087	12.73	77,848	7.08	71,399	41.6
July.....	78,772	11.02	77,787	11.27	70,688	35.34
Aug.....	77,441	12.1	78,177	13.32	68,183	19.92
Sept.....	78,529	9.54	75,012	11.15	66,395	8.16
Oct.....	84,424	12.50	76,374	13.72	65,525	2.19
Nov.....	81,250	12.24	69,437	16.02	62,599	0.15
Dec.....	89,903	11.47	74,836	11.49	68,204	4.62
Jan., 1931.....	87,160	8.08	77,998	13.67	58,133	11.98
Feb.....	76,205	15.60	75,462	28.14	77,874	23.4
Mar.....						

Houston Electric Company, Houston, Tex.						
Mar., 1930.....	274,515	8.28	194,809	4.40	623,313	73.0
Apr.....	261,403	6.81	188,034	3.62	615,008	33.9
May.....	262,653	8.60	194,968	1.94	597,837	4.66
June.....	247,461	11.87	179,084	10.27	589,240	6.38
July.....	247,070	10.86	176,909	11.82	584,163	1.24
Aug.....	244,033	12.41	177,452	10.89	573,872	4.18
Sept.....	251,919	9.00	175,905	10.42	571,857	5.84
Oct.....	267,306	7.57	181,499	10.67	573,425	4.16
Nov.....	247,210	10.00	176,739	1.96	550,635	9.55
Dec.....	258,219	9.84	180,678	0.68	524,458	16.64
Jan., 1931.....	242,554	10.52	176,792	11.08	518,843	17.70
Feb.....	223,256	14.11	163,249	12.96	507,328	20.2
Mar.....						

Kansas City Public Service Company, Kansas City, Mo.						
Mar., 1930.....	736,416	7.75	597,210	1.57	63,427	49.7
Apr.....	715,707	4.85	602,031	0.50	39,101	37.0
May.....	719,705	5.03	594,064	1.49	45,132	41.2
June.....	656,292	8.03	562,308	4.19	6,396	84.8
July.....	635,205	11.10	573,990	2.92	21,365	141.3
Aug.....	622,554	13.17	530,094	11.41	15,479	64.3
Sept.....	650,114	9.99	524,324	12.12	50,261	1.32
Oct.....	725,428	4.89	700,311	12.90	60,435	190.8
Nov.....	706,577	5.29	572,066	7.04	58,994	5.69
Dec.....	758,045	1.73	570,065	14.58	108,444	23.4
Jan., 1931.....						
Feb.....						
Mar.....						

Hudson & Manhattan Railroad, New York, N. Y.						
Mar., 1930.....	1,078,807	1.04	531,327	2.72	212,760	1.83
Apr.....	1,063,729	0.21	515,470	1.85	213,380	9.06
May.....	1,039,637	2.79	509,707	3.06	194,759	2.49
June.....	989,627	1.69	499,396	1.74	154,985	4.49
July.....	954,538	3.12	502,515	1.61	116,747	15.77
Aug.....	934,204	5.65	499,806	3.98	98,977	26.28
Sept.....	974,433	2.80	506,845	0.23	132,332	19.02
Oct.....	1,033,584	4.33	521,325	1.97	176,999	17.8
Nov.....	994,735	6.18	489,761	4.08	169,465	21.42
Dec.....	1,060,614	4.66	419,109	17.40	306,321	12.07
Jan., 1931.....	1,005,022	7.62	512,350	7.23	157,098	21.37
Feb.....	936,542	5.67	467,137	6.09	134,717	16.34
Mar.....	1,013,577	6.05	497,695	6.34	180,554	15.10

Long Island Railroad, New York, N. Y.						
Mar., 1930.....	2,958,720	0.23	2,455,517	1.41	360,645	24.45
Apr.....	3,123,136	3.33	2,449,645	0.09	523,097	15.87
May.....	3,346,650	6.25	2,542,463	3.10	632,246	18.1
June.....	3,662,765	4.22	2,512,947	3.06	994,868	4.62
July.....	4,018,939	5.76	2,668,042	3.56	1,180,528	11.19
Aug.....	3,968,936	5.21	2,635,376	5.06	1,152,651	6.68
Sept.....	3,589,671	7.33	2,467,056	7.07	928,655	6.68
Oct.....	3,371,761	5.80	2,446,346	8.97	729,067	1.77
Nov.....	2,954,624	4.20	2,249,258	14.56	483,180	89.2
Dec.....	2,905,045	6.60	2,130,182	16.27	598,812	47.1
Jan., 1931.....	2,763,421	5.65	2,210,263	9.65	321,141	6.0
Feb.....	2,561,169	7.43	2,074,216	9.13	332,002	3.86
Mar.....						

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

†Net Income is shown for the preceding twelve months.

## Trend of Revenues and Expenses by Months (Concluded)

Market Street Railway, San Francisco, Cal.				Staten Island Rapid Transit Company, New York, N. Y.							
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*
\$		\$		\$		\$		\$		\$	
<b>Market Street Railway, San Francisco, Cal.</b>				<b>Staten Island Rapid Transit Company, New York, N. Y.</b>							
Mar., 1930.....	809,658	1.22	680,035	1.61	72,867	3.18	Mar., 1930.....	188,807	23.60	172,481	10.43
Apr.....	798,970	3.66	637,121	8.72	76,480	11.0	Apr.....	198,184	9.46	169,662	11.10
May.....	792,536	3.28	675,407	1.18	61,527	22.0	May.....	214,848	20.61	176,605	9.84
June.....	743,277	4.64	646,615	1.84	42,297	45.9	June.....	224,980	18.31	178,999	10.17
July.....	735,453	5.87	649,901	1.68	32,534	46.4	July.....	243,991	9.93	189,173	39.2
Aug.....	770,284	6.69	643,287	5.46	72,923	16.66	Aug.....	233,371	13.92	168,110	11.19
Sept.....	745,298	5.35	626,770	3.74	64,731	16.38	Sept.....	206,908	15.93	165,525	4.87
Oct.....	786,012	6.73	675,908	6.49	57,384	45.6	Oct.....	205,631	10.58	167,586	6.49
Nov.....	729,407	8.81	615,613	6.18	60,457	29.3	Nov.....	178,552	17.42	161,608	0.58
Dec.....	775,508	5.12	639,249	5.52	83,460	0.0	Dec.....	178,474	9.08	160,715	47.3
Jan., 1931.....	738,092	5.55	641,519	4.83	45,011	12.31	Jan., 1931.....	170,387	9.58	158,982	6.35
Feb.....	668,931	8.17	576,661	8.22	41,002	7.29	Feb.....	161,415	13.58	142,565	9.20
Mar.....	757,960	6.40	.....	.....	72,828	0.0	Mar.....	.....	.....	.....	.....
<b>New York, Westchester &amp; Boston Ry., New York, N. Y.</b>				<b>Third Avenue Railway System, New York, N. Y.</b>							
Mar., 1930.....	208,434	4.70	139,502	4.16	157,515	3.16	Mar., 1930*.....	1,252,562	7.02	1,048,297	5.86
Apr.....	214,672	7.42	141,393	10.06	158,947	0.98	Apr*.....	1,236,554	6.16	1,026,448	4.64
May.....	230,781	3.44	149,901	3.66	148,173	7.86	May*.....	1,291,409	6.92	1,043,554	7.63
June.....	.....	.....	.....	.....	.....	.....	June*.....	1,244,961	6.73	1,018,619	7.64
July.....	224,469	5.89	146,233	6.00	152,633	5.38	July.....	1,429,730	5.18	1,212,311	8.54
Aug.....	196,405	10.53	152,180	0.41	184,982	22.4	Aug.....	1,350,064	5.88	1,180,853	8.08
Sept.....	203,617	8.18	165,256	6.57	192,861	29.6	Sept.....	1,428,136	3.48	1,167,528	8.36
Oct.....	202,046	7.52	138,192	14.1	190,748	20.81	Oct.....	1,456,688	4.03	1,205,455	9.73
Nov.....	184,690	8.74	170,542	2.52	216,451	19.75	Nov.....	1,373,335	5.37	1,146,168	10.17
Dec.....	190,136	12.31	138,592	17.80	205,029	16.75	Dec.....	1,438,752	3.49	1,197,249	8.51
Jan., 1931.....	182,249	13.76	160,800	9.44	220,394	32.4	Jan., 1931.....	1,393,054	5.10	1,178,797	9.14
Feb.....	161,311	15.02	149,571	11.18	222,308	29.4	Feb.....	1,274,832	4.27	1,070,307	8.56
Mar.....	.....	.....	.....	.....	.....	.....	Mar.....	.....	.....	.....	.....
<b>Northwestern Pacific Railroad, Sausalito, Cal.</b>				<b>United Railways &amp; Electric Company, Baltimore, Md.</b>							
Mar., 1930.....	406,807	6.35	476,912	5.31	73,821	15.84	Mar., 1930.....	1,484,031	1.59	1,149,498	1.63
Apr.....	434,145	4.04	482,221	3.74	55,856	18.5	Apr.....	1,449,416	1.82	1,117,959	1.23
May.....	485,027	9.33	482,698	5.49	2,800	103.81	May.....	1,457,181	0.42	1,125,365	0.52
June.....	504,138	4.31	448,510	3.76	42,824	29.3	June.....	1,332,275	2.63	1,043,008	2.92
July.....	597,419	2.54	392,575	18.52	195,195	55.4	July.....	1,236,414	6.91	964,582	6.24
Aug.....	638,476	11.43	415,502	18.64	210,115	4.03	Aug.....	1,198,180	8.34	831,241	18.41
Sept.....	548,282	8.68	471,657	3.78	16,471	83.5	Sept.....	1,261,734	6.71	995,805	5.02
Oct.....	555,867	18.5	534,858	4.44	7,447	95.22	Oct.....	1,354,086	7.22	1,049,306	4.84
Nov.....	333,193	27.7	421,717	16.53	97,567	120.9	Nov.....	1,263,811	10.26	983,047	7.40
Dec.....	312,319	32.2	465,220	3.16	158,491	74.6	Dec.....	1,350,553	8.19	1,043,315	7.25
Jan., 1931.....	283,852	21.8	401,656	14.41	123,928	14.76	Jan., 1931.....	1,268,536	10.90	994,411	11.89
Feb.....	273,818	27.4	387,512	12.96	122,531	68.9	Feb.....	1,136,604	15.78	891,421	15.97
Mar.....	.....	.....	.....	.....	.....	.....	Mar.....	.....	.....	.....	.....

\*Decreases or deficits are shown by italic figures.

financial position of the company, and as such are valuable.

It is evident from the figures which are published on electric railway earnings that the business depression was not fully felt for the first few months of 1930. While many companies sustained small reductions in

gross revenue, such losses were less than might have been expected following the good showing made in 1929. In fact, some companies actually showed a gain in gross during this period. As the year progressed it became increasingly evident that the depression was growing worse and that the losses in revenue were becoming steadily greater month after month. This trend is only now slackening. In amount the reductions in revenue varied on the different properties, but they have been general throughout the industry. Even the best properties have suffered.

Operating economies have been general. Although the past years had seen the introduction of modern methods that reduced expenses materially, and it was felt by leading operators that everything possible had been done along these lines, the past year has seen drastic retrenchment in the endeavor to minimize the effect of the losses in revenue. Such economies as have been introduced have been made with comparatively little adverse effect on the quality of service rendered. It is, of course, questionable whether the properties are being maintained as they should be. This may necessitate greater expenditures for deferred maintenance as soon as revenues warrant with returning prosperity.

### Monthly and Other Reports

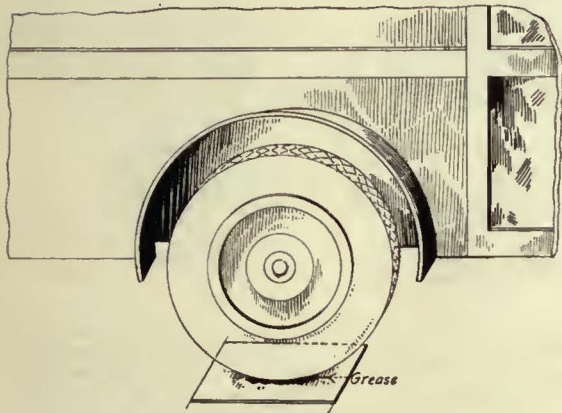
	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
<b>Calgary Municipal Railway, Calgary, Alta.</b>					
2 mo. end. Feb., 1931..	133,635	95,490	.....	20,743	13,118
2 mo. end. Feb., 1930..	181,756	107,046	.....	74,710	22,611
<b>Edmonton Radial Railway, Edmonton, Alta.</b>					
February, 1931.....	60,638	43,006	.....	17,631	4,798
February, 1930.....	75,916	45,917	.....	29,998	2,771
2 mo. end. Feb., 1931..	130,658	89,101	.....	41,556	4,302
2 mo. end. Feb., 1930..	161,151	98,939	.....	62,211	5,098
<b>Honolulu Rapid Transit Co., Honolulu, Hawaii</b>					
February, 1931.....	76,998	48,250	8,998	20,743	10,286
February, 1930.....	82,620	51,782	8,819	22,969	11,141
2 mo. end. Feb., 1931..	161,246	99,891	17,996	45,329	24,415
2 mo. end. Feb., 1930..	169,477	106,289	17,638	47,739	24,084
<b>Lethbridge Municipal Railway, Lethbridge, Alta.</b>					
2 mo. end. Feb., 1931..	7,097	6,744	.....	353	4,771
2 mo. end. Feb., 1930..	10,256	8,264	.....	1,992	3,179
<b>Regina Municipal Railway, Regina, Sask.</b>					
2 mo. end. Feb., 1931..	60,379	45,239	.....	15,140	13,051
2 mo. end. Feb., 1930..	87,637	55,542	.....	31,825	7,697
<b>Saskatoon Municipal Railway, Saskatoon, Sask.</b>					
February, 1931.....	59,343	41,724	.....	17,619	5,365
February, 1930.....	87,823	51,688	.....	32,661	7,726
<b>Mexico Tramways, Mexico City, Mex. (In pesos)</b>					
January, 1931.....	759,950	878,660	.....	118,710	.....
January, 1930.....	840,480	897,210	.....	56,730	.....
February, 1931.....	704,950	825,430	.....	120,480	.....
February, 1930.....	773,110	837,890	.....	64,780	.....
2 mo. end. Feb., 1931..	1,464,900	1,704,090	.....	139,190	.....
2 mo. end. Feb., 1930..	1,613,590	1,735,100	.....	121,510	.....

In the June Number  
will be abstracted  
**Additional Annual Reports**  
which have become available since the publication  
of the financial review in the April number



# PRACTICAL IDEAS for the

## Maintenance Man



A little grease on the sheet will make hard pushing unnecessary in replacing heavy bus wheels

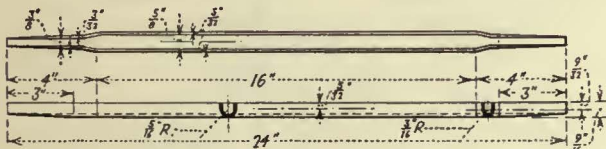
### Skid Plate for Replacing Bus Wheels\*

BY FARRELL TIPTON  
Electrician  
San Diego Electric Railway

WHEN replacing heavy bus wheels on the axles much resistance is encountered because of the contact of the tire with the ground. To eliminate this resistance without the need of jacking the bus too high a piece of sheet metal, about 20x20 in., is placed on the ground beneath the axle and is covered with a thin layer of lubricating grease. The wheel will then encounter practically no resistance at the tire rim, and as a result it can be pushed on the axle with little effort.

### Protecting Sleeve for Trolley Ears\*

BY R. J. RUSSELL  
Pittsburgh Railways



Copper sleeves have increased the life of trolley ears on the Pittsburgh Railways

FOR several years the Pittsburgh Railways has been experimenting with a copper sleeve or trolley protecting armor to reinforce a line ear that is worn out in service and obviate its removal. In the development of this sleeve ease of installation and removal, cost and life as compared to a line ear were the important factors taken into consideration. As the result of these experiments a sleeve of the type illustrated was developed. The cost of the sleeve, including the cost of a die which

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

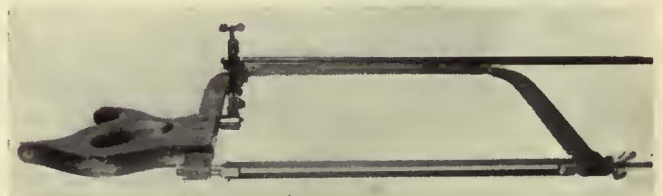
was absorbed with the first order, is approximately two-thirds that of a new trolley ear, and naturally succeeding orders will be cheaper. The sleeve is attached to the trolley wire by clinching it for a distance of 4 in. at each end of the ear. It is removed by running a stripping tool through the clinched ends. The average life of the sleeve was found to be longer than that of the average line ear.

A substantial yearly saving has been made with the use of this sleeve. This saving was due to the difference in cost between the sleeve and line ear, the lower cost of labor for installation and removal and the longer life of the sleeve as compared to that of the line ear.

### Double-Blade Hacksaw Gives Parallel Rail Ends

BY J. A. KRAMER  
Department of Street Railways  
Detroit, Mich.

MAJOR track repairs in Detroit, when new rail is not laid, are made by removing broken or badly worn rails and broken joints, sliding the remaining rails together and installing new rails at car stops where the wear is greatest. The joints are then welded with thermit, as are all rail joints in new construction.



Use of a double-blade hacksaw in Detroit has resulted in better thermit joints at lower labor cost

In order to make satisfactory thermit welds when repairing joints of this type, the abutting ends of the rail must be squared to obtain the necessary smooth surfaces for the use of an insert, or for tight butting of the rail ends when no insert is used. Using a single hacksaw there frequently was a variation in the angles of the two abutting cut ends. The inserts then had a tendency to work loose, or, when no insert was used, the resulting joint was frequently uneven.

In order to make the rail ends parallel, a double-blade hacksaw has been developed which cuts the two adjacent rail ends at the same time. This tool has effected a saving in the labor cost for sawing and also obviates any difference in the angles of the two cuts. It has been found that two men take approximately 40 minutes to make the two cuts with a single-blade hacksaw. With the double-blade saw these two cuts are made simultane-

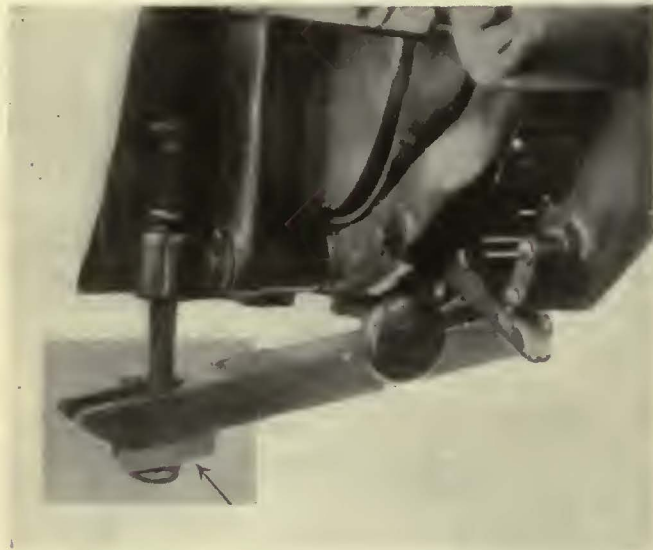
ously in practically the same time required for the single cut, saving half the labor.

The double-blade hacksaw illustrated was made from an ordinary single-blade saw frame by removing the tension keys at each end and substituting heavier ones.  $\frac{3}{8}$  in. thick, with pins at each side to hold the blades. These keys separate the two blades by  $\frac{1}{2}$  in. Both blades are tightened with the same tension key, so that at all times there is uniform tension on the two blades.

## Circuit Breakers Reset Quickly With Calibrated Plugs\*

BY F. W. BRAUND  
Superintendent of Power Conversion  
Cleveland Railway

**D**IRECT-CURRENT circuit breakers controlling outgoing railway feeders, and likewise those protecting conversion or generating equipment, must obviously be set at tripping values in excess of peak-load demands. On the average electric railway the peak load is often two to three times the base load. To protect continuity of operation of the distributing station properly during off-peak periods the direct-current



Red fiber plugs of varying thickness are used to readily set circuit breakers at lower tripping values during off-peak periods

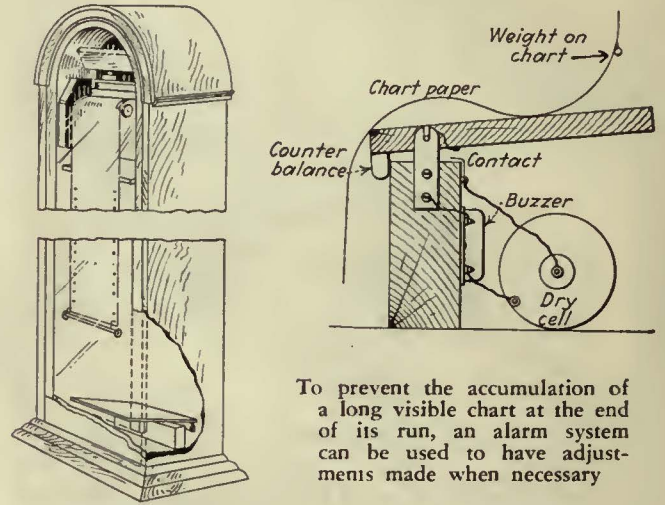
feeder circuit breakers should be reset at lower tripping values, for frequently the peak-load setting of but one feeder in a group will represent 75 per cent to 90 per cent of the capacity of one converter or generator which may be operated alone on the base schedule. To protect the conversion or generating equipment during off-peak periods without the necessity of recalibrating circuit breakers several times a day, a calibrating plug has been developed by the Cleveland Railway.

Peak-load setting, amperes.....	4,000	3,000	2,500	2,000	1,600	1,400
Thickness of plug, inches.....	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$
Base-load setting, amperes.....	3,000	2,500	2,000	1,600	1,400	1,200

The plug is readily inserted under the breaker tripping armature, and any degree of recalibration can be obtained by the use of plugs of varying thickness, made of red fiber. The table indicates the thickness of the plugs and their effect upon the breaker setting when used in conjunction with the standard GE air circuit breaker, Type C, Form K-2, 650-volt, 2,000-amp.

## Recording Chart Alarm\*

BY SIDNEY HARRIS  
Electrical Department  
Toronto Transportation Commission



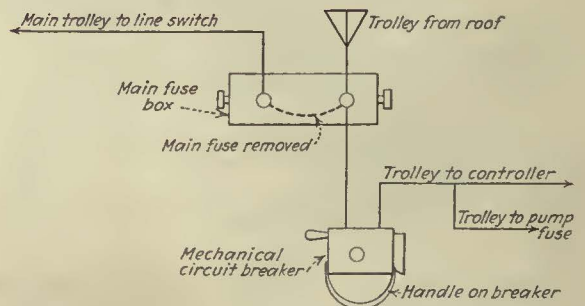
To prevent the accumulation of a long visible chart at the end of its run, an alarm system can be used to have adjustments made when necessary

**O**N certain recording charts where it is desirable to have several feet of chart visible at all times, as shown in the illustration, it has been found desirable to replace the reroll with a weight hanging on the chart. At certain times of the day when a reduced office staff is on duty it is often forgotten to move the weight up the chart when it has run the fixed distance. An alarm device was developed to remind the person in attendance to rearrange the weight when it is necessary.

When the weight reaches the bottom of the case it rests upon a counterweighted platform depressing it so that electrical contacts are closed and a buzzer sounds until weight is removed from the platform.

## Portable Circuit Breaker Used to Run Disabled Cars to the Barn\*

BY R. W. JAMES  
Ottawa Electric Railway



Portable circuit breaker can be connected to a disabled car in about two minutes

**F**AILURE of line switches or line switch cables has been the cause of many pull-ins on the Ottawa Electric Railway. Often, in towing disabled cars to the carhouse, the draw-bars are bent, the bumpers are broken,

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

and the car flashing is badly damaged. To prevent these damages and to avoid towing cars disabled because of defective line switches, a mechanical line switch has been developed to enable a repair man to put it on the car in the street. When a defective switch disables a car in service it is pushed by another car to the nearest loop or siding, and a repair man is dispatched with the mechanical circuit breaker to connect it to the car as quickly as possible and to run the car on its own power.

The circuit breaker can be connected to the disabled car in about two minutes. One lead of the circuit breaker

is connected to the large side of the main fuse box after removing the fuse; the other lead is then connected to the trolley connection in the controller. There is a wire tapped from this connection which may be switched to the dead side of the compressor fuse block. If it is dark, a short wire can be run from the compressor fuse block to the light fuse. The car can be then safely operated as the air pressure and lights are available. When the car has been taken to the barn, the portable circuit breaker remains connected until the damaged circuits are repaired.

## Troubles with Train Line Jumpers Reduced by Systematic Inspection

By G. L. MOSES

*Renewal Parts Engineer  
Westinghouse Electric & Manufacturing Company*

**S**YSTEMATIC inspection and maintenance of train line jumpers and receptacles will keep the cost of maintaining these parts to a minimum and improve the reliability of multiple-unit cars in service. The jumpers unite the "nervous systems" of all the motor cars in a multiple-unit train, and enable one operator to control a number of cars as a unit. Failure of these jumpers or receptacles may render a train inoperative.

Jumpers which are in continuous service should be inspected regularly. Inspection periods of a month have been found satisfactory. Many operators mark the jumper castings with a dot of colored paint to indicate the period of inspection, each period having a color. The best method of inspecting removable jumpers is to have two receptacles mounted on a bench, wired to place all jumper circuits in series. Inspection is begun by passing 50 amp. through the jumper for three minutes. The inspector should move the cable to duplicate service conditions and watch the ammeter for changes in current. Any defects in the jumper, such as bad contacts, loose connections and broken conductors, will be indicated. An insulation test at 2,000 volts, a.c., 60 cycles, should be made from all conductors to the castings and between individual conductors.

Defective jumpers and receptacles should be taken apart by first removing the bolts holding the castings together. The castings can then be pulled apart. It may be necessary to heat the castings slightly with a blow torch to loosen the insulating gum. When the castings are removed from the cable and contact block assembly, the gum should be removed by chipping or melted off by pouring hot gum over it.

It is important that the quality of replacements be at least equal to the quality of the original parts. It is uneconomical to use replacements of inferior quality. Contact parts should be of high-grade phosphor bronze to insure long life. Contact blocks should be of molded composition or of good-grade wood, properly seasoned and impregnated. Castings of malleable iron will insure long life and prevent breakage under the severe duty imposed in railway service. The impregnating gum should be free from impurities and should have good insulating qualities. Flexible multiple-conductor cable

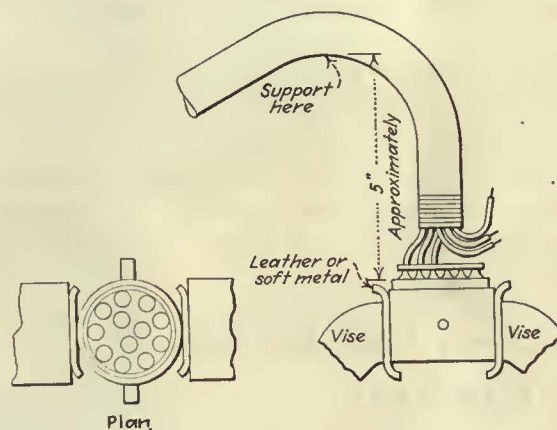
should be used, having a steel core in each conductor to give proper strength.

If an old contact block is used, the fiber pins should be sheared off flush, and the dirt and carbon removed. It should then be shellacked. If the block shows evidence of burning it must be tested before the leads are soldered. Dirty contact holes should be drilled with the next larger size drill.

From  $2\frac{1}{4}$  to  $2\frac{3}{4}$  in. of outer insulation must be removed from the cable, depending upon its number of separate conductors, and about  $\frac{3}{4}$  in. of insulation must be removed from each separate conductor. Care should be taken not to nick the strands of wire. Tin all cable ends and wrap the ends of the insulation with waxed thread.

The leads should be soldered with a blunt iron to quicken the process and prevent the contacts from burning the block. Soldering should be done carefully, so that the contact block or insulation will not be injured. Alcohol and resin or some neutral soldering paste flux should be used; never use acid. After soldering remove excess solder and flux. If particles of solder are on the block, it must be scraped and given a thin coat of shellac.

Practically every train line jumper has one electrical cross-connection. This does not require a mechanical cross. Most of the wires not electrically crossed must be mechanically crossed at one end or the other of the cable.



A safe and convenient way of connecting jumper leads to the head

These mechanical crosses should be divided between the two jumper heads, thus reducing the number of crosses to be made in each head and reducing the complications. When a cable having a large number of separate conductors is used, it is advisable to cross all the necessary center wires at one end and to cross the outer wires at the other end. While making the center connections, the outer ring of wires may be tied back to the cable with twine or tape to prevent interference.

When assembling jumpers and receptacles, care should be taken to line up the contacts. They should be lined up with gages, the lugs in the jumper and the grooves in the receptacle being used as guides. After the contacts are lined up properly and the contact block is clamped, new holes for the fiber pins must be drilled, and new pins inserted. A hex shank screwdriver and a wrench can be used conveniently to fasten the grip castings together securely.

Before clamping the block in the castings, the wires should be arranged so that the gum will surround each individual wire. None of the wires should touch the metal casting. The cable should be taped where it passes between the casting grips to insure that it is clamped securely. The head should be tilted to allow the cavity to be filled with gum. Do not screw the pipe plug into place until the compound has cooled.

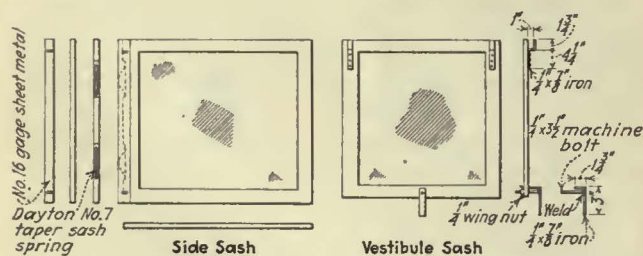
After the jumper or receptacle is completely assembled, the connections of all circuits should be checked. Finally, it is recommended that a momentary insulation test at 2,000 volts, a.c., 60 cycles, be made between the separate conductors and between each conductor and the casting to insure against shorts or grounds.

## Emergency Sash for Broken Car Windows\*

By W. H. McALONEY  
Superintendent of Equipment  
Georgia Power Company,  
Atlanta, Ga.

**E**MERGENCY sash, one type for the front drop vestibule windows and one type for the side raised windows, have been developed by the Georgia Power Company, Atlanta, to replace broken window sash when cars are in service. The change from the broken window sash to the emergency sash can be made in very little time so that the car can complete the run without danger to the passengers.

The drop sash window is fixed with stationary brackets at the top and adjustable brackets at the bottom. By dropping the broken glass sash the stationary brackets of the emergency sash can be put in place at the top of the window sill outside of posts and the adjustable



Broken window sash can be replaced by emergency sash to avoid danger to passengers when a car is in service

brackets can quickly be fastened on the bottom of the window sill with a wing nut. The side emergency sash has two sash springs fixed on one side, over which is placed a sheet metal housing fitting into the sash run. By raising the broken glass sash, the emergency sash can be pressed into place so that the pressure of the spring housing in the sash run will hold it. The broken window is then lowered to rest on the top of the emergency window.

## Device for Removing and Installing Couplers\*

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



This convenient device makes removal and installation of automatic couplers easy in Hamburg

**R**EMOVAL and attachment of the universal couplers used on the elevated cars of this company are facilitated by the device illustrated. Formerly it took four men to do this work, as the couplers weigh about 140 kg. (300 lb.), and, on account of the limited space, injuries were not infrequent. Now only one man is needed.

As shown in the illustration, the device consists of a small portable crane carrying a swiveling horizontal rail used as a runway to support a suspended pulley. This is attached to the car bumper in about three minutes by engaging the bottom of the vertical column with a pin in one of the 12-mm. ( $\frac{1}{2}$ -in.) holes in the bumper. It is held fast with a through bolt. For removal the coupler is held by the tackle and unfastened. Then it is dropped and rolled outward so that it can be placed on a table. Installation is made in the reverse order. Increased safety is assured by the method. The device cost 50 reichsmarks (\$12) and weighs 22 kg. (48 lb.).

\*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

# The Taxi-Coach

*A New Development  
in the Bus Field*



1—Rear compartment, showing the upholstered individual seats and stanchions with fare slots



2—Operator's seat is in the front compartment placed high above the front wheels. Fare receptacle is at the left of the operator

3—With three compartments and three doors, loading and unloading time should be much less than that of the single-door bus



4—Over-all width has been reduced to that of the conventional automobile for flexibility in traffic



**S**ERVICE, comfort and flexibility approaching that of the private automobile were the goal in the design of the Taxi-Coach just announced by the Twin Coach Corporation, Kent, Ohio. These qualities, it is believed, will attract a large number of people who travel to the business section in private automobiles during the non-peak hours of the day.

The Taxi-Coach is offered as a semi-mass transportation vehicle to be operated with close headways. Having the same width as the conventional automobile it can be maneuvered through city traffic with equal flexibility and ease. Owing to its small capacity and high speed, the vehicle should also be found suitable for frequent service in outlying districts and as feeders to the main lines.

Unusual body style has been obtained by the division of the interior into three compartments, two of which seat six passengers, and the third, five. Each compartment has an entrance and exit door at the right side, within 5 ft. of the left end seat. This arrangement is expected to reduce loading and unloading time. Crowding is eliminated, and a semblance of privacy is created by the compartments and the 22 in. wide individual seats.

The division of the interior into separate cross-wise compartments raised the problem of fare collection. This problem has been met with an ingenious remote fare collecting system. Fares are deposited in a slot in the stanchion alongside of each seat. The passenger deposits the correct coin in the slot as he is seated, and it is then carried by an electro-pneumatic transfer system to individual glass receptacles in the front compartment where it is checked by the operator. Each glass receptacle represents a seat; those seats occupied by passengers should show a coin in the corresponding receptacle. Seats occupied are indicated by small

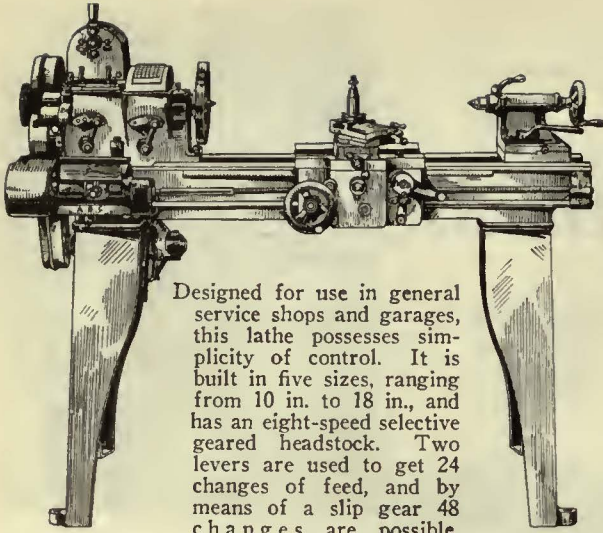
electric lights beside the operator. The operator can transfer the coins, individually or collectively, from the receptacles to a Johnson fare box which counts, separates, then drops the coins into a change-making apparatus. Passengers can secure change from the operator by inserting their money in a separate transfer tube, which delivers it to the operator, and receiving the correct amount in return. Transfers, tickets and passes can also be exchanged in this manner.

An electric sign prominently located on the front end of the bus automatically displays the words "Standing Room Only" when all seats are occupied. This will inform awaiting passengers who may not wish to ride as standees, and thus avoid unnecessary stopping. The three compartments have a total standing room capacity of seventeen.

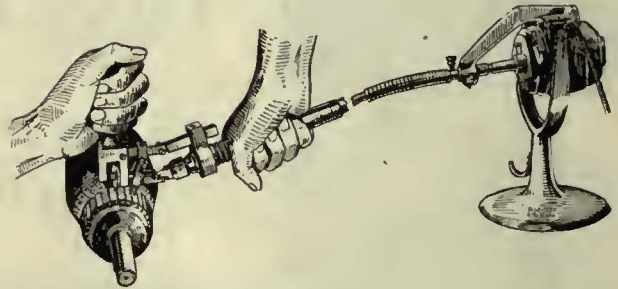
Over-all completed weight, including the 100-hp. engine, has been held to less than 7,500 lb. by the design of a new type of chassis and body structure, and the liberal use of duralumin.

By attaining flexibility in traffic, maximum acceleration and deceleration with comfort to passengers, quick loading and unloading, it is believed that automobile performance is insured with this vehicle.

# Pertinent Briefs



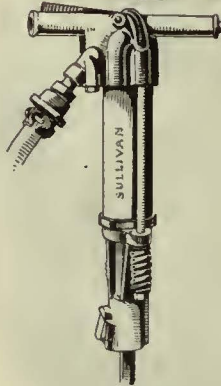
Designed for use in general service shops and garages, this lathe possesses simplicity of control. It is built in five sizes, ranging from 10 in. to 18 in., and has an eight-speed selective geared headstock. Two levers are used to get 24 changes of feed, and by means of a slip gear 48 changes are possible. Manufacturer: LeBlond Machine Tool Company, Cincinnati, Ohio.



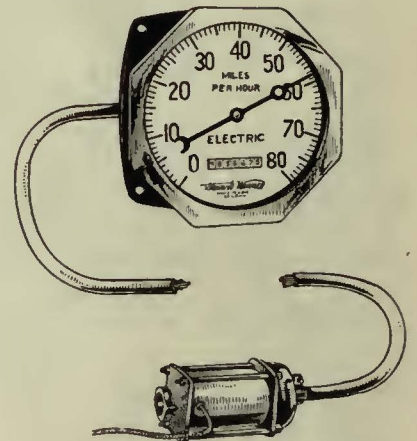
Mica undercutter is equipped with a portable motor,  $\frac{1}{4}$  hp., mounted in a universal swivel yoke, and a flexible shaft, 5 in. long. The driving shaft is chucked in the collet, and has a universal joint to allow undercutting of railway motors without dismantling them. It is also equipped with an adjustable depth gage and two guide rollers with angular adjustment. Manufacturer: Keller Mechanical Engineering Corporation, Brooklyn, N. Y.



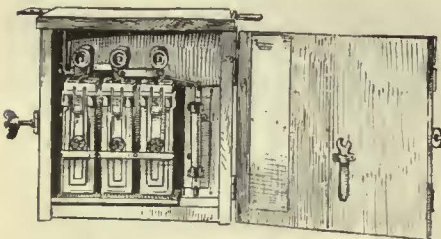
Sheet dryer for blueprints, negatives, blue line and brown line prints up to 24 in. wide is equipped with an electric heater for 110 or 220-volt circuits. With a chromium plated cylinder it can be adapted for drying photo prints. It is also furnished with gas heater. Manufacturer: C. F. Pease Company, Chicago, Ill.



Pneumatic concrete breaker weighs 72 lb. It is said that it runs smoothly and with little vibration, thus reducing fatigue to the operator. It requires a  $\frac{3}{8}$ -in. air hose and connections. Any ordinary form of tool made from hexagonal steel with plain hexagonal collar shank can be used with it. Manufacturer: Sullivan Machinery Company, New York.



No mechanical connections feature this electric speedometer which has only two elements, an indicator and a converter. The latter is assembled directly on the sleeve of the driven gear without reduction through an adapter, and is connected to the indicator by a six-wire cable. The indicator contains a motor operated by battery current. Manufacturer: Stewart-Warner, Chicago, Ill.



Aluminum lightning arrester can be used on cars and in generating plants and substations, indoors or outdoors. With this type there is no need for pole arresters. Arrester is made up of groups of aluminum cells in series, filled with a fluid and supported from porcelain covers to prevent vibration and short circuits. Manufacturer: General Electric Company.



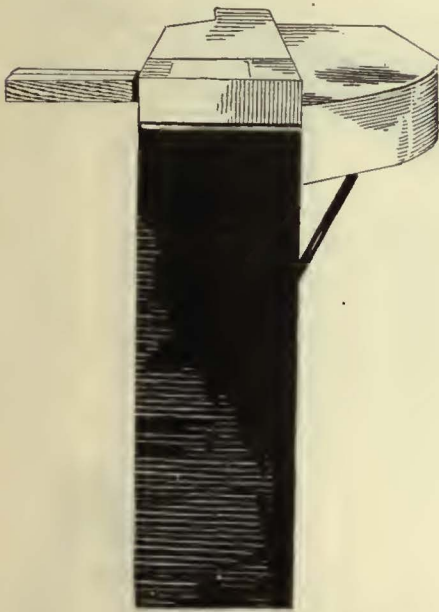
Tie renewal machine removes old ties from the track without need of digging, and inserts new ties without disturbing ballast. The old tie is pushed out as the new tie goes into place. This work can be done in twelve minutes with a crew of three men. Manufacturer: Nicholas R. West, Hohart Building, San Francisco, Cal.

# in New Equipment

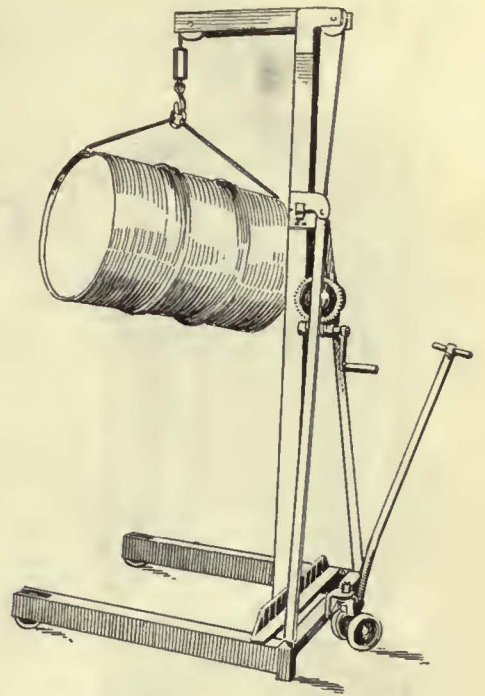


Tree wire has protection against wear from rubbing against tree limbs. The protection is obtained by an armor of brakelining wrapped around the rubber compound insulation. This wire is marketed under the trade name of Okolast. Manufacturer: Okonite Cable Company, Passaic, N. J.

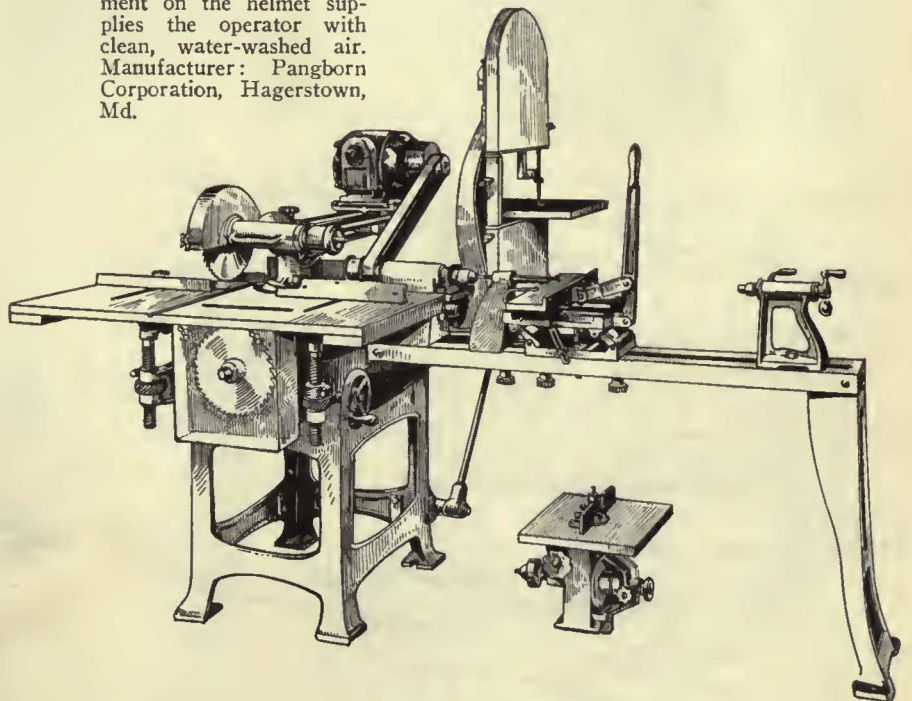
"Coinstile" is entirely mechanical; no electrical connections are necessary. Installation is made by simply bolting down level. Patented cam mechanism makes opening, locking, ejection of coins, registration and silencing positive. Rotary movement of arm is retarded in last 10 deg. of turn. Passage space is 19 in. wide. Manufacturer: American Turnstile & Supply Company, 140 Liberty Street, New York, N. Y.



Sand blast helmet of rubber is fitted with a curved windor which gives operator clear vision. Window is protected against breakage by a wire screen. Both glass and screen are replaceable. An attachment on the helmet supplies the operator with clean, water-washed air. Manufacturer: Pangborn Corporation, Hagerstown, Md.

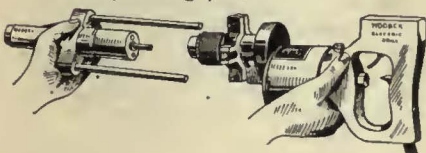


Portable crane for general utility service can be obtained in heights varying from 6 to 14 ft., and capacities from 500 to 2,000 lb. Four types of frames are available: Telescopic, hinged, revolving telescopic and revolving hinged. Hand worm, hand spur or electric worm drive are offered as standard. Manufacturer: Lewis-Shepard Company, Watertown, Mass.



A complete shop is offered in one machine, which combines all the necessary wood-working units, each being individually driven by the same motor. The standard equipment supplied consists of saws, rip saw unit, saw table, swing arm, cross-cut head, jointer, band saw, lathe, shaper, mortiser and boring attachment. Manufacturer: Porter-Cable-Hutchinson Corporation, Syracuse, N. Y.

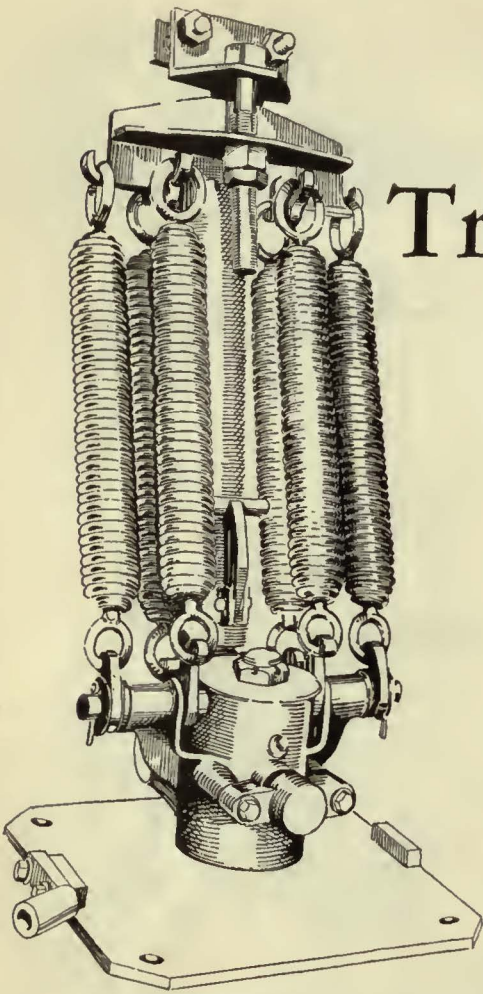
Electric dual twist and hammer drill can bore with equal facility into wood, metal and masonry. It can also be used for grinding, scratching or buffing. The tool is furnished in a case with star and twist drills. Manufacturer: Wodack Electric Tool Corporation, Chicago, Ill.



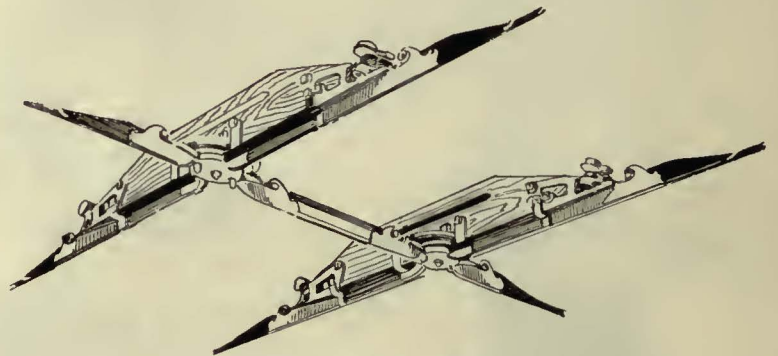
*New Products for*

# Trolley Bus Operation

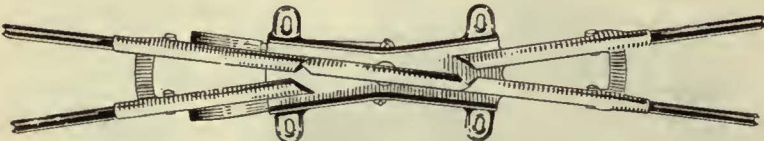
*Developed by the  
Ohio Brass Company*



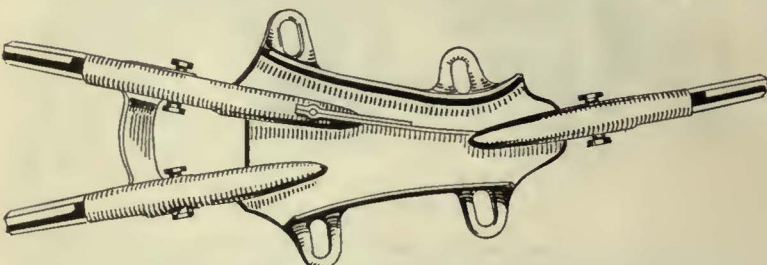
Welded all-steel construction makes this six-spring trolley base for trolley buses 33½ per cent lighter than previous models, without sacrifice of strength. A rubber block instead of buffer springs provides an adequate buffering protection, and a main bearing of Timken adjustable roller bearings allows maximum freedom in lateral movement



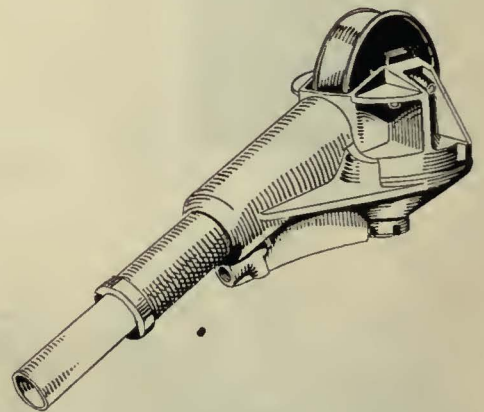
Insulated adjustable crossovers for trolley bus overhead have a higher and longer wood beam than standard, which, with the air gap, provides the additional insulation necessary at crossings of positive and negative wires. These crossovers are adjustable to any angle from 45 to 90 deg., and are designed for one wire over one wire, one wire over two wires, two wires over one wire (as illustrated), or two wires over two wires



An acute angle crossover requires a long pan, but this does not allow the wheel of a trolley bus swivel harp to operate correctly unless a guide runner is placed in the pan. The guide of the illustrated crossover is operated by a trigger mechanism, which places the guide runner in the correct position when the trolley wheel moves under one of the trippers

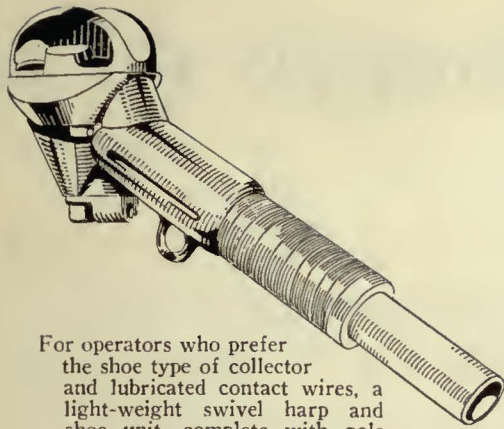


Spring frog, designed for use at points where positive operation is desired, such as wyes, loops and passing sidings. The spring may be furnished for straight line or turn-out as needed

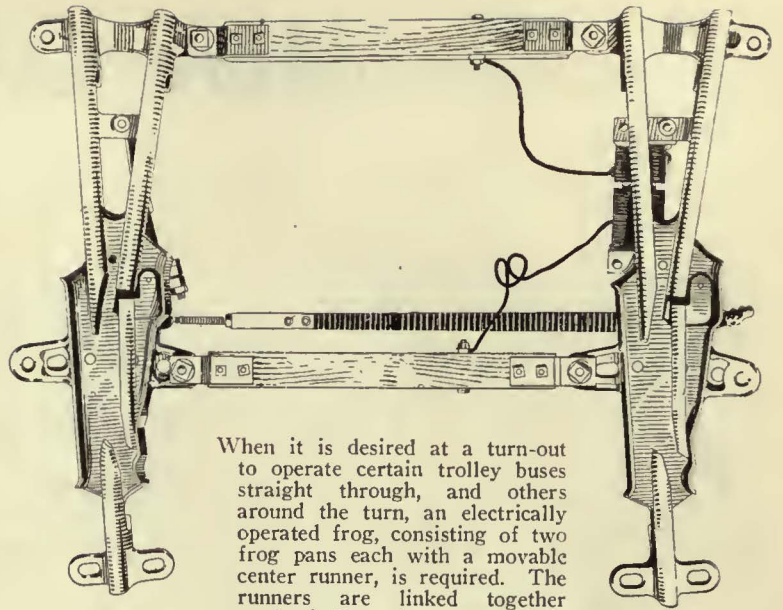


With the swivel casting supported on the pole head by a 4½-in. ball bearing a free rotating action is provided in the improved swivel harp and wheel unit. Current from the wheel is shunted around the bearing. Insulation from the pole is accomplished by a rubber sleeve, which also serves to silence wheel noise. The 4-in. bronze wheel has a special groove. Harp castings are of aluminum

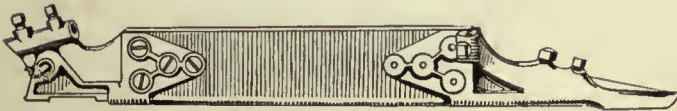




For operators who prefer the shoe type of collector and lubricated contact wires, a light-weight swivel harp and shoe unit, complete with pole end and insulation, has been developed. Construction features are a ball and socket bearing between the shoe and harp; close assembly of swivel joint and shoe, permitting backing; convenient mounting of shoe, allowing quick replacement; copper bearing washer of ample capacity, carrying current through the ball and socket without pitting; heavy rubber insulation, and streamline design, eliminating overhead fouling



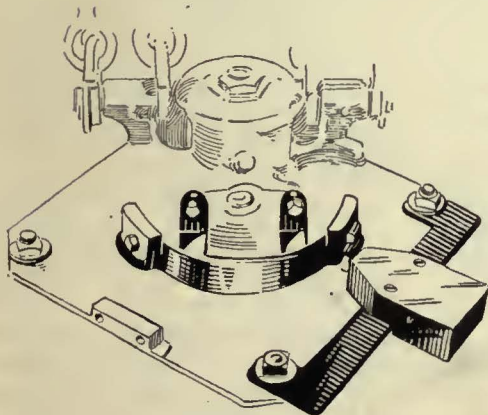
When it is desired at a turn-out to operate certain trolley buses straight through, and others around the turn, an electrically operated frog, consisting of two frog pans each with a movable center runner, is required. The runners are linked together mechanically and are actuated by two solenoids. The runner position in the frog is set, as for an electrically operated track switch, by the controller



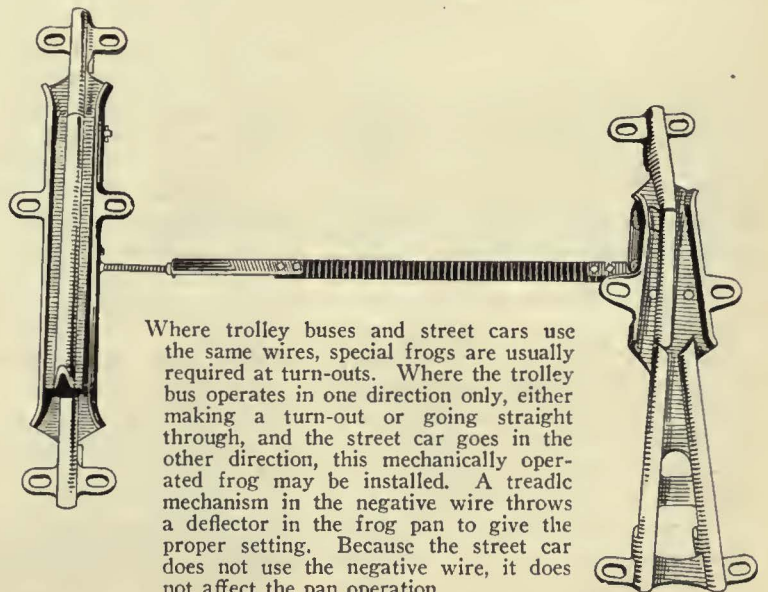
Light weight and interchangeability are features of this insulated approach. It is particularly suitable where crossovers and turn-outs have previously required special insulated pieces. One end is equipped with a casting which fits into the wire groove of a frog or crossover in place of the cam tip. Provision is made for locking it into the wire groove and also for dead-ending trolley wire when approach is used with a crossover or frog. Trolley bus overhead requires this approach in conjunction with live rigid crossovers at crossings where the angle is less than 45 deg. and where insulation is necessary



This trolley pole, designed for trolley buses, is made of heat-treated seamless steel tube with an opening at the harp end for passing the cable from the harp to the inside of the pole. A second opening near the base provides for leading the cable out for connection with the terminal block on the roof. The harp end is designed to fit over the shank of the two harp units, described elsewhere on these pages.



The new touring range indicator is a constant guide to the driver, for it warns him by flashing a light when he reaches his maximum safe touring range, usually 12 ft. from the center line. The device consists of a segment, with adjustable castings at the ends, which is mounted on the turret of the trolley base. As the turret swings it engages the plunger of a switch which lights the signal.



Where trolley buses and street cars use the same wires, special frogs are usually required at turn-outs. Where the trolley bus operates in one direction only, either making a turn-out or going straight through, and the street car goes in the other direction, this mechanically operated frog may be installed. A treadle mechanism in the negative wire throws a deflector in the frog pan to give the proper setting. Because the street car does not use the negative wire, it does not affect the pan operation

# More Comments on the

The thoughts advanced in your business platform are good sense. You appreciate, as well as I, that one cannot change humanity and its business practices at a stroke, but if enough people read your statement of principles, I believe that it will lend impetus to some careful thinking.

There is no doubt in my mind but that this country will emerge from the present crisis in a satisfactory fashion, largely due to the resourcefulness of our people, but I further think that the recovery will be expedited if we have greater leadership than has been evidenced up to the present time.

**SAMUEL KAHN,**  
*President,*  
*Market Street Railway,*  
*San Francisco, Cal.*



I have read your platform for American business, general objectives, conclusions and check sheet of suggestions and I am gratified to say that the whole program meets with my heartiest approval and support. The presentation of this "statement of principles" for American business in 22 of your publications will undoubtedly have a very wholesome and favorable reaction.

**G. D. CRABBS,**  
*President,*  
*Philip Carey Company,*  
*Cincinnati, Ohio*



I have read with a great deal of interest your statement of principles for American business; and while I believe the statement is somewhat Utopian, I feel that such belief on my part detracts in no way from the statement and manner in which it should be received by American business.

I, to some extent, question paragraph No. 1 on page No. 3 under the caption "Maintenance of Established Standards of Living" where you state in effect: "The belief that there is danger of a general overproduction of wealth, that technical development necessarily involves unemployment, . . . is an economic fallacy." While I believe this doesn't necessarily produce *protracted* unem-

ployment, the mechanization of industry cannot avoid temporary unemployment, which condition will exist until the slack has been taken up through the creation of new avenues of endeavor, or the shifting of such unemployment to other lines of industry permitting such absorption. I believe this fact must be recognized, and if in business, as has been suggested in your statement, more instruments be set up, the evils of unemployment will be minimized.

Another matter, which to my mind has caused considerable concern, is the habit of our various industries to distribute large dividends in fat years. It occurs to me that a reasonable amount could be set aside out of earnings to a dividend reserve, and the balance of earnings to go into surplus. I believe this would have a tendency to stabilize market quotations and reduce speculation mania in prosperous times. While the stockholders have the right to expect the major portion of earnings, I am of the impression that if, after paying a reasonable dividend, an additional amount is put aside for the purpose of maintaining such reasonable dividends in periods of depression, there will be a greater feeling of security and a more steady market because of the fact that the investor is more assured of a continuous return through both good and bad times. I believe this would have a tendency to eliminate wide fluctuations in market quotations and stabilize stock equity investments. The lure of large returns in prosperous times invites abnormal speculation, which, in my belief, is injurious to business generally, as evidenced by the recent stock market collapse, which in its incipency was claimed to be a stock market panic only, without effect upon business generally. The fallacy of this thought has, unfortunately, been strongly demonstrated. Earnings going into surplus are generally looked upon for use of any corporate purpose, whereas the dividend reserve would readily be interpreted as a stabilization of return.

Another matter which I believe

should be given serious consideration is the large number of business failures, most of which, I dare say, have been caused by the lack of knowledge of true business principles. The small concern, principally, conducts business without a true idea of costs, and the banks are led to lend money on statements which often are not reliable because of the lack of proper reserves and a true knowledge of cost accounting. It is my belief that if some agency could be set up, probably by the banks, thereby accountants could be available for the preparation of statements to be given the banks as a basis for credit, unwise loans could be avoided, and concerns that would otherwise be doing business to an ultimate failure, could be persuaded to retire before disaster overtook them.

We have agencies in different cities which make it possible for industrial enterprises to receive the benefit of such studies, but as a rule the cost incident to such examination and audit is prohibitive, and, therefore, not availed of. If the government *will* persist in adopting a paternal attitude toward industry, it seems to me this is one avenue along which it could exert its influence and help. On the other hand, if it is a matter for the banks throughout the country, I believe a contributory plan could be devised by means of which the cost could be shared, and the banks ultimately save money through the elimination of bad loans.

**JOHN L. SWOPE,**  
*Vice-President,*  
*United Railways & Electric Company*  
*of Baltimore*



I have read through the statement of "Principles for American Business." My initial reaction is that they set up excellent ideals. However, reduced to practicalities, I am inclined to think that the greatest hinderance to accomplishment lies in the difficulty of bringing about a standardization of ideas as to what might be termed "business morality." In other words, until the millenium, we will have with us the individual

# BUSINESS PLATFORM

## Operating and manufacturing executives of the electric railway industry praise the principles that were outlined in the proposed platform for American business

who is willing to take advantage of those who hew to the line of such ideals as you have set forth. Regardless of all that, whatever of good may be accomplished in such a movement should be striven for.

Another factor of interference which is economic in its operation is that "prosperity," as such, possibly cannot be a continuing process. I am inclined to view it as only the rise to the crests of waves in the ordinary course of business cycles. Corrective down swings are bound to occur. Just to what extent we can regulate the violence of fluctuations and, what is more important, the social effect thereof, is impossible of determination. There are probably involved some problems of sociology and social readjustment as well as those of business management.

▼  
W. S. FINLAY, JR.,  
*President,*  
*West Penn Railways*

I read with greatest interest the proposed business platform and wish to compliment you on the clear, concise, correct manner in which this has been assembled and in which it has been presented to your readers. It seems to me that you have covered the field very thoroughly and as I am wholly in accord with the principles which you have stated I have no suggestions or criticisms to offer.

C. H. KING,  
*President,*  
*Ohio Brass Company*

I have looked over the statement of principles and feel very much in accord with them. The problem, of course, is to have them put into effect, and I have no doubt that presentation in your numerous publications will be mighty helpful.

W. H. WOODIN,  
*President,*  
*American Car & Foundry Company*

▼  
I think the plan sets out admirably the general objectives for sound business development. I am impressed with the thought that the plan requires for its success a greater degree of co-operation between industries than is now permissible under federal laws. I suggest as one of the objectives such modification of the Sherman Act and the Clayton Act as will permit the kind of co-operation which has been so well set out in this memorandum. I am inclined to the opinion that our present situation is due, in part, at least, to the fact that our political policies do not square with our economic interests.

P. H. GADSDEN,  
*Vice-President,*  
*United Gas Improvement Company*

▼  
The statement of principles for American business is quite impressive and seems to me logically a basis in the betterment of sound business.

There is one item that caused me to hesitate as I read over the printed plan. Under No. 1, Maintenance of

Established Standards of Living, the last line of the recommendation reads: ". . . thereby raise the standard of living of the American people." In view of the fact that it is realized today that the standards of living are no longer considered the bare necessities of food, clothing and shelter—that our standard of living today is on a much higher level than was ever before attained by any people of the earth—I wonder whether the recommended ending here should not read: "Thereby maintain the present standard of living of the American people."

These are times in which courage and sound business thoughts must dominate and your program seems quite timely and appropriate to the cause.

W. H. CORDES,  
*Advertising Manager,*  
*American Steel & Wire Company*

▼  
I have read with interest your platform for American business because I have been giving considerable thought to this subject. In principle I agree with the idea that industry must do a better job of co-operation, co-ordination, and planning. Carrying on propaganda along this line is bound to stimulate the thinking of business executives all over the country. My one criticism of the platform is that in its very nature it deals with generalities. It seems to me that one of the real weaknesses of most associations, chambers of commerce and other bodies, is their ability to pass generalized resolutions without offering any detailed or specific plan of transforming generality into a reality.

LEWIS H. BROWN,  
*President,*  
*Jahns-Manville Corporation*

▼  
Undoubtedly this presentation of your "Platform for American Business," which I consider most effective, will greatly help in stimulating the interest of the business man in your valuable contribution to the business thought of the time.

T. FITZGERALD,  
*Vice-President and General Manager,*  
*Pittsburgh Railways*

# NEWS of the Industry

## Improvement Projects

**Sacramento, Cal.**—Keeping its year-old promise to the city, the Sacramento Northern Railway will start its five-year street paving program here at once. The five-year program, to cost \$250,000, comprises paving or repaving sections of the thoroughfares as agreed on the road's franchises, between the tracks and for a space on the outsides.

**San Francisco, Cal.**—Grant of the supplementary permit asked by the Market Street Railway for the proposed extension of the Turk Street line out Turk from Divisadero to Arguello and thence out Balboa to 30th Avenue, has been recommended by City Engineer O'Shaughnessy.

**Chicago, Ill.**—Extension of station platforms, and other improvements now being made over the Chicago Rapid Transit system, are progressing satisfactorily. Steelwork has been installed at fifteen stations where platforms are being lengthened.

**Montreal, Que.**—Another move has been made in connection with the proposal for a subway system for Montreal. The idea is to submit the plan to citizens to find out the public's attitude toward the new project. The estimated cost for subway lines such as proposed would be between \$65,000,000 and \$67,000,000, and it would be necessary for the city to guarantee the bonds to be floated by the Montreal Tramway to finance the project.

**New York, N. Y.**—First bids for construction of the Sixth Avenue subway are being advertised by the Board of Transportation. The bids are for the section extending from 53rd Street to 43rd Street. They will be opened May 19. The new subway is to be constructed in four sections. Bids for the second section, from 43rd to 33rd Streets, are expected to be advertised before the end of May, and the remaining two sections some time during the summer.

## Fare Changes

**Pasadena, Cal.**—The Railroad Commission has extended until May 15, 1931, the time limit under which Pacific Electric Railway is to carry out changes in its bus service and passenger fares here under terms of a recent order of the commission making extensive changes and revisions therein. The city requested that no changes be made in the service and fares until the new equipment, provided for in the commission's previous order, is available for service. The company has agreed to that request.

(Continued on Page 272)

## Public Relations a Major Maryland Topic

More than ordinary interest attached to the meeting of the Maryland Utilities Association held at the Lord Baltimore Hotel, Baltimore, on April 10. Some 300 delegates attended the sessions, which lasted all day, with a dinner dance in the evening. After the entire association was called to order and welcomed by President R. E. Town, of the Potomac Edison Company, the "electric eye," or photo-electric tube relay, was demonstrated by R. H. Maxwell of the Westinghouse Company. Separate sessions of the transportation, electric and gas groups were then held for the rest of the morning, after which the entire body assembled for luncheon. At the afternoon session William Knowles Cooper spoke on tendencies at home and abroad; Frank R. Phillips, on the progress, development and future prospects of utilities; and Lloyd C. Thomas, on the romance of radio.

At the meeting of the transportation group, which was presided over by Adrian Hughes, Jr., Halbert O. Crews, supervisor of public relations Chicago Surface Lines, emphasized the necessity of meeting the public face to face. He outlined the organization of a speakers' bureau for the purpose of informing the public on utility subjects. The speakers are men picked from the employees because of their ability. They are trained especially for the work, and know their subjects thoroughly before

going out. Nearly 300 calls a year are received by the Chicago Surface Lines alone for speakers. In connection with the addresses, stereopticon pictures, movies and talking pictures are all used to good effect. The work of these men has resulted in a wonderful change in public sentiment. Good management and good service, Mr. Crews holds, are fundamentals that can be told about to good effect by the speakers.

Charles Gordon, managing director American Electric Railway Association,

(Continued on Page 273)

## James Dalrymple on World Tour

James Dalrymple, formerly manager of the Glasgow Corporations Tramway, recently reached Vancouver, B. C., where he is making a short stop-over during a tour of the world. An authority on local transportation with a reputation that is world-wide, Mr. Dalrymple was constrained to comment on the local situation complicated by the appearance of the threat of competition from buses run independently.

He states that while conditions in English cities differ from those in Canada, he believes that as cities increase in density in population, street cars become still more economical as a means of transportation. In Glasgow competition between bus and street car services was intense, but the street car more than maintained its place. Today in that Scottish city, by a graded ticket price system, a passenger can travel 20 miles for 4 cents, the maximum fare, 1 mile for 2 cents, and half a mile for 1 cent. He stressed the fact that through intensive maintenance and improved track companies in the United Kingdom were endeavoring to reduce noise as much as possible.

Mr. Dalrymple recently made an investigation and a report for the city on the tram system in Buenos Aires.

## Governor Signs New York Unification Bill

Governor Roosevelt of New York on April 23 signed the Downing-Steingut transit unification bill which will permit the Transit Commission to adopt formally a plan for the unification of rapid transit facilities in New York City. The measure incorporates the major features of the Untermyer transit unification plan. It authorizes the creation of a Board of Transit Control of nineteen members, ten to thirteen of whom may be appointed by the Mayor. The 5-cent fare is assured in the present bill by the exemption from taxation of the securities to be issued by the proposed Board of Transit Control.

## The Business Outlook

**B**USINESS has been backsliding since the slight spring stimulus spent its force the latter part of March. Security markets have closely followed suit and commodity prices continue their relentless movement toward inconceivably low levels. Seasonal building improvement seems to be weakening again, and carloadings still show little more than seasonal recovery. Hope of reversal of the downward drift of steel production persists, and marked increase in automotive requirements becomes doubtful. As first quarter business bumps on the bottom, there appears no immediate and definite beginning of recovery. Governor Norman's mission has apparently meant nothing more than further futile effort to force short-term money rates lower in hope of melting frozen long-term investment funds. Our idle gold hoard piles up without increasing the means of payment by credit expansion because of paralysis of banking policy, thus prolonging price deflation, impoverishing ourselves as well as the world and making poor old Midas appear a piker by comparison.

—The Business Week.

## Carrying the Message to the Consumer



Exterior view of the Public Service advertising bus, "Miss South Jersey." The new bus, a unit of Public Service Co-ordinated Transport, Newark, N. J., will be used to advertise the various seashore and other long-distance bus routes

and to distribute advertising matter and time-tables. The new bus is artistically painted and the interior comfortably equipped with lounge seats, with chairs and with a radio. Its mission will be state-wide.

## Franchise Proposal Withdrawn at Calumet

Calumet Railways, Inc., has withdrawn from the cities of Hammond, East Chicago and Whiting, Ind., the service-at-cost franchise offer presented a year ago. The Council of Hammond had twice rejected the plan. Inasmuch as the franchise stipulated that it must be accepted in identical form by the three communities concerned, railway officials felt that nothing was to be gained by leaving the matter open. The company proposed to spend between \$2,000,000 and \$3,000,000 in rehabilitating the railway system of the three cities.

Late in 1929 a syndicate of business men of the Calumet district backed by the Midland United Company, as minority stockholder, bought the Hammond, Whiting & East Chicago Railway at foreclosure. Subsequently the Calumet Railways, Inc., was chartered as the successor company. A service-at-cost franchise was presented to the boards of works of the three cities on March 12, 1930. In Hammond and Whiting the franchise was received favorably, but the East Chicago board of works never acted upon the proposal. Twice the Hammond Council voted against the franchise. The Whiting Council never acted upon it.

Hammond, Whiting and East Chicago form an important part of the well-known Calumet region of Indiana. Local transportation is for the most part provided at present by the Shore Line Motor Coach Company, a subsidiary of the Midland United Company. Had the franchise been approved, the Calumet Railways would have taken over the Shore Line buses, rehabilitated the railway and co-ordinated rail and coach services.

## Many Subjects Before Summer Meeting of Pacific Claims Men

The executive committee of the Pacific Claims Agents' Association met in the offices of W. H. Moore, claim agent of the San Diego Electric Railway, Union Building, San Diego, Cal., recently, and it was decided to hold the next annual convention

of the association at Stockton, Cal., Aug. 6, 7 and 8. At the Stockton convention papers on the following subjects will be read:

"Unique Methods of Locating Witnesses to Accidents," by Harry Woodrow, assistant claim agent Key System, Inc., Oakland, Cal.; Marshall Widenor, assistant claim agent San Diego Electric Railway; J. N. Shrader, chief investigator Los Angeles Railway, and M. R. Poundstone, Pacific Electric Railway, Los Angeles.

"Some Lessons I Have Learned from Dealing with Claimants," by O. S. Krogstad, chief claim adjuster Pacific Northwest Public Service Company, Portland, Ore.

"Some Methods That Have Proved Successful in Securing the Co-operation of Attorneys in Adjusting Instead of Litigating Claims," by J. H. Handlon, claim agent Market Street Railway, San Francisco.

"What Can We Do to Improve the Personnel of Our Juries," by Melvin C. Chapman, Jr., claims attorney Key System, Inc., Oakland, Cal.

"The Relationship of the Claim Agent with the Community and the Local Bar Association," by Thomas G. Aston, claim agent Spokane United Railways, Spokane, Wash.

"What Should Be Done with Claims for Alleged Personal Injury Arising from Very Minor Automobile Accidents," by A. E. Nicoletti, claim agent Key System, Inc., Oakland, Cal.

"Is It Good Policy to Try to Collect for Damaged Equipment and Other Property?" by H. D. Turner, chief clerk Pacific Electric Railway, Los Angeles, Cal.

"What Has Been Done to Enforce the Ethics of the State Bar Association in California Relative to Ambulance Chasing," by B. C. Sterry, general attorney Los Angeles Railway.

"Trend of Recent Decisions in Personal Injury Cases," by A. L. Levinsky, attorney Stockton Electric Railway, Stockton, Cal.

"What's New in Claims Work"—Discussion to be led by C. M. McRoberts, general claim agent Los Angeles Railway, Los Angeles, Cal.

## Essential Service Says Commission About Railways

In its report to Governor Caulfield covering the years 1929 and 1930, the Missouri Public Service Commission, in commenting on street railway conditions in the state, said that the industry is the victim of the evolution in transportation. It continued:

Nevertheless, it is rendering an essential service and must be maintained. On its own initiative the commission authorized new fare schedules in St. Louis and Kansas City designed to yield additional revenue without increasing the rate of fare to the regular rider. The commission feels that the new schedules have been successful in operation and have been favorably received by the riding public.

The commission points out that the new schedules applied to Missouri street railways for the first time the principle underlying water, gas, steam and electric rates that the unit charge should decrease with increased use of the service.

## Railway Helps Community Chest Drive



Salt Lake City's annual Community Chest drive took place during the period from March 3 to 10 inclusive. It was effectively advertised and supported through the co-operation of the Utah Light & Traction Company. Among other things the company donated a street car for advertising purposes, and then contributed all cash received on this car during the six days it operated (from March 2 to 7 inclusive). Tickets, tokens and transfers were accepted in the regular manner, but it was made plain to riders that whatever cash was paid as fare would be con-

sidered as being contributed to the chest.

The car was run from 9 a.m. to 4:30 p.m. on a different line each day, on regular schedules, the routes being chosen from those most liberally patronized.

In addition to the display material on the outside of the car, signs were prominently displayed inside showing the various member agencies of the chest and pointing out what had been accomplished by the chest during the past year in furnishing relief to the needy.

The car proved to be a very valuable medium of publicity for the chest.

## Fare Changes

(Continued from Page 270)

**Yonkers, N. Y.**—This city lost on April 16 in its attempt to prohibit the Public Service Commission from hearing the application of the Yonkers Railroad for an increase in fare rates.

**Gary, Ind.**—The Gary Railways reports that many regular Gary Railways patrons are availing themselves of low rates of fare provided by the weekly pass and the token under the new fare structure placed in effect on March 29. The fare structure includes a weekly pass selling for 40 cents which entitles the bearer to an unlimited number of rides during the week at 5 cents per ride. A token rate of six for 50 cents is also in effect. The straight cash fare is 10 cents. The 10-cent zone limit was extended in some instances under the commission order. Intermediate fare zones between Gary and Hammond and Gary and Indiana Harbor were abolished. A cash fare of 20 cents between Gary and Hammond became effective under the new zoning system.

**Louisville, Ky.**—No appeal will be made of the Federal Court's decision in the Louisville Railway case, Mayor William B. Harrison has announced. He said he believed an appeal would be useless and involve needless expense. A statement made by him was concluded as follows: "The court's findings of the facts and its application of the law are sustained by the findings in many similar cases upheld by the United States Supreme Court. The city's position will be to await a return to normal business and if the railway patronage shows a sufficient revival, to enter its claim for reduced fares at the proper time."

**St. Louis, Mo.**—The People's Motor Bus Company announced that on Sunday, April 26, it would adopt the 25-cent Sunday pass plan that has been used by the St. Louis Public Service Company for several years. The pass will entitle the holder to an unlimited number of rides on the company's bus lines in St. Louis and St. Louis county on the date of purchase.

## Bus Operations

**Atlanta, Ga.**—Pointing out that legislation enacted at the recent extraordinary session of the Georgia General Assembly affects both private and common motor carriers, James A. Perry, chairman of the Georgia Public Service Commission, has issued a statement emphasizing some of the more important features of the regulatory and tax measures. No owner or operator of a motor vehicle can be considered to have a vested right to use public roads of Georgia, and no perpetual franchise to use such public roads can be granted, the chairman declared.

**Trenton, N. J.**—The single-track trolley line connecting Trenton and Camden will be replaced by fifteen buses of Public Service Co-ordinated Transport on permission of New Jersey Public Utilities Commission.

## A.E.R.A. Members

Ever watch your mother bake a cake? She puts a lot of things into it, her best thought and work—result A GOOD CAKE.

That's compensation.

Have you filed your application for Exhibit Space at the

### Atlantic City Golden Jubilee Convention?

If not, don't delay. Put your product on display, give your exhibit your best thought and work—result MORE BUSINESS

That's compensation.

### APRIL 30

closing day for the receipt of space requests. You are cordially invited. Get some Atlantic City sun in your system for next winter's big business.

THE EXHIBIT COMMITTEE

**Tulsa, Okla.**—Another step was taken in the litigation to prevent operation of jitney service here when District Court Judge Clendinning granted a temporary injunction to the United Service Company to restrain operation of the jitney lines. Judge Kennamer in the federal court recently issued an injunction against the jitney service on application of the Union Transportation Company and the Oklahoma Union Railway.

**Evansville, Ind.**—The Evansville, Suburban & Newburgh Railway has been authorized by the Public Service Commission to carry freight, as well as passengers, on its proposed bus line between Boonville and Washington, to operate over state roads Nos. 61 and 57 via Lynnville, Winslow and Petersburg. Three round trips will be made daily, with connections at Boonville for Evansville.

**Jersey City, N. J.**—Public Service Co-ordinated Transport proposed to substitute buses for trolleys in Hudson County. The four lines upon which the company would carry out the substitutes here, with the retention of some trolley service, are: Greenville, Journal Square, Montgomery and Jackson routes. Permission of the city has been obtained, but approval of the Public Utilities Commission must be obtained before the change can become effective. Independent operators oppose the change. The case has been set for hearing on May 14 and 15.

**Vancouver, B. C.**—The City Council has appointed a committee to ascertain streets that could be used for the bus service contemplated by a Liverpool, England, syndicate. Under the present agreement between the city and the British Columbia Electric Railway the city cannot grant another franchise, but it can issue licenses for motor coaches. C. F. Rymer, representing the English syndicate, wants assurance of operation for five years at least, with fares on a zone system basis.

**Amsterdam, N. Y.**—Petitions for hearings in proceedings involving the

authorization for the operation of bus routes in Amsterdam were denied by the Public Service Commission on March 27. The commission recently authorized Charles Vollmer to operate additional bus routes here and removed restrictions in certificates for other bus routes so as to permit the Vollmer buses to pick up passengers along the route of the trolleys operated by the Fonda, Johnstown & Gloversville Railroad. The commission held that the railroad's petitions for re-hearings in the proceedings authorizing the Vollmer bus routes were not well taken.

**Los Angeles, Cal.**—The Pacific Electric Railway has been authorized by the Railroad Commission to reroute its motor coach line No. 1 in Glendale from the intersection of Broadway and Glendale Avenue for the purpose of serving a well-built-up district along Lexington Drive, not now served, and to provide a more frequent service along Verdugo Road between Broadway and Chevy Chase Drive.

**Buffalo, N. Y.**—Finis is being written to the Buffalo & Williamsville Railway, superseded by buses last September. Recently the first of the remaining cars was run out at the rear of the carhouse on the bank of Ellicott Creek and burned. Tracks from the carhouse to Main Street will be removed at once. Plans for taking up the rails in and along the side of Main Street have not yet been completed. The overhead has already been taken down and scrapped. Only old car number 23 has been spared. It stands in the yard at the rear of a home in Williamsville, where it is used as a playhouse for children.

## Service Changes

**Oakland, Cal.**—The East Bay Street Railways, Ltd., has been authorized by the railroad commission to discontinue street car service on 40th Street and a private right-of-way from 41st Street and Piedmont Avenue to 40th Street and San Pablo Avenue in Emeryville, subject to the condition that East Bay Motor Coach Lines, Ltd., shall commence simultaneously the operation of an extension of its bus service over a specified route. Permission is also granted to the coach company to abandon a portion of its Excelsior Avenue bus line simultaneously with the establishment of motor bus service on 40th Street.

**Washington, D. C.**—The Public Service Commission has authorized the Capital Traction Company to shift from street car to bus service on the F and G Street loop, but has denied the Washington Railway & Electric Company's request to discontinue its bus line to Foxhall Village and Potomac Heights because of lack of patronage. The east terminal of the Foxhall Village-Potomac Heights bus line will, however, be moved from Wisconsin Avenue and Reservoir Road to Fifteenth and K Streets northwest so as to provide a direct downtown service. Discontinuance of the bus line now operated at nights, Sundays, and holidays between Potomac Park and Nineteenth Street and Pennsylvania Avenue has been ordered for the same reason.

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## Service to Continue in Boise

The threat made by the Boise Street Car Company, now serving Boise, Idaho, by bus, to discontinue operations on April 1 was rescinded. It was caused by the recent passage by the Legislature of an automobile license tax increase. Following the announcement that service would be withdrawn, the attorney-general ruled that the company would be exempt from certain of the state fees. Meanwhile, the company has curtailed services and cut overhead expenses.

Under the new license, the company's annual vehicle tax increase was \$2,400. Along with this tax the company pays a gasoline impost of \$500 a month and other taxes. The company operated at a loss in 1929 and 1930, but continued service in the hope that legislative relief might be obtained. A bill was introduced covering this subject. It provided for a tax on the gross earnings on a sliding scale. The bill failed in the Senate, but during the period the bill was under consideration by the Legislature, both houses passed a measure to increase the license taxes. Company officials decided that operations under these conditions was impossible.

## New Fare Schedule Suggested for Portland

Engineers of the Oregon regulatory commission have made the following recommendations relative to rates and service on the Pacific Public Service Company's railway in Portland:

Single cash fare of 7 cents; unlimited tickets in strips of ten, 60 cents; weekly pass with five tickets attached, 35 cents; limited school children tickets, 4 cents.

Further the commission has recommended that the utility spend \$812,000 on modernization of rolling stock and other equipment.

The present cash fare charged by this utility is 10 cents per passenger, but a weekly pass is in effect. The municipality asked the commission to reduce the fare to 5 cents. The company contends that a combination of adverse circumstances renders it impossible to earn a reasonable return on the railway investment with even a 10-cent fare. With this the regulatory authorities agree in part. At a further hearing the matter of proposed free use of bridges and streets by the operator will be discussed.

## Maryland Topic

(Continued from Page 270)

emphasized that the speakers can work effectively only when the company is producing a brand of service that they can sell. It is difficult to take employees out of all departments and make salesmen or advertising men out of them, so that care is necessary in the selection of representatives. He said the industry was relatively untrained in the problem of meeting competition, and found it difficult to visualize the application of merchandising to the daily jobs of managing an electric railway. As to the present business situation, Mr. Gordon stated that the electric railways have held up remarkably well. Employment has been relatively stable, a fact noteworthy since the electric railways are the largest or nearly the largest employers of labor in every community.

In the discussion, H. B. Potter pointed out that the electric railway man is doing a job that is well worth while. He felt there

have been too many apologists and too few real representatives of the railways. The railway man should have no inferiority complex.

At the close of the afternoon session Adrian Hughes, Jr., of the United Railways & Electric Company was elected president for the ensuing year. Other officers elected are F. A. Mitchell, vice-president; W. A. Tobias, treasurer, and D. E. Kinnear, secretary. R. E. Town, J. E. Heberle, M. J. O'Connell, F. A. Alexander, R. P. Monsal and G. P. Mangau were chosen for the board of directors.

## Wage Readjustment Proposal in St. Louis

With the purpose of operating within its income until the present general depression passes and at the same time carry the maximum number of employees, the St. Louis Public Service Company has suggested that its workers agree to accept monthly reductions in pay up to 10 per cent of their present salaries, contingent upon the company's income for the month.

Under the plan, which would be tentative and in effect for six months, effective on May 20, the company would continue to pay officers and other employees 90 per cent of their present wages and at the end of the month, if interest requirements have been earned over and above the operating expenses, the other 10 per cent would be dispersed for that month.

If the company should fall short of earning enough to meet the interest payments for any month it could devote up to 10 per cent of the employee's wage to help make up the interest deficit.

Under no circumstances would earnings be applicable to security holders in any month in which employees' wages were not paid in full.

## Financial News

(Continued from Page 272)

Rochester, N. Y.—The New York State Railways, Rochester Lines, failed by \$367,410 to make the guaranteed 6 per cent return on operations under service-at-cost during the year ended Dec. 31, 1930. City Railway Commissioner Barnes says the adverse contributing facts were the economic depression and the increased use of the private auto-

## Coming Meetings

May 4-7—International Chamber of Commerce, Washington, D. C.

May 14-15—Middle Atlantic States Equipment Men's Association, Washington, D. C.

June 8-11—National Association of Purchasing Agents, Royal York Hotel, Toronto, Ont., Canada.

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

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

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.

Buffalo, N. Y.—Employees of the International Railway, under the Mitten co-operative plan now own 11 per cent of the common stock; 12 per cent of the preferred shares and \$600,000 par value of the company's bonds. Three new representatives of the employees have been elected to the board. They are Stephen J. Hanley, president of the company's co-operative association; George Del Vecchio, vice-president, and Joseph B. Ross, chairman of the general committee under the Mitten co-operative plan. Mr. Hanley is a traveling auditor; Mr. Del Vecchio is a track worker and Mr. Ross is a clerk in the track, bridges and building department. They succeed Samuel Haslam, W. W. Owens and Isidor Spati on the board.

Canton, Ohio—This city on April 19 had only a bus transportation system with the suspension of railway service by the Canton Traction Company. Emergency transportation service is being rendered by the Canton Motor Coach, Inc., which has a franchise covering the rest of the city. Railway service between Canton and Massillon, also scheduled to be suspended on April 19, will continue until after a hearing scheduled before the Public Utilities Commission on May 10.

New York, N. Y.—For the eight months ended February the number of passengers carried on the subway division of the Interborough Rapid Transit Company, the Manhattan Railway and the New York Rapid Transit Company, operating subsidiary of the Brooklyn-Manhattan Transit Corporation, declined to 1,316,588,484, off 30,771,557, or 2.3 per cent from the corresponding preceding period. Passenger revenues declined to \$65,829,423, off approximately \$1,500,000 from the twelve months ended February, 1930. In consequence, the city's investment in the subway lines under Contract 3 again will be on a non-paying basis.

Brooklyn, N. Y.—Certificates for 6,000 shares of Brooklyn-Manhattan Transit Corporation preferred stock were recently turned over to 1,400 employees of the system who bought it under the employees' stock ownership plan, the first payment having been made in 1926. Deductions from salaries were made at the rate of \$1 a share every month for 55 months. In totals, the cost to the employees was only \$330,000, whereas the present market quotation gives their holdings a value of \$540,000. The stock was offered at \$75 a share, the difference between \$55 and \$75 being made up by dividends during the time of payment with 5 per cent charged for interest on deferred payments.

## Regulation and Legal

New York, N. Y.—Prof. William Z. Ripley of Harvard, said, in lecture at Columbia University, that creation of a cabinet post—secretary of transportation—to take over administrative functions of Interstate Commerce Commission, would result in enforcement of discipline in the railroad industry, one of the things it needs to get out of its present condition. He predicted that such a cabinet post eventually would be created.

(Continued on Page 274)

## Transportation to Airport Is Specialized Service

Airplane passengers demand a specialized type of public transportation service to and from landing fields, it was stated in a recent order of the California Railroad Commission, to which it appeared clear, from the testimony, that airplane passengers prefer not to use regular bus or street car service in traveling between the landing field and their ultimate destination.

An application was filed by Joe Ferrant for authority to establish service as a common carrier for the transportation of passengers and their baggage between four locations in Los Angeles and the airports in Glendale and Alhambra, using automobiles and charging a fare of 75 cents or \$1, according to the point of origin.

The Original Stage Lines, Motor Transit Company and Pacific Electric Railway contended that they offered transportation service sufficient and satisfactory to meet the public demand.

The applicant said he proposed to arrange his schedules so that they will correspond with the arrival and departure of airplanes, which of necessity are somewhat irregular. The service is to be limited to passengers of Western Air Express and Transcontinental Air Transport, using either the Glendale or Alhambra airport, and is not to include any intermediate service.

In the event of forced landings at certain designated fields, applicant proposes to keep in touch with airplane officials and meet all airplanes arriving on such schedules.

Officials of both Western Air Express and Transcontinental Air Transport testified that the service proposed was essential to the adequate ground transportation of their passengers and that by far the larger percentage of such passengers preferred a specialized service of this type to the ordinary methods of traveling to and from the landing field.

Pacific Electric Railway operates from the downtown section of Los Angeles to Glendale, making ten stops en route and transferring to buses such passengers as desire to reach the airport. The wait for a bus would be anywhere from 20 to 50 minutes. Its affiliate, Motor Transit Company, operates a ten-minute bus service to Alhambra airport and had offered to render a service on a leased car basis with a guarantee of \$30 per day for each car so leased.

## Washington's New Parking Law in Effect

After the first day's trial of Washington's new drastic parking law, city officials expressed themselves as being satisfied that under it the movement of traffic was expedited. The new law became effective on April 22. It divides the downtown section of the city into zones, prohibits parking in the central business district until after 9:30 in the morning and limits parking to one and two hours respectively in zones surrounding the central area. In addition, parking is prohibited on the flow sides of streets leading to the business district during rush hours, and all angle parking is abolished.

Material improvement in electric railway schedules is expected as the result of the new parking laws and other new traffic regulations that have been invoked. One of the new traffic regulations prohibits the making of "U" turns on F and G Streets,

important street car routes. Another new regulation has put a stop to the cruising of taxicabs on the streets of dense traffic.

Within a short time steps will be taken under authority granted by Congress last session to prevent the use of sidewalk terminal stations for interstate buses. The Public Utilities Commission has arranged a conference with bus operators next month at which it is hoped the way may be paved for the construction of a union bus terminal providing off-street loading facilities.

City officials have warned the operators of one interstate bus terminal that they must refrain from allowing their buses to be parked at an angle to the curb. Further violations will lead to the arrest of bus drivers, it is stated. Traffic officials have also issued orders to prevent trucks from backing into the curb to load or unload merchandise.

## Regulation and Legal

(Continued from Page 273)

**Richmond, Va.**—The State Motor Vehicle Commissioner is checking all buses and trucks operating on state highways to determine if load weights comply with restrictions of the highway department. Court proceedings are threatened against violators of the state's regulations.

**Syracuse, N. Y.**—The New York State Railways has obtained an order from Judge Bryant broadening the temporary injunction issued a few weeks ago which further restrains the Syracuse Auto Rental & Taxicab Company from encroaching on the railway's business. The original injunction directed the taxi operators to refrain from carrying passengers on return trips to the downtown section at 10 cents each. The new order restrains the cab company from parking its cars at places other than designated taxi stands and from soliciting fares by cruising on railway streets.

**Baltimore, Md.**—The Sun Cab Company, Inc., has won its contest with the Public Service Commission, which ordered the company to provide \$10,000 and \$20,000 liability insurance for each of its taxicabs or to set up an indemnity reserve of \$100,000. Later the commission reduced these amounts to \$5,000 and \$10,000 or a reserve of \$60,000. The Court of Appeals held that the requirement imposed by the commission's order is legislative, and that those who use the roads are not required to do anything except pay their taxes and the license fees required by the motor vehicle act, until the Legislature acts in the matter.

## General

**Cleveland, Ohio**—Offices of the accounting division of the Cleveland Railway have been moved to the ground floor of the new Midland Bank Building in the Union Terminal area to expedite ticket checking. Other offices of the company will be moved early this summer to quarters being prepared on other floors of the building. The railway's offices in the Hanna Building have been gradually vacated since the first of the year. The Midland Bank Building quarters will not occupy as much floor space as in the Hanna Building.

**Harrisburg, Pa.**—Chairman W. D. B. Ainey, of the Pennsylvania Public Service Commission, was called before the House of Representative committee investigating the commission and the utilities on April 17. He was wheeled into the room and up to the witness stand in his invalid's chair and immediately was subjected to an examination as to the activity of the commission in supervising the financing of the utilities.

**Denver, Col.**—Lease of 5½ lots of the Denver Tramway interurban loop to the Loop Auto Parking Company, Inc., for ten years has been announced as a result of the tramway's abandonment of several tracks which have not been used for more than a year. Room for more than 125 cars, a service station and four entrances from Fourteenth and Fifteenth and Curtis and Arapahoe Streets will be made by the parking company.

**San Francisco, Cal.**—President Samuel Kahn, of the Market Street Railway, has placed the silver non-accident trophy permanently in the possession of 28th Street division for having the best record for 1930. It was believed the contest had six months to go, but it was decided that since 28th Street had a definite lead, there was no good reason for not awarding it.

**Chicago, Ill.**—A fleet of highway vehicles, trains, locomotives, watercraft, old and new, added to airplanes and dirigibles overhead, will be utilized to tell the story of 100 years of advance in transport, Edward Hungerford, of the New York Central Lines, stated on April 8, over a radio network, in describing plans for the transportation exhibit at the Century of Progress International Exposition to be held here in 1933. Transportation will be dramatized at Chicago in a manner that will excel any similar exhibit hitherto staged, Mr. Hungerford told the radio audience. The transportation display is to be called the "Travel and Transport Show."

**St. Louis, Mo.**—The Board of Public Service has referred to Director of Streets and Sewers Brooks for recommendation a proposal that the curbed-off area on Delmar Boulevard between Kingshighway and Clara Avenue be eliminated, that the strip be paved and trolley poles placed on the sidewalks instead of the center of the street so that all vehicular traffic can use the roadway for its entire width. Officials of the St. Louis Public Service Company estimate it would cost the company \$120,000 to make the change, including its share of the new paving. The parkway strip is 26 ft. wide and the company would have to pave about 18 ft. of this. In addition, the movement of street cars would be greatly retarded. Three times bills for the removal of the parkway have been vetoed by the Mayor.

**New York, N. Y.**—The Appellate Division has dismissed the proceedings brought by the Second Avenue Railway and the New York Railways Corporation for a review of the orders of the Transit Commission, directing them to install "dead-man's buttons" on all their one-man cars. Under the ruling the order must be complied with. In substance, the companies contended that to comply with the order would burden them unduly because of the cost.



## PERSONAL MENTION

# Messrs. Bradley and Moynihan Are Advanced

Stanley Clarke was re-elected president of the St. Louis Public Service Company by the recently elected board of directors. Other officers named are: S. W. Greenland, vice-president; T. E. Francis, general attorney; J. D. Evans, auditor; W. deW. H. Bradley, secretary, and W. R. Moynihan, treasurer. Mr. Bradley has been assistant secretary and Mr. Moynihan assistant treasurer.



Kalden-Keystone Studios  
W. deW. H. Bradley

Robert E. Maloney of the law firm of Boyle & Priest, and Tom K. Smith, president of the Boatmen's National Bank, have been elected directors to succeed the late Judge Henry S. Priest and George W. Wilson, of the Mercantile Commerce Bank & Trust Company. All other directors were re-elected.

Mr. Bradley was born in Gloucestershire, England, on Jan. 17, 1888. He was graduated from Cambridge University and is a member of the English bar. Shortly after the outbreak of the World War he joined the British Expeditionary Forces, with which he served from 1914 to 1918. He came to this country with the British Military Commission in the rank of Major, and he assisted in the training of American troops at Camp Devins near Boston.

At the close of the World War, Mr. Bradley returned to this country. In 1919 he was with the Boston Legal Aid Society in Boston. Later he took a position in the patent department of the United States Rubber Company at New York. He remained with that company until the spring of 1922 when he was made secretary of the Harbor Dry Dock Company, New York City.

While in New York he had become acquainted with Stanley Clarke, president of the St. Louis Public Service Company, and J. K. Newman, president of Newman, Saunders & Company, Inc., who later reorganized the St. Louis railway system. In the early fall of 1924, Mr. Bradley became secretary of the reorganization committee of the United Railways at St. Louis and he continued in that capacity until Dec. 1, 1927, when the reorganization was perfected. As soon as the properties of the United Railways were taken over by the St. Louis

Public Service Company, Mr. Bradley was elected assistant secretary of the new company. Since that time he has performed all of the duties of secretary, a position never officially filled until now.

Mr. Moynihan was born in Ashland, Mass., on Dec. 17, 1892. He was educated in the primary and high schools of Holliston, Mass., and later studied law at Northeastern College, Boston, Mass. His first job was with the Eastern Massachusetts Street Railway in the summer of 1910, when he was a chairman for an engineering gang. In 1911 he joined the Boston & Albany Railroad, and for seven years held various positions in the engineering, auditing and legal departments of that road.

When the United States entered the World War he volunteered for service with the Fourteenth Engineers as a private, but came out with a first lieutenant's commission and is now a captain in the Engineer's Reserve Corps. At the close of the war, he rejoined the legal department of the Boston & Albany.

In France Mr. Moynihan served as adjutant to Col. Albert T. Perkins, who was in charge of all of the light railways for the American forces in France. Shortly after the close of the war, Colonel Perkins was made general manager for Rolla Wells, receiver for the United Railways, and early in 1920, Colonel Perkins induced his old adjutant to accept the post of assistant treasurer for the receiver.

In the latter part of 1923 the health of James Adkins, treasurer for the receiver, began to fail. Mr. Moynihan was then made treasurer, but Mr. Adkins continued to serve the railway as consulting treasurer until Dec. 25, 1923, when he died. On Dec. 1, 1927, the railway was taken over by the St. Louis Public Service Company, as successor after sale at foreclosure and Mr. Moynihan was then made assistant treasurer of the new company, the official position of the treasurer not being filled then.

In addition to his position of treasurer of the St. Louis Public Service Company, Mr. Moynihan is president of the Public Service Savings & Loan Association, the



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W. R. Moynihan

largest association of its kind in St. Louis and St. Louis County exclusively. The membership is composed of employees of the railway and their families and it has assets of more than \$5,500,000.

## M. W. Rew Superintendent of Transportation at Cleveland

Morse W. Rew, formerly superintendent of motor coach operations, of the Cleveland Railway, Cleveland, Ohio, has been advanced to superintendent of transportation in charge of all coach and car operations. The position has been vacant for some time. Leonard Rose, formerly assistant to Mr. Rew, will head the division for maintenance of motor coach equipment.



M. W. Rew

Also announced recently was the resignation of Charles H. Stanley, brother of the late railway president, John J. Stanley, as superintendent of materials and stores. Mr. Stanley had been in the company's employ 21 years. A. C. Kennedy, formerly assistant to Mr. Stanley, was named to succeed him.

Under the changes at Cleveland, the motor bus department, which had been operating as a separate organization, is fully co-ordinated with the rail operating organization. Bus maintenance is placed under the direction of Tom Nicholl, superintendent of buildings and equipment, but direction of bus operations is under Mr. Rew as superintendent of transportation, with authority over both cars and buses. Previously the track and line department personnel reported direct to President Alexander, but henceforth will come under the direct supervision of Ralph Emerson, vice-president and general manager.

Mr. Rew brought to his work at Cleveland wide experience as a traffic expert and engineer. He was graduated from Grinnell College, Iowa, and from the Massachusetts Institute of Technology. After completing his course at "Tech," Mr. Rew remained there two years as instructor in civil engineering. Then he entered upon engineering work in traffic and allied fields which resulted in his serving in Boston, Cincinnati, Pittsburgh and other cities. Especially did he do notable work as chief engineer of the Pittsburgh Transit Commission, and as assistant to A. M. Taylor, who was in charge of the division of passenger transportation of the Emergency Fleet Corporation.

## Merchant, Banker and Railway Man P. R. T. Receivers

E. L. Austin, Dr. Herbert J. Tily and Edward Hopkinson, Jr., named receivers by Judge McDevitt to handle the affairs of the Philadelphia Rapid Transit Company will not take office, so the court has announced, until the court proceedings have ended. All the men named are widely and favorably known in Philadelphia, but of the three, only Mr. Austin has had practical experience in transit affairs. He is widely known as the director-general of the Sesqui-Centennial Exposition. He was born in Maryland in 1880, and went to Philadelphia in 1900, entering the employ of the Union Traction Company, one of the roads now included in the P. R. T., system, as a conductor. When the P. R. T. took over Union Traction he was transferred to the office force. He worked as general auditor and then as comptroller in charge of financing and accounting. He established the firm of Austin-Johnson, Inc., general engineering and accounting, in 1923.

Dr. Tily is president of Strawbridge & Clothier, chairman of the public utilities committee of the Philadelphia Chamber of



E. L. Austin

Commerce, and vice-president of the Philadelphia Business Progress Committee. He was born in England in 1866 and started at thirteen years as cash boy in the store he now heads.

Mr. Hopkinson is chairman of Mayor Mackey's finance commission and a member of Drexel & Company and J. P. Morgan & Company. He was born in Philadelphia in 1885, and was graduated from the University of Pennsylvania. He completed his law course in 1910 and was admitted to the bar the same year, joining the firm of Dickson, Beitler & McCouch, which he left in 1926 to join Drexel & Company.

### Harry T. Edgar Retires

Harry T. Edgar, associated with Stone & Webster in managerial work in various parts of the country for 32 years, has resigned from that organization. Mr. Edgar is a native of Griggstown, N. J. He entered the utility field in 1886 as an employee of the Edison Electric Illuminating Company, New Brunswick, N. J., soon going to New York with the engineering department

of the Edison Electric Light Company, a predecessor of the General Electric Company. After seven years of construction work he became secretary and general manager of the Georgia Electric Light Company, Atlanta. In 1897 he entered the sales field and spent two years in the electrical apparatus market in New York and New England.

Since he joined Stone & Webster in 1899, Mr. Edgar has served as manager of the Lowell Electric Light Corporation; El Paso Electric Company;

Northern Texas Traction Company, Fort Worth; and Seattle Electric Company, including both power and railway interests.

For some years now Mr. Edgar has made his headquarters at Boston, serving as district and division manager of the Middle West district, and operating railway and power properties centering at Houghton, Mich., Paducah, Ky., the Mississippi River Power Company at Keokuk, Iowa, and lighting systems at Keokuk, Fort Madison and Dallas City.

## James W. Welsh Becomes Consultant in Traffic Field

James W. Welsh, assistant to President Joseph H. Alexander of the Cleveland Railway, has resigned to head his own organization as a consulting engineer specializing in traffic problems. He will establish New York headquarters at Room 1310 in the Equitable Life Building, 393 Seventh Avenue, New York, with a branch office in Cleveland. He will make traffic studies and surveys for municipalities and transportation organizations. Mr. Welsh went to Cleveland on Sept. 1, 1929, from the post of executive secretary of the American Electric Railway Association shortly after the Van Sweringens, through Metropolitan Utilities, Inc., took control of the Cleveland Railway.

As a specialist in traffic engineering, Mr. Welsh devoted much of his time at Cleveland to studies for the proposed coordination of rapid transit and the surface lines, and of the application of the zone fare principle to Cleveland's needs. According to Colonel Alexander, these studies by Mr. Welsh have made possible increased speeds on the local system and have resulted in many operating economies. Colonel Alexander said:

We feel disappointed in losing Mr. Welsh, for he has made a fine record in the field of research with this company. However, he feels that his new enterprise will offer him a wider field for his abilities, and we wish him success.

Mr. Welsh went to the Cleveland Railway with a national reputation both as an electrical engineer and a traffic expert. Early in his engineering career he became intensely interested in traffic problems presented with the expansion of cities, and in all of the posts he has held he has devoted himself unremittingly to the study of these problems. As secretary of the association Mr. Welsh was brought constantly face to face with this problem as one of the major questions before the industry. Incidentally, in that post he was afforded unusual opportunities for study not only at first hand, but as a consequence of the extent that consideration of the problem entered most discussions of matters coming before the association for consideration. Also in 1924 as a member of the special investigating committee which studied transportation conditions in England, France and Switzerland and reported progressive developments to American operators he was able to broaden his grasp of the subject. To a representative of *ELECTRIC RAILWAY JOURNAL*, a few days ago, he said:

I have felt for a long time that the traffic problem in our major cities should be

approached from a new angle. We are too inclined to think of the traffic situation merely as a problem of law enforcement, rather than as an engineering problem.

The continued growth and welfare of cities depends as much on efficient use of our present transportation facilities as on the providing of additional ones. In view of the heavy tax burdens of most communities, we should be sure we are getting 100 per cent use from the facilities we have at hand before assuming new burdens.

Born in Springfield, Ohio, Mr. Welsh obtained degrees at Wittenberg College, Harvard University and Massachusetts



J. W. Welsh

Institute of Technology. He was graduated as a Bachelor of Science in electrical engineering from the last named institution in 1903.

After periods in the service of the National Tube Company and the Westinghouse Company, he went with the Pittsburgh Railways in 1906 as an assistant electrician. In 1910 he was made electrical engineer and three years later, as an additional duty, took charge of the traffic department.

During the war he was transportation engineer for the Emergency Fleet Corporation. In that capacity he surveyed transportation facilities to the various ship yards along the Atlantic coast. After the war he was retained as special engineer by the American Electric Railway Association and two years later was promoted to executive secretary. During his ten-year term he was constantly consulted in the traffic surveys undertaken by electric railways.

During the readjustment period following the war, Mr. Welsh assembled the data and assisted in the preparation of the case for the electric railways presented at Washington before the Federal Electric Railway Commission.

## Adrian Hughes, Jr. Elected President Maryland Body

Adrian Hughes, Jr., who has been elected to the presidency of the Maryland Utilities Association for the ensuing year, is one of the more prominent of the younger executives in the transportation industry. While nearly all of Mr. Hughes' operating experience has been with the United Railways & Electric Company of Baltimore, he has served in several important positions in different branches of



Underwood & Underwood

Adrian Hughes, Jr.

the work. At present he is on the executive staff of the general manager. Until the operating departments were consolidated recently he was superintendent of bus transportation, having been appointed when the position was created in 1925. During his incumbency there has been a steady expansion of the bus system of the Baltimore property.

Before his connection with the bus system Mr. Hughes had served for more than ten years in the power department, the last five years as superintendent of power. Prior to assuming charge he was an engineer in the distribution division for four years and assistant to the superintendent of power for nearly two years.

Mr. Hughes began his professional career with the Carnegie Steel Company in 1912, and in November of that year was made general foreman of the electrical department of that company, which position he relinquished when he joined the United Railways in 1914. He was born in Baltimore, and received the degree of A.B. from Rock Hill College in 1908. His technical education was obtained at Cornell University, from which he was graduated in 1912 with the degree of M.E.

Apart from his duties, Mr. Hughes has long been active in association work. He has been one of the leaders in the Maryland Utilities Association since its formation eight years ago. As vice-president and chairman of the program committee he was largely responsible for the successful meeting recently held in Baltimore. For some time he has presided over the meetings of the transportation group. For many years he has been among the leaders of the American Electric Railway Association. At present he is a member of the entertainment committee and a member of the executive committee of the Transportation and Traffic Association. In former years he was active on the power commit-

tees of the Engineering Association. He has contributed much to the research work on bus operation and on substation development by his active participation in association affairs. Articles by him based on his intimate study of transportation and engineering subjects at first hand have appeared in *ELECTRIC RAILWAY JOURNAL* and other publications.

## A. W. Leonard Made Chairman at Seattle

A. W. Leonard has resigned as president of the Puget Sound Power & Light Company, Seattle, Wash., to become chairman of the company. He has been connected with the Stone & Webster interests for 36 years, more than half of which have been spent in Seattle. He was made president of the Puget Sound company on Nov. 1, 1914, upon the death of Jacob Furth. Under his presidency the company won the Charles A. Coffin medal in 1928 and the Forbes public service cup in 1929.

Mr. Leonard was born in Monmouth, Me., in 1873. His early affiliations include the Edison Electric Illuminating Company, Brockton, Mass., of which he was superintendent and manager. In 1901 he went to Houghton, Mich., as superintendent of the Houghton County Electric Company, later becoming manager, and in 1905 he was appointed manager of the Minneapolis General Electric Company, later becoming vice-president. Still later he became district manager of the Stone & Webster interests in the Middle West, moving to Seattle in 1912.

## Messrs. Hannaford and McPhail Named to Winnipeg Board

The Insull interests, of Chicago, having acquired a very substantial block of shares in the Winnipeg Electric Company, President Anderson of the company suggested at the recent annual meeting that these interests be represented on the board by two directors to fill vacancies. To that end he suggested the names of Foster Hannaford, Chicago, and J. A. McPhail, Sault Ste. Marie, Ont. Incidentally, Mr. Anderson said that Nesbitt, Thomson & Company, and the Power Corporation continue their interest in the company as heretofore. In other words, the Insulls have acquired



Foster Hannaford

common stock on the market to the point where they now have a very substantial interest in the company. The advent of these interests in the affairs of the company will not mean any change of policy of management in the light, power and railway system. Other directors were re-elected.

Mr. Hannaford is a former St. Paul man, son of J. M. Hannaford, former president of the Northern Pacific Railroad and now vice-chairman of the board of this road. He was graduated from the Sheffield Scientific School of Yale in 1908, and after two years' study abroad returned to enter the service of the Westinghouse Electric Company in East Pittsburgh, as an apprentice. He was made superintend-



J. A. McPhail

ent of the Twin City Rapid Transit Company in 1924, later becoming associated with the firm of Noyes Brothers & Cutler, St. Paul, wholesale druggists. Last June Mr. Hannaford joined the Middle West Utilities Company, Chicago, and is now assistant to the president of that company.

Mr. McPhail is a man of wide corporation experience and a lawyer. He was born at Bruce Mines, Ont., on Feb. 7, 1878, and was graduated from Osgood Hall, Toronto, in 1900. In September of that same year he was admitted to the bar. Among his many other activities he was an alderman at Sault Ste. Marie for four years and was Mayor two years.

He is president of the Great Lakes Power Company, Algoma District Power Company, International Transit Company, Lake Superior Power Company, Algoma Pyrites Company, St. Mary's River Construction Company, Superior Alloys, Winnipeg Heating Company, and Northern Public Service Corporation. He is vice-president and director of the FitzGerald Laboratories of Canada, Middle West Utilities Company of Canada, and Stone Lumber Company. He is a director of Insull, Son & Company of Canada, and chairman of the National Utilities Corporation.

## Professor Riggs in Engineering Practice

Henry Earle Riggs will devote his attention to the practice of engineering, giving particular attention to problems growing out of railroad and public utility regulation, with offices at Ann Arbor, Mich. His retirement, on June 30, 1930, from active administrative and teaching work at the University of Michigan, now permits him to devote his entire attention to engineering practice.

## E. J. Jonas, Ohio Equipment Man, Heads C.E.R.M.M.

E. J. Jonas, superintendent of equipment of the Cincinnati Street Railway, Cincinnati, Ohio, was elected president of the Central Electric Railway Master Mechanics' Association at the meeting held at Toledo, on April 9. Two years ago he was made vice-president of the association and at the same time elected chairman of the program committee.

Mr. Jonas has been prominent in mechanical and electrical engineering circles for some time. In addition to the active part that he has long taken in the



E. J. Jonas

affairs of the Central Association, he has also contributed to the work of the Association of Equipment Men, Southern Properties, by participating in its affairs. Mr. Jonas knows his subject thoroughly and knows how best to impart information about it to others, a most important talent. Moreover, he writes with ease and grace and has been a frequent contributor to *ELECTRIC RAILWAY JOURNAL* on cars, maintenance and other topics which he has made peculiarly his own. It would, indeed, be difficult to appraise the value of his contributions to the industry as a participant in association affairs and as an author, but these contributions rank high in the annals of the progressive thinking in the industry.

Mr. Jonas' work at Cincinnati and on other properties has won for him regard as an authority on car design. That he is unusually resourceful is attested by the fact that he has perfected many important mechanical improvements for electric railway equipment. In the planning and construction of the new \$1,000,000 Winton street car repair shops, built in 1927 by the Cincinnati Street Railway, he played an important part.

Mr. Jonas is a native Cincinnati. He attended Walnut Hills High School and received his technical training at Ohio Mechanics Institute from which he was graduated as an electrical engineer. His first position in the electric railway field was with the St. Louis Transit Company in the power maintenance department. From 1902 to 1921 he was employed by the Cincinnati, Georgetown & Portsmouth Traction Company, in charge of power and roadway. He came to the Cincinnati Traction Company in November, 1921, as as-

sistant to F. J. Venning, superintendent of equipment and overhead lines. Shortly after the Cincinnati Street Railway resumed the operation of its property in 1926 as successor to the Cincinnati Traction Company, Mr. Jonas was appointed superintendent of equipment, which position he holds at the present time.

Partly as a compliment to Mr. Jonas and partly because the electric railway engineers are interested in the improvement program which has been developed by the Cincinnati Street Railway, the next meeting of the Master Mechanics' Association will be held in Cincinnati during the month of September.

## New Purchasing Agent at Detroit

Walter S. Brieden, assistant purchasing agent of the Department of Street Railways, Detroit, Mich., has been promoted to purchasing agent by the Street Railway Commission, filling the position vacant since the removal of Harold S. Owen, a Bowles appointee, shortly after the advent to office of Mayor Frank Murphy. For ten years Mr. Brieden has been connected with the purchasing department of the Department of Street Railways, operating the municipal railway and bus lines. At three different times in the past he has been acting purchasing agent. Before he entered the service of the city, Mr. Brieden was with the purchasing departments of the Timken Detroit Axle Company and the Wadsworth Manufacturing Company in capacities in which he gained wide experience.

## Bert Gray Heads Houston Companies

Bert Gray has been elected president and general manager of the Houston Electric Company and Galveston-Houston Electric Railway, Houston, Tex., to succeed Jeff L. Alexander, who has been transferred to New York by Stone & Webster. Mr. Gray is a native of Ohio. Prior to his becoming connected with the Houston Electric Company, 25 years ago, as a stenographer and clerk, he was deputy county clerk of Fort Bend County. He has been claim agent of the Houston Electric Company, Galveston-Houston Electric Company and Galveston-Houston Electric Railway for several years.



Bert Gray

## J. F. McLaughlin Elected President of Seattle Utility

J. F. McLaughlin has been elected president of the Puget Sound Power & Light Company, Seattle, Wash., to succeed A. W. Leonard, made chairman of the board. Mr. McLaughlin brings to his new executive position a broad background of practical engineering experience. Equipped with a high school education, he started in the public utility field twenty years ago with the Woonsocket and Pawtucket (R. I.) properties in a clerical position. While doing this office work he took special business and technical courses at Brown University, and it was not long before he was appointed assistant to the manager of the utility company. Subse-



J. Frank McLaughlin

quently he was sent to Texas to assist in reorganizing the Eastern Texas Electric Company, later being made superintendent of light and power for the El Paso Electric Company and then manager of the Baton Rouge Electric Company.

When the Engineers Public Service Company acquired Virginia Electric & Power Company in 1925, Mr. McLaughlin was made vice-president in charge of the Norfolk division. He was later appointed operating vice-president at Richmond. From there he was called back to Texas as district manager in charge of all of the Texas, Louisiana and New Mexico properties. While serving in this capacity he was elected president of the Virginia Electric & Power Company, and from there he was made operating executive of the Stone & Webster Service Corporation, having charge of the operation of twenty utility companies located in the south.

Guy C. Hecker, secretary of the American Electric Railway Association, contributed to the pre-convention issue of *The Foundry*, dated April 15, a brief article devoted to the diversity of castings required by electric railway lines. He said, in effect, that the foundries get a good share of the \$1,000,000 which is spent by the electric railways daily for new plant, equipment and supplies. For the benefit of those connected with the foundry business who might not be fully informed on the extent of the electric railway industry, he reviewed statistically the magnitude of the electric railway industry.

## W. W. Cooper Retained by California Commission

Walter W. Cooper has been retained to take charge generally of the preparation of cases before the California Railroad Commission, the employment to commence as soon as Mr. Cooper can bring to a close his existing engagement with various California cities, by which he is employed in rate matters. He will enter upon his new work not later than July 1.

Mr. Cooper will maintain a constant check on the rate structures and earning conditions of the various utilities, and coordinate the work and records of the several departments of the commission in handling rate cases. He has had a broad and valuable training and experience in representing the public interest in rate matters. The California Commission has long felt the serious handicap its department experts were under in being required to build up a rate case, testify in the same, and then act as cross-examiners of utility witnesses. In this work it is expected Mr. Cooper will be a great benefit to its present staff.

Mr. Cooper was graduated from the University of Minnesota. He has been associated with C. L. Pillsbury, consulting engineer, in connection with the valuation of various public utilities in the District of Columbia for the utility commission there, with the late Dr. Edward W. Bemis in making a valuation of the People's Gas, Light & Coke Company for the city of Chicago, and with the late Dr. Delos F. Wilcox in valuation work or reports on various light and power companies and electric railways. He was employed by the East San Francisco Bay cities in the recent telephone rate case, and has represented the cities of Oakland, Sacramento, Stockton, Tracy, Fresno and Minneapolis in utility matters.

## A. J. Goedjen Heads Wisconsin Association

A. J. Goedjen, Green Bay, Wis., has been elected president of the Wisconsin Utilities Association. Mr. Goedjen is division manager of the Wisconsin Public Service Corporation.

E. J. Steinberg, service engineer of the Milwaukee Electric Railway & Light Company, Milwaukee, has been elected vice-president of the association. Ewald Haase, vice-president of the Milwaukee Gas Light Company, has been re-elected treasurer.

Mr. Goedjen has had extensive training with public utility companies in the Middle West. A graduate of the University of Wisconsin, he took the General Electric Company's test course for two years, and then spent one year drafting and designing in the engineering department of the Commonwealth Edison Company. He served for several more years as superintendent of the meter and testing department and later as assistant in the electrical department of the Milwaukee Electric Railway & Light Company.

He then became electrical engineer of the Merchants Heat & Light Company, Indianapolis, in which capacity he supervised the reconstruction of all the electric lines and substations and the electrical equipment of the power plants of that company. He returned to Wisconsin in 1916 as assistant manager of

the Wisconsin Public Service Corporation at Green Bay, and then affiliated himself with the Menominee & Marinette Light & Traction Company in the capacity of manager for six years; here also he played a prominent part in the rebuilding of the property.

## M. C. Smith Takes Over El Paso Post as President

M. C. Smith has taken up his duties at El Paso, Tex., as successor to F. J. Gannon, president of the El Paso Electric Company, promoted to the Tampa Electric Company, Tampa, Fla. At an informal luncheon arranged in his honor at noon on March 24, Mr. Smith had an opportunity to meet heads of all departments in the light and power and railway divisions.

The new chief executive at El Paso brings to the company there the efficient handling assured by unusual capabilities,



M. C. Smith

plus the benefits of a wide experience together with inherent qualities that should make him a prime favorite, both within the company circles and with the citizens of El Paso at large. At Baton Rouge, from which property he transferred to El Paso, Mr. Smith made a fine record and took an active interest in all constructive civic affairs. There he was a member of Baton Rouge's Industrial Commission of Five which did notable work in advertising the city's advantages as an industrial center.

His service as manager of the Baton Rouge Electric Company, Baton Rouge, La., and as president of the Louisiana Steam Products Company dates from 1926. Under his management, the latter company recently completed a 45,000-kw. power plant at Baton Rouge which embraces many features of construction unusual in power station practice. During the five-year period under Mr. Smith's management the Baton Rouge property made notable progress.

Mr. Smith is a native of Maine. He was graduated from the University of Maine in 1912. From 1912 until 1916 he was stationed at Sydney, Nova Scotia, with the Cape Breton Electric Company, Ltd. Beginning as student engineer, he worked upward through the positions of solicitor, purchasing agent and assistant to operating executives. He became superintendent of light and power, for the Cape Breton Electric Company, Lt., in November, 1915. The following spring Mr. Smith was as-

signed to the Brockton & Plymouth Street Railway as manager, later being transferred to the Lowell organization, where he gained considerable experience in electrical engineering.

The next step in his career was with the Nova Scotia Tramways & Power Company, to which he went in 1921, as superintendent of the light and power department, later also taking over the supervision of the tramway department. Returning to Sydney in 1923, Mr. Smith became manager of the Cape Breton Electric Company, Ltd., and remained there, in that position, until 1926 when he was sent to Baton Rouge as manager of the Baton Rouge Electric Company.

## A. S. Durrant Retires from General Electric

Arnold Stuart Durrant, for the past six years vice-president in charge of commercial relations of the International General Electric Company, Inc., has retired from active service and been made an honorary vice-president of the company following a connection of 40 years with the General Electric organization.

Upon formation of the International General Electric Company, Mr. Durrant was made manager of the Department of the Americas. In 1925 he was elected vice-president in charge of all commercial relations of that company. He is on the board of each of the subsidiary companies in Argentina, Brazil, China, Colombia, Cuba, Mexico, Porto Rico and South Africa, and vice-president also of those in Colombia, Porto Rico and South Africa.

Mr. Durrant was graduated from University College, London. After two years of further education in Brussels and Paris he returned to the British West Indies, where he was born. In 1890 he entered the employ of the Edison United Electric Company, out of which grew the Edison General Electric Company and later the General Electric Company. In 1896 Mr. Durrant went to Schenectady. In 1898 he had charge of apparatus sales in the foreign department, and in 1908 he was made responsible for the handling of all Canadian business.

## G. G. Landis Is Lincoln Chief Engineer

George G. Landis has been advanced to chief engineer of the Lincoln Electric Company, Cleveland, Ohio, manufacturer of "Stable-Arc" welders and "Linc-Weld" motors. Mr. Landis was graduated from Ohio State University, where he completed the course in electrical engineering, receiving the degree of bachelor of science in electrical engineering. His first work was with the General Electric Company in the design of small motors. He later went to the Westinghouse Electric Company as sales engineer for central station equipment. Mr. Landis joined the Lincoln Electric Company eight years ago to assume charge of this company's experimental activities. Subsequently he was placed in charge of electrical design of both motors and arc welders, and some time afterward of mechanical design. Many of the Lincoln patents, both on arc welding equipment and electric motors, are the result of his ingenious efforts.

## Otis R. Hill Master Mechanic at Omaha

Otis R. Hill has been appointed master mechanic of the Omaha & Council Bluffs Street Railway, Omaha, Neb., succeeding Thomas E. Wood, who is retired on a pension, effective June 11, when he reaches the age of 70 years. Mr. Hill went to Omaha from Springfield, Ill., where he was car and engine foreman for the Illinois Terminal Company. For many years he has been associated with several Illinois and Indiana railway companies. He studied electrical engineering at Millikin University. During the World War he was a captain and was commanding officer of the First Trench Mortar Battery. He is 41 years old.

## Arthur Gaboury in Safety- First Teaching Post

Arthur Gaboury, secretary-general of the Province of Quebec Safety League, will in future be responsible for conducting classes in safety throughout the Technical Schools of the Province. Mr. Gaboury was notified of his appointment by L. A. David, secretary, Province of Quebec Legislature. Mr. Gaboury is one of the pioneers of the safety movement, having fostered safety-first practices when general superintendent of the Montreal Tramways. Seven years ago he was responsible for the foundation of the Province of Quebec Safety League, an organization that has grown until today it is recognized by the Provincial Government of the Province of Quebec as being an integral part of every-day life.

## President Kyser Heads Memphis Campaign

W. D. Kyser, president of the Memphis Power & Light Company and Memphis Street Railway, and member of the law firm of Wilson, Kyser, Armstrong & Allen, Memphis, Tenn., has been made general chairman to head the group that is to stage the ten-year campaign for new pay-rolls, new purchasing power and permanently stabilized employment at Memphis, through advertising and industry-building activity. It is a \$2,000,000 campaign to culminate in 1941 with a celebration of the 400th anniversary of DeSoto's discovery of the Mississippi. Mr. Kyser said:

Memphis must start a movement entirely new, if we are to continue to provide employment for those who come here to live, as well as for our sons who are graduating by the thousands from our schools into a city that has yet to begin its major industrial development.

## C. Thorburn Motor Transit Purchasing Agent

Since the discontinuance of the purchasing department formerly headed by Jack Sikking about a year ago, the company has had no general purchasing department. For the better handling of all purchases, C. Thorburn has been appointed purchasing agent for the Motor Transit Company, affiliated with the Pacific Electric Railway, Los Angeles, and J. C. Neph is now assistant purchasing agent.

## OBITUARY

### Harlow C. Clark

Harlow C. Clark, public relations counsel since 1920 for the Public Service Corporation of New Jersey, Newark, N. J., died on April 10 at his home in East Orange, N. J. Mr. Clark went to the post in New Jersey from that of editor of *Aera*, published by the American Electric Railway Association, after serving that paper for seven years. He was a newspaper man of wide experience, well-versed in civic affairs, and his counsel was widely respected in association affairs. One of his many worthwhile contributions to the industry was his presentation as author in 1920 while he was editor of *Aera* of the volume "Service at Cost Plans," an identical analysis of statutes, ordinances, agreements and commission orders then in effect, or proposed, together with a discussion of the essentials of local transportation franchises. It was a contribution invaluable to the conduct of this industry under the changing conditions of the last decade. This and his work on *Aera* established his place in the history of the industry indelibly.

Harlow C. Clark was modest and retiring almost to a fault. Without any fanfare he did most constructive civic work in several posts in Syracuse, and it was this work that attracted the attention of J. N. Shannahan, J. P. Barnes, C. Loomis Allen and other operators then engaged in electric railway work in Central New York, and won their admiration with the result that he was induced to leave Syracuse to take the post of editor of *Aera* which he filled so creditably.

Born in Syracuse, N. Y., Mr. Clark worked in the freight and transportation departments of the New York Central Lines and the Lehigh Valley Railroad, but in 1892 returned to Syracuse, where he entered the employ of the Syracuse News as a reporter. Later he was Sunday editor of the Syracuse Herald and city editor of the Syracuse Journal. In 1903 he became secretary to the Mayor of Syracuse and in 1905 secretary of the Syracuse Chamber of Commerce. After that he was Public Safety Commissioner in Syracuse and again secretary of the chamber. In 1911 he became an editor of the Syracuse Journal and in 1912 he did publicity work for the firm of Allen & Peck, Inc. One year later he became editor of *Aera*. Harlow Clark's interest in civic affairs never abated, and he was a frequent contributor to the New York Times and to other papers and to magazines on topics of city affairs speaking with the broad and humanitarian knowledge of them which his intimate contact with them at first hand had engendered.

### W. E. Livingston

W. Eugene Livingston, secretary and treasurer of the Grand Rapids Railroad, Grand Rapids, Mich., died suddenly on April 17. He had gone to the company's amusement park at Ramona, Reed's Lake, on an inspection tour preparatory

to the opening of the park, when he was stricken with heart failure, from which he had been ill some time.

Mr. Livingston was born in Grand Rapids on May 1, 1880. He started with the railroad there on Nov. 1, 1903, as a clerk in the storeroom. Later he was promoted to purchasing agent and a few years ago was elected secretary and treasurer. For three years he had been manager of Ramona Park, operated by the company and one of the leading amusement parks of the country.

Mr. Livingston was active in the civic progress of the city and was a leader in every movement for industrial or commercial advancement. He was past president of the Lions Club, active in the Association of Commerce and in Masonic circles.

### Nelson Robinson

Nelson Robinson, a former member of the New York Stock Exchange and director of electric railways in Buffalo and Philadelphia, died in New York on March 27 after an operation. He was a widower, 77 years old.

For some years Mr. Robinson was interested in the International Railway of Buffalo. In 1922 he was elected a director of the Philadelphia Rapid Transit Company, in which he had been a strong supporter of the late Thomas E. Mitten.

Mr. Robinson was born in the Union Square section of New York City, a son of the late Nelson Robinson, who was a partner of Daniel Drew. The American founders of the family settled in Putnam County, N. Y., in Colonial days. After attending the Choales School at Newport, R. I., and the Sheffield Scientific School at Yale, Mr. Robinson entered Wall Street. He later became a member of the Exchange and a partner in Homans & Company, brokers. He retired from business about seven years ago.

### Joseph R. Ellicott

Joseph R. Ellicott, for many years an official of the Westinghouse Air Brake Company, died of heart disease at his home at Ormond Beach, Fla., on April 16. It was in 1905 that he was appointed New York district manager of both the Westinghouse Traction Brake Company and the Westinghouse Air Brake Company. In these positions he continued until 1919, when he asked to be relieved of active duty. Since then he has served in a consulting capacity. For several years he had made his home in Florida. He was president of the American Electric Railway Association for several terms.

As H. H. Westinghouse, chairman of the Westinghouse Air Brake Company, said, Mr. Ellicott's death will be deeply regretted not only by his immediate associates but by his many friends in the railroad field. He was an able executive and a genial friend, and he played an important part in modern railroad development. Few men were more widely known or held in higher regard by the railroad officials and engineers of America.

Mr. Ellicott was born in Batavia, N. Y., in 1858. He was educated at the public schools of Grand Rapids, Mich. He started in business with the First National Bank of Grand Rapids. In 1873 he entered railroading, becoming a fireman on the Michigan Central.

In 1877 he was employed in the claims department of the Chicago & North Western Railroad and later became traveling auditor, first for the St. Paul, Minneapolis & Omaha Railroad and then for the Chicago & North Western. He then became, successively, general manager of the Ajax Forge Company, Chicago; Eastern sales manager of the Griffin Wheel & Foundry Company in New York, and organizer and director of the General Agency Company, a railway supply company, New York.

In 1898 he was made general manager of the Standard Air Brake Company. In 1901 the company was taken over by the Standard Traction Brake Company, which was in turn controlled by the Westinghouse Air Brake Company, and Mr. Ellicott was made manager of this company, with headquarters in New York. The Westinghouse Traction Brake Company succeeded the Standard Company in 1903, with Mr. Ellicott retained as manager. From that post he was advanced in 1905 to district manager.

Mr. Ellicott is survived by a widow, two sons, Charles R. Ellicott and Joseph R. Ellicott, Jr., and a daughter.

### W. I. Berryman

William I. Berryman, Union Trust Company official, died on April 13 at Pittsburgh, Pa. Mr. Berryman's other business interests in the last 35 years included J. W. Berryman & Sons, merchants, of Coal Centre, Pa.; presidency of the Pittsburgh & Charleroi Street Railway and of the West Side Street Railway, vice-presidency of Webster, Monessen, Bellvernon & Fayette City Street Railway; the Bank of Charleroi & Trust Company and the Union Trust Company of Clairton. He held directorships in the First National Bank of Finleyville, the Connellsville Courier Publishing Company, the Babcock Carrier Lumber Company and the Tilghman Island Club. He was born in August, 1865, and was graduated from California Normal School, taught school and then took a business course at Poughkeepsie, N. Y. He attended Waynesburg College, and later was admitted to the bar.

### R. J. Higgins

Richard J. Higgins, connected with the legal department of the Kansas City Public Service Company, Kansas City, Mo., for many years and widely known throughout the country for his legal ability, died on April 1.

Mr. Higgins became connected with the legal department of the Kansas City Railways, predecessor of the present company, in 1916, as general solicitor. Later he was made general counsel, and remained in the latter position until the receivership in 1920. He then returned to the practice of law and was one of the attorneys representing the bondholders protective committee during the receivership. At the time of his death Mr. Higgins was employed as special counsel for Kansas City Public Service

Company, in which capacity he was primarily engaged in the 10-cent fare case.

At the age of 25 years, Mr. Higgins was known as one of the youngest judges in the United States. He held that position for about a year when he was appointed city attorney for Kansas City, Kan., in which capacity he served three terms.

Mr. Higgins was born May 14, 1883, in Kansas City, Mo. He was graduated from the Kansas City School of Law in 1906, and in the ensuing years built up a practice which earned him the reputation of being one of the most able lawyers in the Middle West. He formerly was associated with James A. Reed, and participated with him in defending Henry Ford in the famous libel suit.

### J. B. Terbell

Joseph Bodine Terbell, chairman of the board of directors of the American Brake Shoe & Foundry Company with which he had been associated for the last 30 years, died in New York on April 15.

Mr. Terbell was born at Corning, N. Y., Feb. 12, 1863. After he was graduated from Hamilton College in 1884 he at once went to work with the Fall Brook Railway, a small railroad near Corning which is now a part of the New York Central System. He was an officer of this road for thirteen years, until 1897, when he became president of the Corning Brake Shoe Company.

While occupying this position he helped bring about a merger with the American Brake Shoe & Foundry Company, in 1902, and assumed the vice-presidency of the consolidation. He was elected president in 1919, retiring ten years later to take the chairmanship of the board.

In addition to serving subsidiary corporations allied to the American Brake Shoe & Foundry Company, Mr. Terbell was a director of several others of national importance, including a number of banks.

### G. L. Maltby

George L. Maltby, president and general manager of the Jamestown, Westfield & Northwestern Railroad, the Jamestown Street Railway, the Jamestown Motor Bus Transportation Company and the Chautauqua Lake Navigation Company, died on March 29 at a hospital in Jamestown, N. Y., following a brief illness.

Mr. Maltby planned and carried out an extensive reorganization of the transportation lines at Jamestown, effecting many economies in management and improving service. The Jamestown, Westfield & Northwestern Railroad was practically rebuilt during his administration and an extensive interline freight business developed. The Chautauqua Traction Company, paralleling the line of the Jamestown, Westfield & Northwestern Railroad, on the west side of Lake Chautauqua, was abandoned and service of the Chautauqua Lake Navigation Company was cut down to the operation of a ferry connecting Mayville, Point Chautauqua and Chautauqua. Service of the Jamestown Motor Bus Transportation Company was extended and several new lines added. On the lines of the Jamestown Street Railway one-man cars were placed in operation and many routes combined.

Mr. Maltby was born in Jamestown 47 years ago. Following his graduation from the local high school he became ticket agent for the New York Central Lines. Later he joined the local Jamestown lines and subsequently became general superintendent of the Jamestown, Westfield & Northwestern Railroad.

Following the death of Almet N. Broadhead, president of the various lines, in May, 1925, Mr. Maltby was elected general manager. When Homer M. Preston, president, died in 1928, he was appointed to the post of president.

### James R. Pratt

James R. Pratt, who began his career as a conductor in Baltimore more than 35 years ago and rose to the position of vice-president and general manager of the United Railways & Electric Company, from which he retired in 1920, died there on April 22. More recently he had been president of the Maryland-Delaware Coast Railroad. He was 67 years old.

When Mr. Pratt withdrew from the company at Baltimore he went into business for himself. The record of his rise in esteem in the eyes of civic Baltimore until he commanded both public commendation and editorial attention reads like a page from Horatio Alger. James Pratt became a master at his work. From the post of trainman he went into the claim department. But he wasn't destined to stop there. Not James R. Pratt. He worked hard and he studied diligently. And his efforts were crowned by his admission to the bar. He made a name for himself as a practitioner, and won renown as a factor in the affairs of the American Bar Association and for his work in association affairs in this industry.

It is eleven years since Mr. Pratt participated actively in the affairs of electric railways, but the industry has always considered him its own, for if this industry afforded Mr. Pratt his opportunity, Mr. Pratt in turn afforded this industry its opportunity—to be proud of him. All of which it was.

Charles F. Donnelly, formerly superintendent of the Northern division of the Key System Transit, Oakland, now the East Bay Street Railway, is dead. After finishing his schooling at the old Lincoln School in San Francisco, Mr. Donnelly entered the service of the United Railways, San Francisco, as a motorman. He later was appointed inspector. In 1906 Mr. Donnelly went to Richmond as assistant superintendent of the East Shore & Suburban Railways, a forerunner of the present company. In 1913 he was promoted to superintendent, a position he held until his recent illness.

Benjamin I. Spock, general counsel for the New York, New Haven & Hartford Railroad and of the Connecticut Company, New Haven, Conn., died in Bermuda on April 22. Mr. Spock had been suffering from a heart ailment for two years. A week ago he went to Bermuda on the advice of physicians. He was born in New Haven and was graduated from Yale in 1897. He started with the New Haven Railroad in 1903.

William J. Tylee, receiver for the Penn Yan & Lake Shore Railway, which discontinued operations two years ago, died recently at his home in Penn Yan, N. Y., following a brief illness.



B.-M. T. recently tested this Diesel engine bus in a week of experimental operation

## Diesel Engine Buses Under Tests by Electric Railways

Increased interest is being shown by electric railways in the Diesel engine as a propulsion power plant for buses. Fuel economy has always been a strong point in favor of the Diesel engine, but the lack of thorough and extended tests has retarded its adoption by electric railways in this country. However, during the past year several railways have made extended tests of buses driven by Diesel engines with generally satisfactory results. In all the tests substantial fuel economy was obtained.

The Public Service Co-ordinated Transport purchased a Mercedes-Benz Diesel truck engine in August, 1929. This engine had a 105-mm. bore, 165-mm. stroke, and developed 70 hp. at the governed speed of 1,300 r.p.m. It weighed about 1,400 lb. It was installed in a standard gasoline-electric 30-passenger bus, and was operated in regular service in Newark throughout the winter of 1929-1930. In March, 1930, an experimental Diesel engine, built especially for bus operation, was received from Germany, having a 100-mm. bore, 150-mm. stroke, and developed 75 hp. at a speed of 1,600 r.p.m. After it had been in service for a time, this engine was returned to the manufacturer in Germany who sent back a third model incorporating several improvements found desirable during the test operation by Public Service. The third model has been operating in city service since October, 1930, with satisfactory results.

Capitol District Transportation Company, Albany, N. Y., purchased a Mercedes-Benz Diesel engine with an 85-hp. rating at 1,600 r.p.m., and weighing 1,580 lb. It installed this engine in a Mack bus, Model AL, with electric drive, and operated the vehicle in daily service for 10,000 miles as a test. Accurate performance data were kept of this engine, and at the end of the test comparisons with other types of buses were very favorable in the matter of fuel economy.

The Brooklyn-Manhattan Transit Corporation recently ran a test operation for a week with a Diesel engine bus, the first complete Diesel engine bus imported from

Germany. The bus was built by Mercedes-Benz, having a 72-hp. Diesel engine weighing 1,400 lb. The body was of all-steel construction, having an over-all length of 30 ft., and a seating capacity of 30 passengers. The results of this test were said to be satisfactory.

These imported Diesel engines are built by the Daimler-Benz Company, the parent company of the Mercedes-Benz Company, which has had considerable experience in the production of stationary Diesel engines for many years at Mannheim. Three important patents cover the principles of design, which gave the original impetus to the development of the compressor Diesel engine. These include the adoption of a precombustion chamber before the main combustion chamber, the design of the burner and the particular formation of the passage between precombustion chamber and cylinder.

In the precombustion chamber process, the fuel is not injected directly into the part of the cylinder swept by the piston but into a precombustion chamber where it undergoes partial combustion. The extra pressure thus generated in the precombustion chamber drives the fuel-air mixture through a special burner into the combustion chamber proper, where it is mixed with the air. The compression pressure is about 500 lb. per sq.in., the combustion pressure about 590 lb. per sq.in. The precombustion chamber replaces the compressor since it fulfills the requirements of introducing the fuel into the actual combustion chamber with perfect atomization of the fuel and intimate admixture with the combustion air.

The introduction of the fuel into the actual combustion chamber is effected by means of an atomizer situated between this and the precombustion chamber. This burner is fitted in such a way that only its lower face is in contact with the gases of combustion and any heating effect on the cooled walls is almost entirely precluded. In this way a rapid destruction of the body of the attachment, which might be caused by high passage velocity of the hot gases, is prevented.

## 300 Cars To Be Ordered for New York Subway

Before the end of the summer the Board of Transportation will place a contract for 300 more steel cars for use on the new subway lines, John H. Delaney, chairman, announced. The new cars will augment the 300 already delivered. Their cost is expected to be about \$9,000,000, the price paid for the first 300. Mr. Delaney estimated that about 2,000 cars would be required for the new city lines mapped out in the Board of Transportation's first stage of new rapid transit construction.

Of the first 300 cars, nearly all have been tested in trial runs in the 207th Street yards. Two trains of ten cars each will be tested soon in service conditions on sections of the B.-M.T. system to check the efficiency of the four-door construction in loading and discharging passengers.

## Chicago Will Increase Trolley Bus Fleet

Twenty-nine more trolley buses were ordered on March 28 by the Chicago Surface Lines for use in extending and supplementing its present system on the Northwest section of the city. A portion of these vehicles will be used to increase service on the heavy Central Avenue line. The remaining will be operated along new trolley bus routes. The trolley buses will replace gasoline buses along Belmont Avenue, and the other line will be the first step in a general program of establishing feeder service to rapid transit terminals. Four of the trolley buses have been in test service in Chicago.

Eleven of the new trolley buses were ordered from J. G. Brill Company, ten from the Twin Coach Corporation, six from the Cincinnati Car Company and two from the American Car & Foundry Motors Company. These orders will increase the total of trolley buses in Chicago to 114.

## British Railways Order Mercury Arc Rectifiers

The British Thomson-Houston Company, Limited, of Rugby, has obtained repeat orders from the London Electric Railway Company for the following mercury arc rectifiers: Seventeen of 1,500 kw. each and five of 2,000 kw. each. These rectifiers, which are of British design and manufacture, will be installed in nine substations, for which the equipment will include, in addition to the rectifiers, over 100 air blast transformers, 120 high-speed circuit breakers, and 60 heavy-duty oil circuit breakers. The rectifiers will be provided with automatic control gear for remote control. This is the largest order for mercury arc rectifiers ever placed in England.

The company also has in hand the manufacture of two 1,200-kw. mercury arc rectifiers for the London, Midland & Scottish Railway, Barking-Upminster electrification scheme, while a rectifier will shortly go into service on the Manchester-Altrincham Railway, the electrification of which is nearing completion.



## Brown Boveri Receives German Rail Contract

Electrification of the Stuttgart-Augsburg Railway line in southern Germany was decided upon recently by the Reichsbahn. The line is a continuation of that of the Augsburg-Munich, which is already electrified. Brown Boveri, Siemens-Schuckert, AEG and Bergman will divide the contract involving an expenditure estimated at 50,000,000 reichsmarks.

No immediate financing by the Reichsbahn will be necessary as a Swedish, Swiss and Dutch syndicate, headed by Schweizerische Kreditanstalt, has agreed to grant 7 per cent credit for the 1931 and 1932 work. The electrical manufacturers are guarantors to this loan. It is estimated that 10,000 Germans will receive employment in the electrification work.

## Road Building Speeded Up by New Du Pont Method

Certain phases of road building have been revolutionized by a new method developed by Du Pont explosives experts and highway engineers and recently announced. It is claimed that the new method frequently reduces the settling of fills to one-tenth the time formerly required.

Quantities of dynamite, in some cases amounting to 1,200 lb., are placed in the soft mud and a fill of earth is piled above it, sometimes the mound being as high as 30 ft. and containing 6,000 cu.yd. of earth.

The explosive is detonated, the soft mire blown out and the fill settles down to hard ground, leaving a firm, solid foundation for the concrete or other top material. The method is known as "accelerated fill settlement work" and it has greatly speeded up road building in those places where soft mire conditions have been encountered.

## Pennsylvania Buys \$7,500,000 of Steel

Contracts for approximately \$7,500,000 of structural steel and accessories were recently placed by the Pennsylvania Railroad. The material will be used for the railroad's \$175,000,000 improvement program, which includes the electrification of its lines between New York and Washington, D. C., and terminal improvements at Newark, N. J., and Philadelphia.

The structural steel contracts totaled 100,900 tons and were awarded to eight different companies. The following steel companies share the huge order: McClintic-Marshall Steel Corporation, subsidiary of the Bethlehem Steel Corporation, 34,000 tons; American Bridge Company, a subsidiary of the United States Steel Corporation, 26,000 tons; Shoemaker Bridge Company, 14,000 tons; Ingalls Iron Works Company, 13,000 tons; Mount Vernon Bridge Company, 4,300 tons; Fort Pitt Bridge Works, 4,000 tons; Lehigh Structural Steel Company, 4,000 tons; and Phoenix Bridge Company, 1,600 tons. Fabrication of the steel was started immediately after the award of the contracts.

Nearly one-half of the steel will be used in the electrification of the lines between New York and Washington. A total of 47,000 tons of fabricated steel for poles, crossarms, beams and braces will be used for the overhead lines, signal bridges and substations were switching equipment and power transformers are located. The work of erecting the steel for the power lines

between the Sunnyside yards in Long Island and Manhattan Transfer in Newark has been practically completed.

Construction to be undertaken immediately on the new passenger terminal in Philadelphia will require 18,000 tons of the steel orders. Preliminary ground work on the Philadelphia station is already progressing rapidly, following the recent award of a \$1,500,000 contract for excavation and foundation.

## Waste Material Association to Make Scrap Copper Survey

The National Association of Waste Material Dealers is undertaking a survey of the copper and brass scrap industries, working in co-operation with the Copper and Brass Research Association, the Non-ferrous Ingot Metal Institute and the American Association of Engineers. Provided the present experiment justifies such action, it is planned to make a canvass annually and to cover all domestic geographic sources of scrap copper and brass reduction points.

For many years the Bureau of Mines of the Department of Commerce has issued a yearly summary of the amount of copper, zinc, tin, lead, antimony, aluminum and nickel made available to the trade, and the technology of the methods used in their recovery.

## U. S. Rubber Enters Brake Lining Field

United States Rubber Company has placed on the market a complete line of automobile and industrial brake lining products. The distinguishing feature of the new line is that latex, the liquid form in which rubber is obtained from the tree, is used as the bonding material. Laboratory tests are understood to have indicated certain advantages for brake lining manufactured by this process. The products will carry the trade name "Royal Master."

The new products have been developed by the fiber products department, but sales will be handled by a new brake lining division of the tire department of the company.

## London Orders 335 Cars

In connection with the extensions now in progress of the Great Northern, Piccadilly & Brompton, the London County Council has ordered 145 motor cars and 130 trail cars. In addition to this order, the Council has decided to order 60 cars of similar type for operation on hilly routes, which will involve an estimated expenditure of £174,000. These cars will replace the old cars which cannot be reconditioned. The added equipment will meet all traffic demands which have been estimated for the future.

## Omaha Burns Old Cars

Thirty-five street cars, some in use since 1898, belonging to the Omaha & Council Bluffs Street Railway Company, are being burned. These cars represent an original value of approximately \$250,000. About \$20,000 will be salvaged from the old cars.

Some of the oldest cars have been used only as emergency cars of late, but others have been in regular use up until last winter. The old cars are being replaced by steel rebuilt cars, eight of which have gone into service since Jan. 1.

## Wind Tunnel Tests for High-Speed Car Designs

One drop of falling water is showing engineers and scientists how to revolutionize the shape of trains, locomotives, interurban cars and other high-speed vehicles.

That drop of water helped them to work out the present designs for Zeppelins, airplane wings, and racing automobiles. Now the same principles are being applied to train design.

Demands for higher speed have been growing more and more insistent. The great possibilities of applying Acro dynamics to streamline design of trains and interurban cars is now realized.

More than one year ago Westinghouse Electric & Manufacturing Company built a wind tunnel for testing models of present type trains as well as those of the streamline pattern. Investigations of wind resistance revealed that a falling drop of water assumes a shape offering the least resistance when descending through air. Air resistance tests of high-speed trains and automobiles indicated that total train resistance could be reduced one-half and wind resistance to one-third for certain types of rail equipment at high speeds.

In a series of tests with models of present type and streamline cars in winds of varying velocities, up to 80 m.p.h. some startling conclusions were worked out.

For a heavy locomotive and two heavy coaches, streamline design saves 13 per cent of the required total horsepower for a speed of 35 m.p.h. and 32 per cent of the total horsepower for a speed of 75 m.p.h.

It requires 286 horsepower to drive the present type of light interurban car at 80 m.p.h. Tests made in the Westinghouse wind tunnel indicated that the same type of car in the streamline design can be driven at 80 m.p.h. with only 140 horsepower, thus saving 146 horsepower. At 35 m.p.h., streamlining will save 30 per cent of the horsepower required for the present type of car.

It is evident that streamlining is not as important for the slower speeds or for heavy equipment as it is for high speeds and light equipment. Dr. Tietjens, who conducted the tests, concludes that streamlining will be worth while for medium and high-speed, light interurban cars and for heavy high-speed trains.

## Packing of Overhead Line Material to Be Discussed

A general conference of manufacturers, distributors and users of overhead electric railway materials will be held, under the auspices of the division of simplified practice of the Bureau of Standards, in the board of directors room, Chamber of Commerce Building, Pittsburgh, Pa., at 10 a.m., daylight saving time, on Thursday, May 7, 1931, to consider the simplification of packaging these units.

The American Electric Railway Association, through its committee on unit piling and standard packages, has been studying the possibilities and advantages of standard packages for this class of material for some time, and has submitted a tentative recommendation which will be used as a basis for discussion. The results of these studies indicate that the simplification of the number of units being packed in each container or bundle should prove helpful to manufacturers, distributors, and the electric railway companies, as consumers, and that much avoidable waste will be eliminated in this field.

## Conspectus of Indexes for April, 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
<b>Street Railway Fares*</b> 1913 = 4.84	Apr., 1931 7.81	Mar., 1931 7.80	Apr., 1930 7.71	Apr., 1931 7.81	Apr., 1926 7.35
<b>Electric Railway Materials*</b> 1913 = 100	Apr., 1931 120	Mar., 1931 124	Apr., 1930 140	Dec., 1926 159	Apr., 1931 120
<b>Electric Railway Wages*</b> 1913 = 100	Apr., 1931 233.2	Mar., 1931 231.9	Apr., 1930 231.7	Apr., 1931 233.2	Apr., 1926 224.7
<b>Electric Ry. Construction Cost</b> Am. Elec. Ry. Assn. 1913 = 100	Apr., 1931 186	Mar., 1931 187	Apr., 1930 203	Nov., 1928 206	Apr., 1931 186
<b>General Construction Cost</b> Eng'g News-Record 1913 = 100	Apr., 1931 191.6	Mar., 1931 194.5	Apr., 1930 207.1	Jan., 1927 211.5	Apr., 1931 191.6
<b>Wholesale Commodities</b> U. S. Bur. Lab. Stat. 1926 = 100	Mar., 1931 74.5	Feb., 1931 75.5	Mar., 1930 90.8	May 1926 100.5	Mar., 1931 74.5
<b>Wholesale Commodities</b> Bradstreet 1913 = 9.21	Apr., 1931 9.23	Mar., 1931 9.17	Apr., 1930 11.18	Jan., 1928 13.57	Mar., 1931 9.17
<b>Retail Food</b> U. S. Bur. Labor Stat. 1913 = 100	Mar., 1931 126.4	Feb., 1931 127.0	Mar., 1930 150.1	Apr., 1926 162.4	Mar., 1931 126.4
<b>Cost of Living</b> Nat. Ind. Conf. Bd. 1923 = 100	Feb., 1931 89.6	Jan., 1931 91.1	Feb., 1930 98.5	Feb., 1926 106.2	Feb., 1931 89.6
<b>General Business</b> The Business Week Normal = 100	Apr. 11, 1931 78.6	Mar. 14, 1931 81.4	Apr. 12, 1930 96.5	Oct. 6, 1928 117.6	Jan. 31, 1931 77.0
<b>Industrial Activity</b> Elec. World, kw.-hr. used 1923-25 = 100	Mar., 1931 108.2	Feb., 1931 110.3	Mar., 1930 120.3	Feb., 1929 140.4	Jan., 1931 97.6
<b>Bank Clearings</b> Outside N. Y. City 1926 = 100	Mar., 1931 71.5	Feb., 1931 69.8	Mar., 1930 94.3	Oct., 1929 111.8	Feb., 1931 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.

### Rail Prices Under Scrutiny

Investigation by the Department of Justice will reveal that the prices of steel rails have been fixed by fiat for the past 30 years. To the extent that the purchase of rails is infected by the contagion of reciprocal buying, the matter is subject to scrutiny by the Interstate Commerce Commission, to which Senator Couzens, chairman of the Senate interstate commerce committee, has submitted a request for an

investigation, but the Department of Justice is the only agency that is empowered to act under the anti-trust laws with regard to the uniformity in rail prices, which have stood at \$43 per ton for the last nine years, having been boosted from \$40 on Oct. 1, 1922. The prices bid vary only to the extent that specifications call for delivery of rails which depart from basic standards and, in ordinary practice, the railroads divide their orders among several steel companies.

### Cement Output Capacity Put at 261,000,000 Barrels

The production capacity of the Portland cement industry in the United States is estimated to exceed 261,630,000 barrels, according to Frank H. Crehore & Company, who have completed an analysis of the industry. In 1930 the Portland cement plants produced 160,905,000 barrels of cement, or approximately 61 per cent of the capacity of present equipment. This ratio is seen as placing the industry in a favorable position to meet expanding demands. At the present time there are 172 plants distributed at strategic points in 36 states, Pennsylvania having the most with 29 plants. There are thirteen major units in the Portland cement industry.

### Zinc Hits Lowest Since 1902

Price of common zinc metal, known as prime Western slab zinc, declined during April to the lowest price since 1902, 3.90 cents per pound, East St. Louis, or 4.25 cents, New York. The drop followed the issuance of zinc statistics for March by the American Zinc Institute. Though the trend was shown to be favorable the net change was evidently too small to be considered satisfactory. In 1902 the price of zinc dipped to 4.10 cents per pound, New York. The lowest price ever recorded was 3.10 cents, New York, in 1895, while the highest was 27½ cents per pound in 1915, during the war when scarcity of material was general. Three or four times during the past year zinc has dropped to 3.95 cents, East St. Louis, or 4.30 cents, New York. On every occasion that figure proved to be the bottom of the market.

### Four Million Pounds of Sheet Aluminum Ordered

An order for 4,000,000 lb. of sheet aluminum has been received at the Alcoa plant in Tennessee, the new alloy plant of the Aluminum Company. This is a strong indication that the new plant is rapidly gaining capacity in an operating schedule and that it will soon be able to maintain a full-time operating schedule. It was also announced that heavy rains had almost completely restored the supply of water at the various dams of the plant of the Aluminum Company.

## Electric Railway Material Prices April 24, 1931

<b>Metals—New York</b>	
Copper, electrolytic, delivered, cents per lb.	9.50
Lead, cents per lb.	4.50
Nickel, ingot, cents per lb.	35.00
Zinc, cents per lb.	3.90
Tin, Straits, cents per lb.	24.85
Aluminum, 98 to 99 per cent, cents per lb.	22.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	33.75
General service	29.00
<b>Waste—New York</b>	
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
<b>Wire—New York</b>	
Bare copper wire, cents per lb.	11.50
Rubber-covered wire, No. 14, per 1,000 ft.	\$4.25
Weatherproof wire base, cents per lb.	12.75
<b>Paint Materials—New York</b>	
Linseed oil (5 bbl. lots), cents per lb.	9.6
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), cents per gal.	55.00
Putty, 100 lb. tins, cents per lb.	5.50

<b>Scrap Metal—New York</b>	
Heavy copper, cents per lb.	7.25
Light copper, cents per lb.	6.25
Heavy brass, cents per lb.	4.25
Zinc, cents per lb.	2.12
Lead, heavy, cents per lb.	3.50
Mixed babbitt, cents per lb.	3.50
Battery lead plates, cents per lb.	1.50
<b>Old Material—Chicago</b>	
Steel car axles, net ton	\$13.00
Cast iron car wheels, gross ton	9.75
Steel car wheels, gross ton	12.75
Leaf springs, cut apart, gross ton	12.50
Angle bars, gross ton	11.25
Brake shoes, net ton	8.00
Steel rails (short), gross ton	12.75
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	4.75
<b>Track Materials—Pittsburgh</b>	
Standard steel rails, gross ton	\$43.00
Track spikes, ½-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, white oak, Chicago, 6 in.x8 in.x8 ft.	1.35

<b>Hardware—Pittsburgh</b>	
Wire nails, per keg	\$1.95
Sheet iron (24 gage), cents per lb.	2.25
Sheet iron, galvanized (24 gage), cents per lb.	2.85
Auto body sheets (20 gage), cents per lb.	3.15
<b>Bituminous Coal</b>	
Pittsburgh mine run, net ton	\$1.40
Central, ill., screenings	1.18
Kansas screenings, Kansas City	1.75
Big Seam, Ala., mine run	1.70
Smokeless mine run, Chicago	1.80
<b>Paving Materials</b>	
Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	\$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ½-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.35
Gravel, ½-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	16.00



# SAFETY

Can Be Bought!

with

## PEACOCK

### STAFFLESS BRAKES

Because Peacock Staffless Brakes arrest the momentum of the car instantaneously—with a braking force on the wheel of 3000 lbs.

There is no chance of the chain binding or clogging—no limit of safety is countenanced, for Peacock Brakes can wind up 12 feet of chain.

And, too, worn brake shoes do not deter positive braking.

**NATIONAL  
BRAKE COMPANY, Inc.**

890 Ellicott Square, Buffalo, N. Y.

General Sales Office: 50 Church St.,  
New York

*Canadian Representative:*

Lyman Tube & Supply Co., Ltd., Montreal, Can.

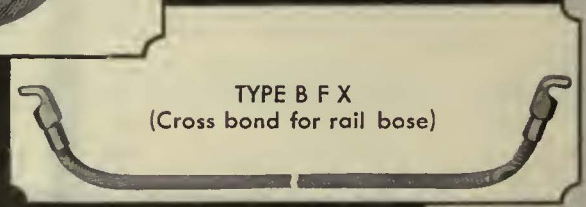
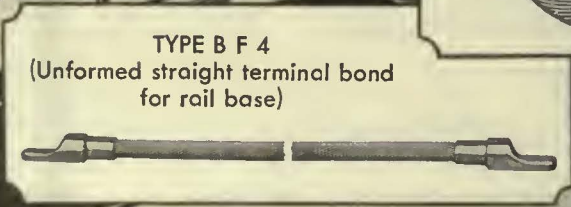
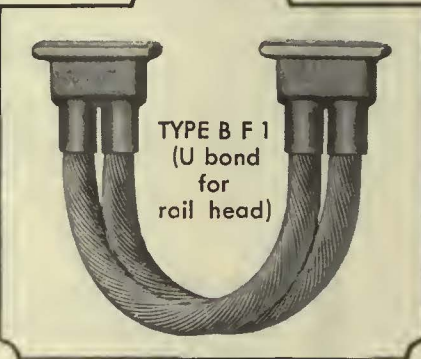
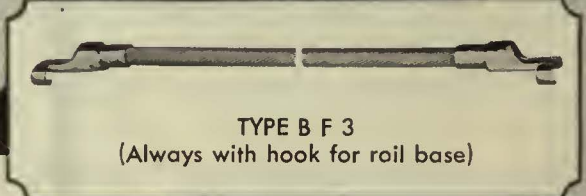
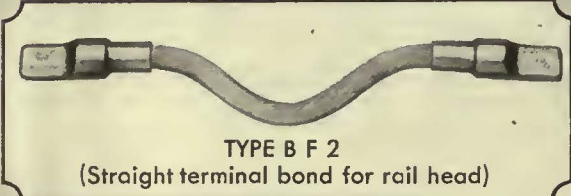
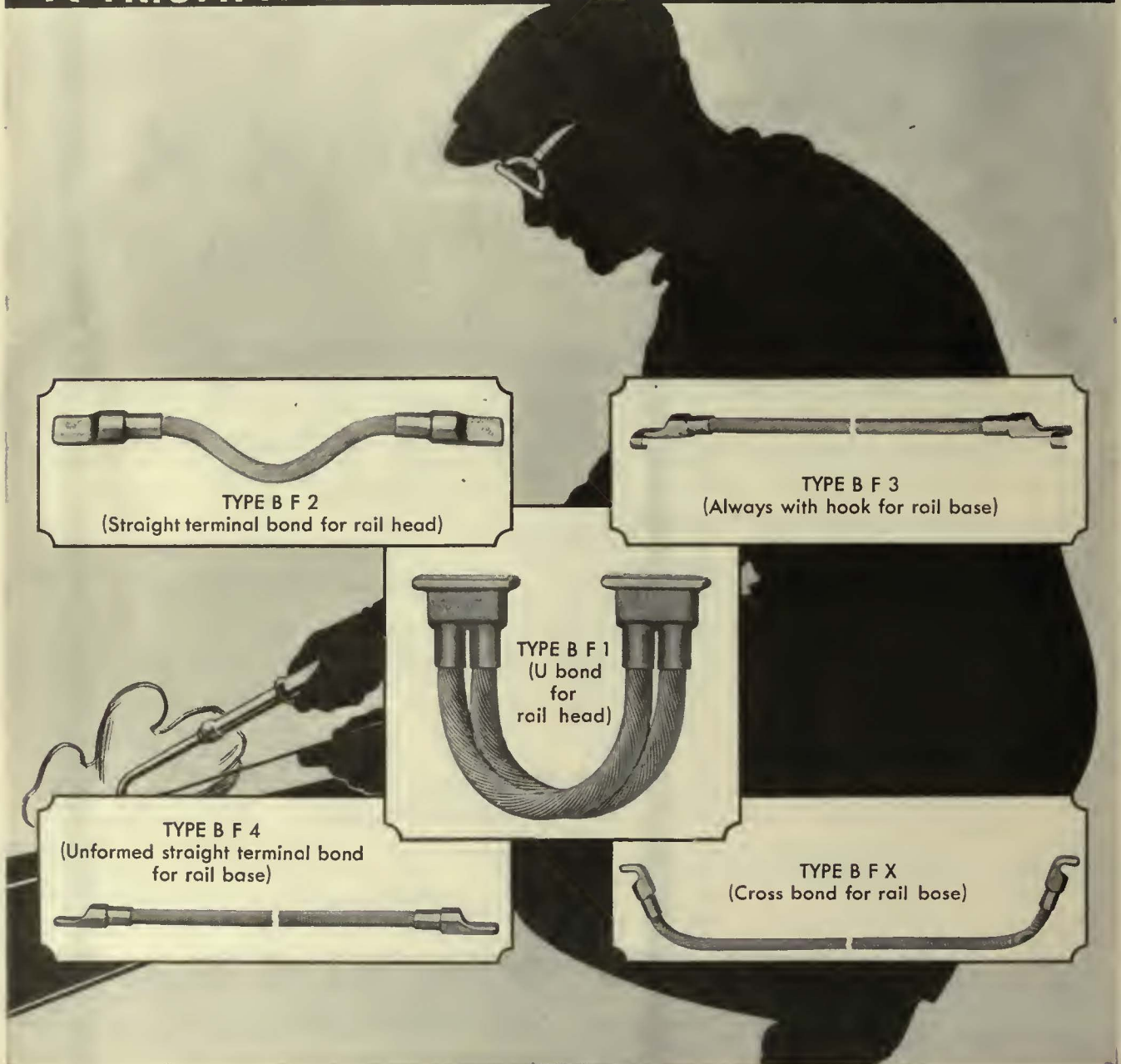
# TIGER WELD

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: Columbia Steel Company, Russ Building, San Francisco

Export Distributors: United States Steel Products Company, New York

# 4,000,000



For 4 years the Pittsburgh Motor Coach Company (Byllesby Engineering and Management Corp., Engineers-Managers) has equipped its buses with Goodyear Tires

## BUS MILES ON PITTSBURGH STREETS

Pittsburgh is a typical city for motorcoach operation. Its choked downtown streets bear heavy traffic, necessitating frequent, quick stops. On broader boulevards in the residential sections, traffic stretches out, speeds up. And Pittsburgh has many hills

—stiff ones to go up or down.

The 103 buses of the Pittsburgh Motor Coach Company have established a reputation for swift, comfortable, and dependable passenger service. Last year, this fleet traveled approximately 4,000,000

miles, completing its fourth year on Goodyear tires.

Goodyear Bus Balloons qualify here on superior performance, just as they do in hundreds of other cities and towns—in tight city traffic and on long, fast interstate hauls.

THE GREATEST NAME IN RUBBER



ON YOUR NEW COACHES SPECIFY GOODYEARS



*Mercury Arc Power Rectifier  
for 600 volt D.C. service*

## Once—always

Although 60% of the orders for A.B.B. rectifiers in 1930 were from new users, over 72% of the capacity in K.W. was "repeat business."

New orders show confidence; repeat orders indicate satisfaction.



AMERICAN BROWN BOVERI CO., INC.  
CAMDEN, N. J.

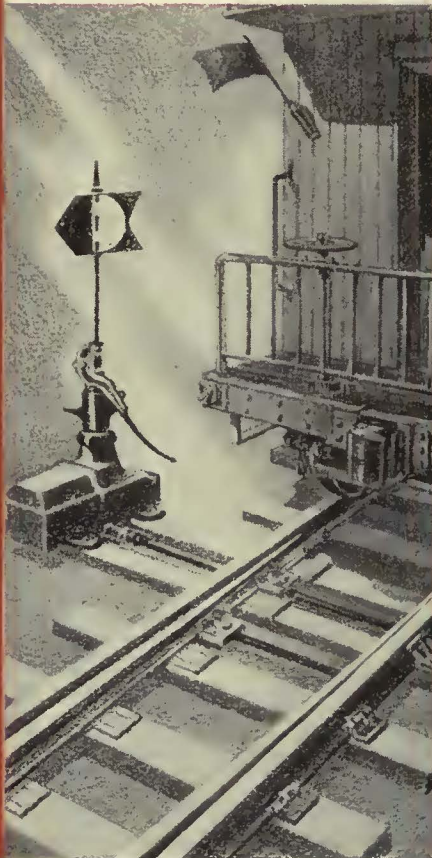
*Pioneers in Mercury Arc Power Rectifiers*

# AMERICAN BROWN BOYERI

# STOP WASTE

Railroad earnings have been cut. Net profit has been lowered, in some cases wiped out. Such a condition calls for strict attention to expenditures from which the annual return on investment is considerable. All waste must be stopped at once.

The cost of starting and stopping a car or train is small. But this sum multiplied by the number of operating cars and their stops per year adds a tremendous sum to the annual operating overhead. With rigid switch stands at the ends of double track or passing siding, cars must stop and start twice for switch operations. The 3-in-1 Switch Stand, operating automatically, eliminates these stops with safety. Many steam railroads have found that the 3-in-1 will pay for itself in less than ten days. To eliminate waste motion . . . to save both time and money, adopt the 3-in-1 Switch Stand.



***A Simple Source of Dividends:*** A double-coil spring returning switch points after trailing train has passed; an oil buffer retarding return between successive pairs of wheels; and a rigid throw for hand operation are the mechanisms that eliminate stops and pay dividends. Write for complete printed information.




## RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . . Los Angeles—Seattle  
Canadian Ramapo Iron Works Limited . . . . . Niagara Falls, Ontario

General Offices—230 Park Avenue, New York

Sales Offices at Works and McCormick Building, Chicago  
Metropolitan Bank Building, Washington  
Midland Bank Building, Cleveland, Ohio  
Builders Exchange Building, St. Paul  
Union National Bank Building, Houston, Texas

Nine Racor Works: Hillburn, N. Y. Niagara Falls, N. Y. Chicago, Ill. East St. Louis, Ill.  
Superior, Wis. Pueblo, Col. Los Angeles, Cal. Seattle, Wash. Niagara Falls, Ont.



# When you need STEEL

**I**NSEPARABLY linked with the development of Steel is the name "Carnegie." For nearly three-quarters of a century, Carnegie Steel Company has engaged in the manufacture of Steel—experimenting, learning, serving. The knowledge accumulated during this time, and the mechanical, metallurgical and engineering resources of this company are yours to summon. A dependable source of supply plays no small part in the success of a product or of an enterprise.

**Wrought Steel Wheels**

**Forged Steel Axles**

**Standard Rails . Steel Cross Ties**

**Plates . Floor Plate**

**CB Sections . Structural Mill Products**

**Bar Mill Products**

**Stainless and Heat Resisting Steels**



**CARNEGIE STEEL COMPANY • PITTSBURGH**

*Subsidiary of United States Steel Corporation*

138



# CARNEGIE



# A LOCOMOTIVE BUILDER WHO

.. changed his finish  
specification

.. got a better product, and

.. saved 31 cents a nut

THE NUTS used in the construction of a locomotive cost only a minor fraction of the total value of the materials needed, but they have an importance which, relatively, exceeds their cost. They must have strength, accuracy, and a good finish. For years R B & W EMPIRE Nuts have been standard on many locomotives.

The cost of these large nuts is secondary to their quality, but even in an item like this a saving is appreciated, as a recent experience proved. We submitted a regular semi-finished EMPIRE Nut, taken from stock, to a locomotive builder who had been buying a full-finished nut from another source.

After the locomotive builder had given us his initial order for semi-finished nuts, he wrote us that they had a better appearance than the full-finished nuts he had formerly purchased, and for which he had been paying a considerably higher price. His average saving, using R B & W Semi-Finished Nuts, was 31 cents a nut.

Eighty-six years of careful craftsmanship and constant progress in manufacturing methods in the R B & W plants result in high quality products made in large quantities to meet every need of American industry. An R B & W sales representative will be glad to discuss your bolt and nut requirements with you, without obligation.



BOURKE WHITE PHOTO

● All R B & W products are carefully inspected before shipment

## RUSSELL, BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, N. Y. ROCK FALLS, ILL.  
CORAOPOLIS, PA.



Sales Offices at Philadelphia, Detroit, Chicago, San  
Francisco, Los Angeles, Seattle, Portland, Ore.

# TULC

*is guaranteed to*

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1. Reduce the Number of your Hot Bearings.
2. Reduce your Bearing Cost.
3. Save in the Cost of your Maintenance.
4. Lengthen Your Oiling Periods.

TULC will do these things on your property—will give you these lubrication savings that it is daily giving to many leading properties.

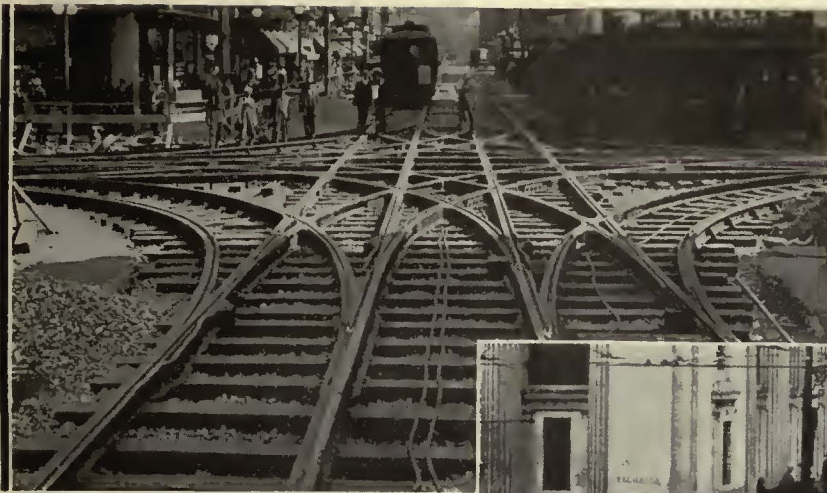
TULC is made for lubrication of electric railway equipment—for your needs. It stays put—does not run or drip off—does a real job of lubricating.

Under all conditions TULC insures faultless lubrication—with savings important enough to merit your investigation.

Arrange for a test of TULC—there is no obligation.

*The*  
UNIVERSAL LUBRICATING CO.  
CLEVELAND, OHIO





Grand Union Branch-Off, Roanoke Railway & Electric Company, Roanoke, Va., corner Campbell Avenue and Jefferson Street. Trackwork by The Lorain Steel Company. Upper photograph of work during installation, September, 1926. Lower view of paved street and tracks, January, 1931.



*Ingenious  
in Design  
Practical  
in Use*

# LORAIN SPECIAL TRACKWORK

FROM the simplest to the most complicated requirements of urban, suburban, or interurban trackwork, Lorain has always kept pace with changing demands. Lorain leadership in this field, established a generation ago, was never more definite than now.

The actual and anticipated nature of street construction, traffic regulations, weight and character of rolling stock, speed, volume, and complexity of movement, are all reflected in the designs and recommendations of Lorain engineers for the most advanced electric railway projects.

The Grand-Union Branch-Off here shown was constructed by The Lorain Steel Company in 1926 for the Roanoke Railway & Electric Co., Roanoke, Va. All switches, mates,

frogs, and crossings are of solid manganese steel. The tongue switches are of Lorain Tadpole Type. The closure rails are of open-hearth steel. The equipment throughout is of American Railway Engineering Association Standard 7-inch guard rail—Lorain Section 140-468—top of guard level with head, within the limits of the street intersections. The layout is built to an angle of 90 degrees, each of the quadrants being symmetrical.

This is a quite typical example of Lorain Trackwork. Five years of constant use have been sufficient to prove it trouble-free, practical, and satisfactory.

Correspondence regarding any problem of trackwork is invited.

## THE LORAIN STEEL COMPANY, Johnstown, Pa.

*Subsidiary of United States Steel Corporation*

AMERICAN BRIDGE COMPANY  
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Pittsburgh

# PERFORMANCE



# THAT COMPELS RECOGNITION

Actual service has proved this performance to the entire satisfaction of the operator.

**STREET CAR** Seats of deep spring construction provide for 21 passengers, while the two large loading wells and the 22-inch aisle (measured at seat cushions) accommodate upwards of 40 standees in comfort. Vacuum-operated entrance and exit doors are 24 inches in clear—assurance of easy, safe and rapid passenger circulation.

**PARLOR COACH** Seats are provided for 21-25 passengers. All except auxiliary and rear seats are of the reclining type with three-position adjustment and arm rests on both aisle and window sides. Interior baggage lofts are commodious and unusually sturdy. A distinctive modernistic motif has been achieved in the design of such interior appointments as reading lights, mirrors, window pillars, baggage lofts, etc. Passengers are assured exceptional comfort, clear vision and safety.

**CHASSIS FEATURES** 120-horsepower 8-cylinder engine . . . Heavy-duty 4-speed transmission . . . 172-inch wheelbase . . . Demountable power plant . . . Full-floating, worm-drive rear axle . . . 10-inch double-drop frame . . . Short turning radius, 27 feet . . . 4-wheel internal hydraulic brakes with booster . . . Designed throughout for motor coach service.



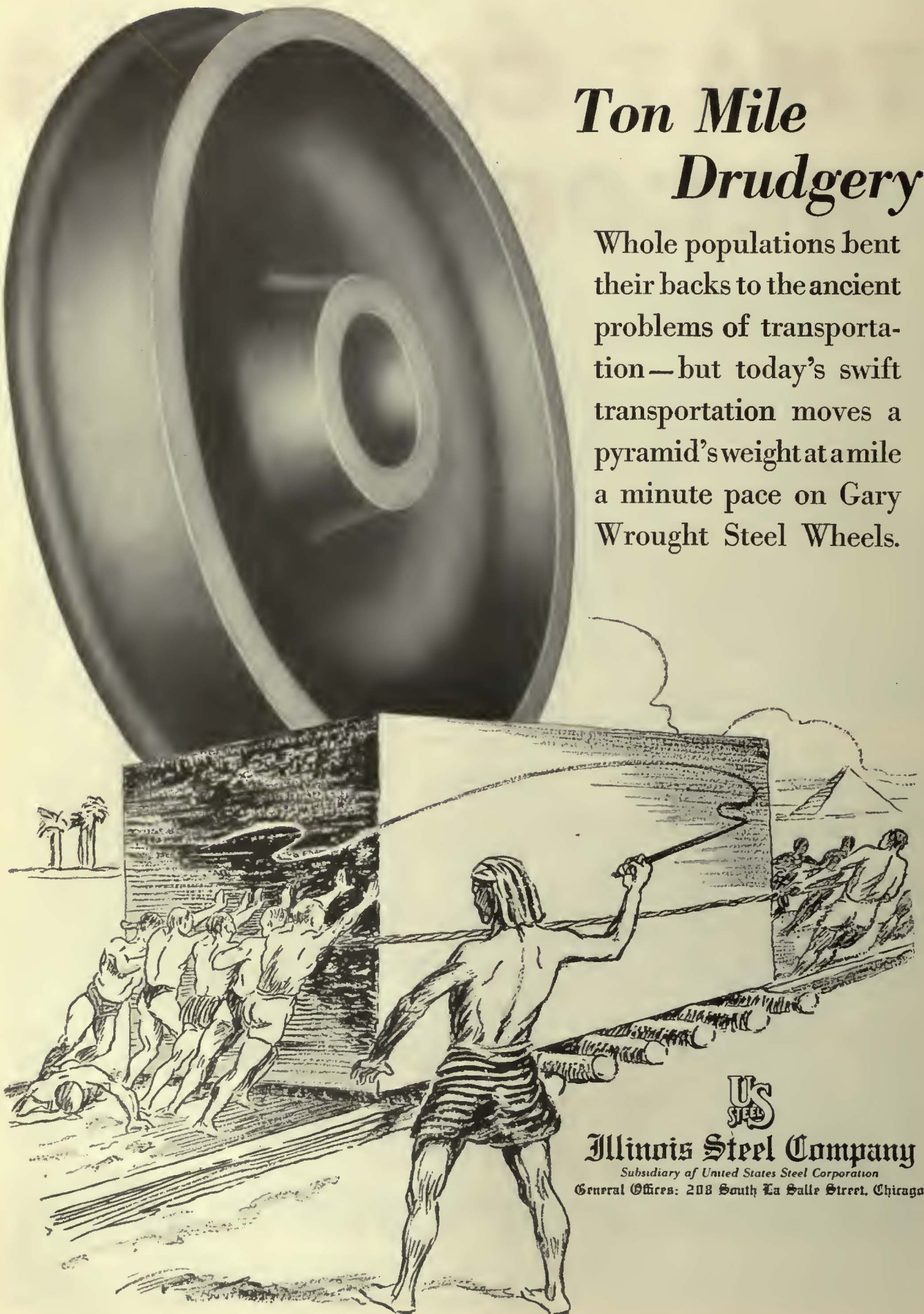
## FARGO MOTOR CORPORATION

DETROIT, MICHIGAN

D I V I S I O N   O F   C H R Y S L E R   C O R P O R A T I O N

# Ton Mile Drudgery

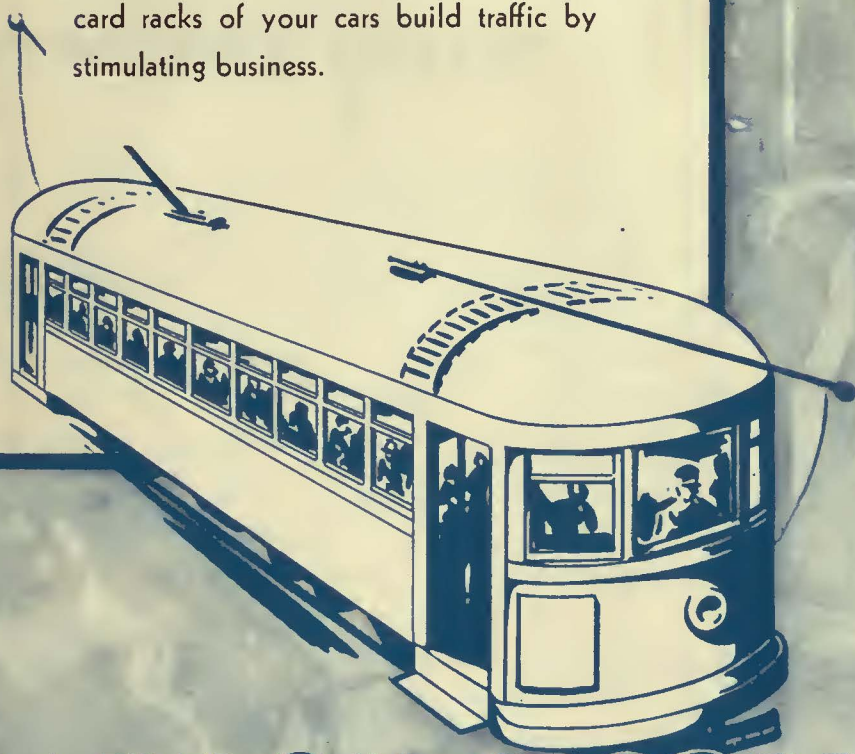
Whole populations bent their backs to the ancient problems of transportation—but today's swift transportation moves a pyramid's weight at a mile a minute pace on Gary Wrought Steel Wheels.



Active optimism is not given to prediction and prophecy. It is not forever guessing how things are just around the corner. Day in, day out, with no ado, it does unhesitatingly the things it knows are helping to make for better times.

Regardless of the apparent trend of general conditions, Collier Service car cards are actively optimistic. Daily they make a constructive contribution towards greater business activity.

Well planned and capably executed advertising campaigns displayed in the card racks of your cars build traffic by stimulating business.



**BAIRRON G. COLLIER, Inc.**  
Candler Building, New York  
**CAR CARD ADVERTISING  
ALMOST EVERYWHERE**

# THE SAFETY CAR CONTROL EQUIPMENT

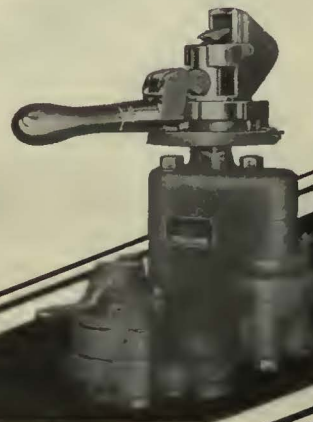
## Accelerates Street Car Service

Waiting time of patrons is reduced by possible shorter headway between cars . . . time consumed in making stops decreased by quick brake application . . . standing time of cars reduced by rapid passenger interchange . . . and quick get away permitted by prompt release of the brakes.

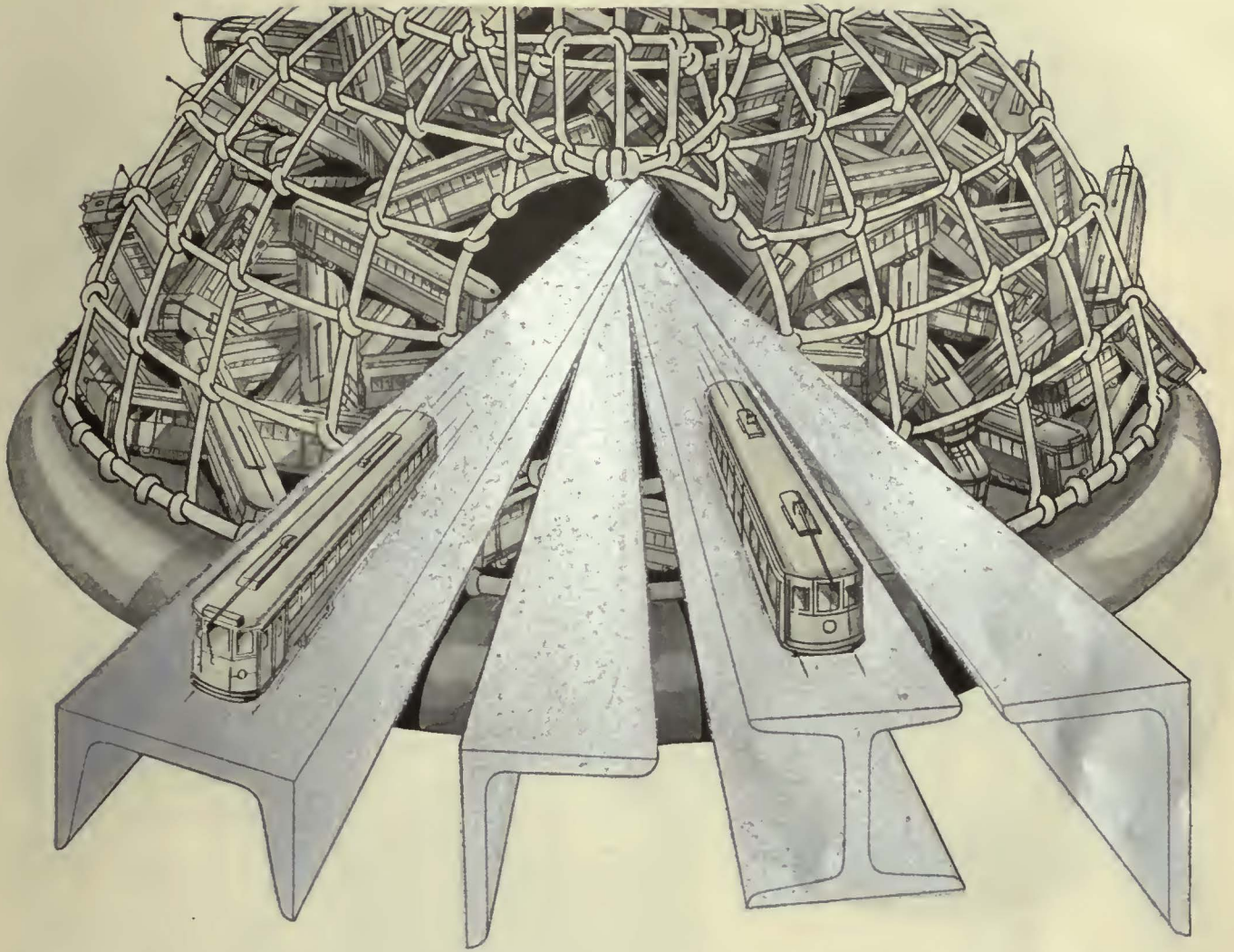
**SAFETY CAR DEVICES CO.**  
OF ST. LOUIS, MO.

*Postal and Telegraphic Address:*  
**WILMERDING, PA.**

CHICAGO                      SAN FRANCISCO                      NEW YORK  
WASHINGTON                      PITTSBURGH







## Break out of the trap of dead-weight with Structural Shapes and Sheets of Alcoa Aluminum

Habit—just clinging to established ways of doing things—lures many a victim. Don't be trapped by obsolete dead-weight construction in street cars. There is one way to escape. Replace surplus dead-weight metals with the strong alloys of Alcoa Aluminum which weigh only  $\frac{1}{3}$  as much and are the equivalent of structural steel in strength. Scrap the dead-load; pile on the pay-load; save power; increase your schedules; save wear on trackage and brakes.

The slight additional cost of original equipment is soon charged off, while clear profits continue to accrue. No wonder one prominent

street railway engineer says that he can easily pay \$1.25 for every pound of weight saved. And you can save up to 33.6% of the weight of every car. Safety is assured by a minimum tensile strength of 55,000 lbs. per square inch.

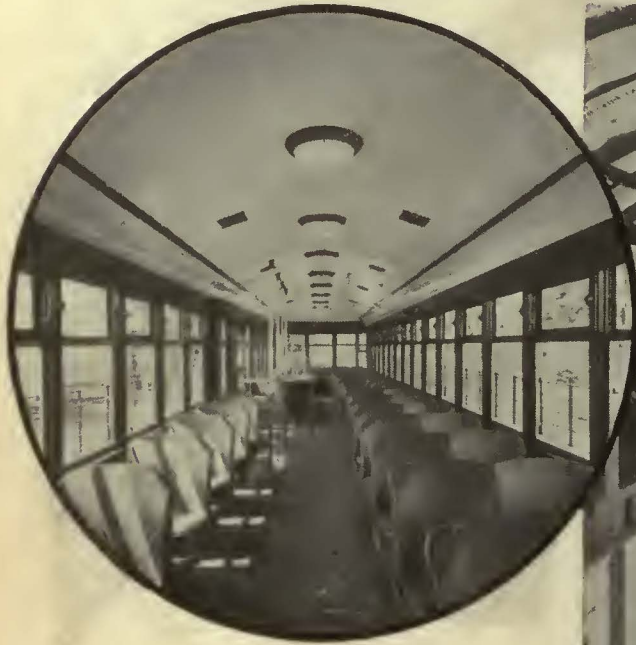
Standard structural shapes of the strong alloys of Alcoa Aluminum, used in street car construction, are carried in stock. Plates, rivets, bolts and screws are also available.

The engineering handbook, "Structural Aluminum," is available at \$1.00 a copy. Address ALUMINUM COMPANY of AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

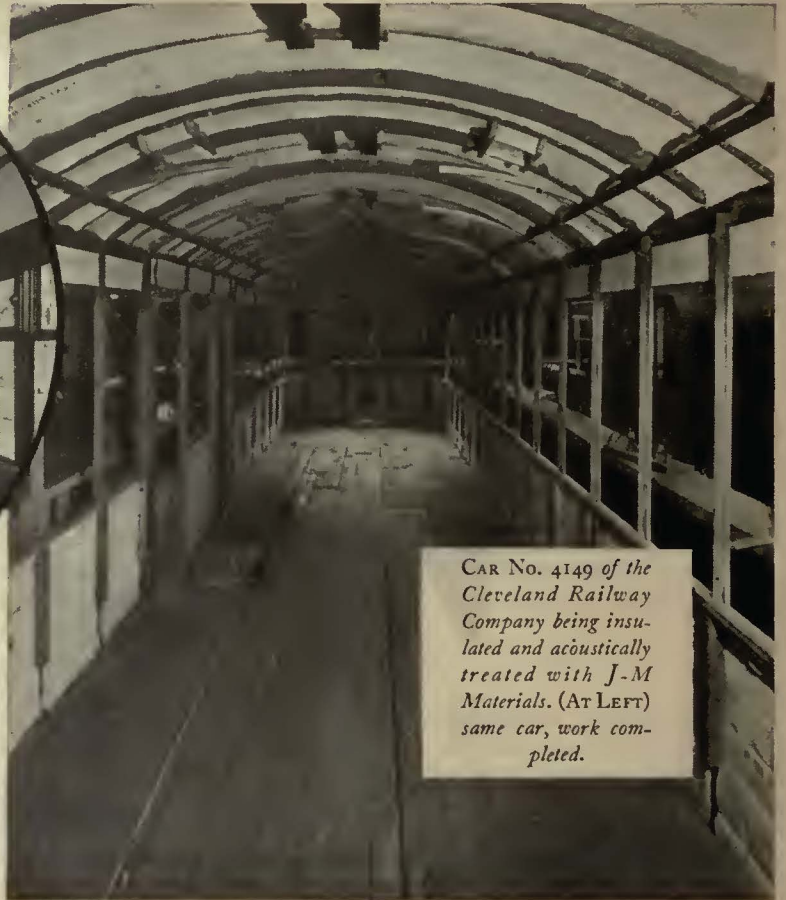


# ALCOA ALUMINUM

# *quiet*.. your strongest Public Appeal



J-M develops the *noiseless car* to meet the increased rider demand for *quiet*.



CAR No. 4149 of the Cleveland Railway Company being insulated and acoustically treated with J-M Materials. (AT LEFT) same car, work completed.

COMPETITION is increasing—the public demands comfort and quiet as well as speed. Now Johns-Manville meets this demand with Acoustical Materials and Methods that make the QUIET car possible.

For example, in Cleveland, Ohio, J-M Insulation engineers completely insulated and acoustically treated street cars No. 4149 and 5014 while

under construction for the Cleveland Railway Company. Floor, sides, rear end and roof deck were lined with J-M Insulation and Acoustical Materials. After several months' service, noise tests were conducted using for comparison an uninsulated car built at the same time.

The J-M insulated cars were from 67% to 77% less noisy than the un-

insulated type. The quietness of the cars was comparable to a modern Pullman. In addition, the cars were cooler in summer and warmer in winter.

J-M Insulation Service puts in your hands one of the strongest competitive weapons of recent years. It will pay you to investigate. Address Johns-Manville, 292 Madison Ave., New York City.

## Johns-Manville



# *Service to Transportation*



*In Pennsylvania  
nearly every other coach  
is a **YELLOW**...*

Far more Yellow Coaches are in revenue service throughout the United States than any other make. Far more revenue passengers are carried by Yellow Coaches than by any other make. Yellow Coaches are revenue builders. For example . . . . .

# Nearly Every Other Coach in the Keystone State is a Yellow Coach

Since 1924, when the first Yellow Coach was purchased in the State of Pennsylvania, the Keystone State has shown an overwhelming preference for Yellows.

Today, Yellow Coaches predominate, on highways and in cities. *Nearly every other coach in revenue service in Pennsylvania is a Yellow—*

And Yellow has sold more than twice as many coaches as its nearest competitor—in a much shorter length of time. The record of Yellow penetration tells its own story.

Year	Sales	Total
1924	.....	212
1925	71	283
1926	199	482
1927	262	644
1928	72	716
1929	133	849
1930	166	1015

These sales were made to 49 operators, which, collectively, have ordered Yellow Coaches 192 times—or an average of 4 times each.

Eight companies have reordered more than 10 times—four companies more than 15 times

and one company more than 20 times—a striking vote of confidence in Yellow performance. Moreover, 39 city transportation companies in Pennsylvania operate 830 motor coaches, of which 535 are Yellows—

65% Yellow preference. The following city coach operations are typical of the great popularity of Yellow equipment.

	Yellows	Others
Philadelphia .....	370	0
Pittsburgh .....	62	35
West Chester .....	31	3
Erie .....	26	0
Wilkes Barre .....	32	9
Altoona .....	7	16
Franklin .....	5	0
Conshohocken .....	2	3
	<u>535</u>	<u>66</u>

The Keystone State, like so many others in the Union, has rendered its decision in favor of Yellow Coaches. With every opportunity to test and compare, Pennsylvania operators choose Yellows on the basis of performance, operating economy and their ability to build revenue.

GENERAL MOTORS TRUCK CO., Pontiac, Michigan  
*Subsidiary of Yellow Truck & Coach Mfg. Co.*



*In Pennsylvania—as throughout all America—it's*

*Yellow Coaches*

# Operators of Yellow Coaches in PENNSYLVANIA

Harmony Short Line Transportation Co. ....	Pittsburgh, Pa.		
Westmoreland Transportation Co. ....	New Kensington, Pa.		
Saltsburg & Indiana Transportation Co. ....	Saltsburg, Pa.		
Shamokin - Mt. Carmel Transportation Co. ....	Mt. Carmel, Pa.		
Pennsylvania Greyhound Lines .....	Philadelphia, Pa.	Huntingdon Broadtop R. R. ....	Huntingdon, Pa.
Philadelphia Rapid Transit Co. ....	Philadelphia, Pa.	Pocohanne Lodge.....	Pocono Pines, Pa.
Pittsburgh Motor Coach Co.....	Pittsburgh, Pa.	Rapid Transportation Co. ....	Carbondale, Pa.
West Ridge Transportation Co. ....	Girard, Pa.	Wayne Auto Transportation Co. ....	Hawley, Pa.
Chester Valley Bus Line, Inc. ....	West Chester, Pa.	Southern Pa. Bus Co. ....	Wilmington, Del.
Johnstown Traction Co.....	Johnstown, Pa.	Wampum Bus Co. ....	Wampum, Pa.
West Penn Electric Co. ....	Pittsburgh, Pa.	Smith, L. B. ....	Harrisburg, Pa.
Logan Valley Bus Co. ....	Altoona, Pa.	Erie Coach Co. ....	Erie, Pa.
Mon Valley Bus Co. ....	Clairton, Pa.	White Transit Co. ....	Wilkes Barre, Pa.
Valley Transportation Co. ....	Lemoyne, Pa.	Reading Transit Co. ....	Reading, Pa.
Auch, Howard .....	Conshohocken, Pa.	Somerset Bus Co. ....	Somerset, Pa.
Bamford, August & Bros. ....	Whitaker, Pa.	Bus Service Corp. ....	Philadelphia, Pa.
Beach, Edward .....	West Hazelton, Pa.	Citizens Transit Co. ....	Oil City, Pa.
Dodaro, Anthony.....	Bradford, Pa.	Waer Bus Co., Inc. ....	Easton, Pa.
East Coast Coach Co.....	Philadelphia, Pa.	Penn Bus Lines .....	Pittsburgh, Pa.
Fullington Bus Co. ....	Clearfield, Pa.	Elk Coach Lines .....	Philadelphia, Pa.
Glen Bus Co. ....	Scranton, Pa.	Hilltop Bus Co. ....	Beaver, Pa.
Edwards Motor Transit Co., Inc. ....			Dubois, Pa.
Schuylkill Transportation Co.....			Philadelphia, Pa.
Beaver Valley Motor Coach Co.....			Pittsburgh, Pa.
Wyoming Valley Auto Bus Co. ....			Wilkes Barre, Pa.
Reading Transportation Co. ....			Philadelphia, Pa.
Phillipsburg Motor Bus Co.....			Phillipsburg, Pa.
Lehigh Valley Transportation Co. ....			Allentown, Pa.
Susquehanna Motor Coach Lines .....			Susquehanna, Pa.
Westside Motor Transportation Co.....			Charleroi, Pa.
Arlington Mausoleum Association .....			Philadelphia, Pa.
Interstate Auto Transportation Co.....			Blossburg, Pa.
School Dist. of Lower Merion Twp.....			Merion, Pa.

*Nearly every other coach in Pennsylvania is a*

# *Yellow Coach*

# EVIDENCE OF SERVICEABILITY IN TROLLEY POLES

**STRENGTH BY SPECIAL HEAT TREATMENT**

**STRENGTH BY HIGH QUALITY OF STEEL**

**STRENGTH DUE TO SPECIAL REINFORCEMENT**


**STRENGTH TO MEET ALL SERVICE CONDITIONS**

**T**HE first requirement in trolley poles is adequate and lasting strength, which must be provided without excessive weight. Economy in operation of the car, efficiency in service, and safety to the public will depend on the fulfillment of this demand.

The heat-treating and other processes under which NATIONAL-SHELBY Trolley Poles are made, fully develop the potential qualities of the special, high-grade steel which has been chosen for superior strength.

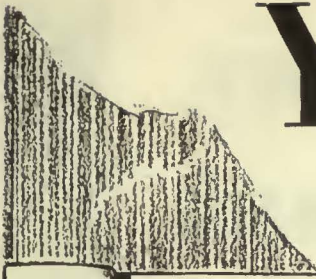
The design of these poles gives complete balance, obviates undue weight, and puts maximum reinforcement where it is most needed. Every pole, before leaving the mill, undergoes the most thorough tests and inspections, to make sure that it is free from defect. Write for complete information.

**NATIONAL TUBE COMPANY** · Pittsburgh, Pa.

Subsidiary of United  States Steel Corporation

# NATIONAL *SHELBY* SEAMLESS POLES

# YES, Providence... and



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 COMPANY  
 Ill., Jan. 3, 1931.  
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 L. E. Goula.

## Extensive Yearly Program of Track Reconstruction

Renewals by the United Electric Railways for the past five years have amounted to approximately 25 per cent of the total track mileage. Construction of a new bridge has necessitated the relocation of one of the important routes. Large saving has been made in the distribution of new ties for replacements

### Carried Out at Providence

By  
H. R. SMART  
Superintendent of Way and Structures  
United Electric Railways  
Providence, R. I.

DURING 1931 the United Electric Railways reconstructed a total of 10.25 miles of paved tracks in Providence and in the surrounding territory which it serves. Of this total, 8.56 miles were entirely rebuilt with new rails, and 1.69 miles were retied and rehabilitated. About 24 miles of the old track which was torn up had been laid 30 years ago; the remainder was from 20 to 25 years old. Since 1921 all the pavement has been laid without cost to the company.

At present the total of main track operated by the United Electric Railways, exclusive of turnouts, sidings and carhouse tracks, is 191 miles. The track reconstruction during the last year, together with the total of track reconstruction during the past five years, is 47.5 miles or approximately 25 per cent of the system mileage. During the same period 611 miles of track extensions have been made.

The streets in Providence and in the surrounding towns are generally quite narrow. Many of the streets in which there are double tracks are only 34 ft. between curbs; many of the streets with single tracks are only from 24 ft. to 30 ft. in width. The grades in Providence are generally easy, the maximum grade on which the railway operators being 6 per cent.

Our standard track construction on paved city streets calls for 7-in. 103-lb. girder rail, laid on 6-in. x 8-in. x 8-ft. treated ties with tie plates. **Joints are usually thermit welded, except where track is renewed under traffic.** For this type of work seam welding of tie plates has been adopted. Round ties, 4 in. in diameter every 12 ft. The type of ballast we use in our track construction depends upon soil conditions, either bank gravel or crushed stone being used. The city authorities have requested that we confine ourselves to these two types of ballast. Our standard specifications call for 6 in. of ballast under the ties. The finished pavement is usually

**“... Joints are usually thermit welded, except where track is renewed under traffic”**

Quotation from article on track reconstruction by H. R. Smart, Superintendent of Way & Structures, United Electric Railways, Providence, R. I., in the February, 1931, issue of Electric Railway Journal.

# The METAL & THERMIT

120 Broadway, New York, N. Y.

Pittsburgh

Chicago

Albany

So. San Francisco

Toronto



# now, you can THERMIT WELD under traffic by this new development

New and improved methods now permit the Thermit welding of tracks *under traffic*.

Here's big news! Here's a new development in the use of Thermit welding that's been announced since the United Electric Railways of Providence completed its 1930 track program—a new opportunity to reduce track maintenance costs by extending the use of Thermit Welding.

Think of the time and money you can save by being able to cut out night work and over-time for your track workers—the complaints you can avoid and the trouble you can side-step

by eliminating service interruptions over regular lines while track joints are being welded.

What an opportunity to extend the life of joints by giving them adequate strength and protection under heavy traffic—joints that couldn't be disturbed without tying-up service.

Yes, Providence, this certainly should be good news. And may we add just this: it is good, though not surprising news to us to read in this article that you have "used Thermit joints since 1920—and have had practically no failures."



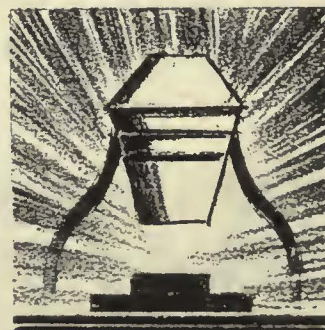
*Providence carried traffic through on one track while the other was being reconstructed.*



*Many of the double track lines in Providence operate along narrow streets. This is Eddy St., 34 ft. between curbs where track was laid in 1930.*

ALTHOUGH the basic process is the same now, as when Thermit rail welding was first instituted in America twenty-five years ago, the methods and details are being constantly improved. Today Thermit welding, with the materials and equipment sold by

the Metal & Thermit Corporation, is standard practice on most of America's leading city and suburban electric railway systems—both large and small . . . Write for information on methods of Thermit welding under traffic.



## CORPORATION

120 Broadway, New York, N. Y.

Pittsburgh

Chicago

Albany

So. San Francisco

Toronto



## 18 Years of Reliable Service Behind— Prolonged Years of Even Finer Service Ahead

Commercial transportation standards are invariably set by Reo.

Eighteen years ago, Reo first introduced light, more-power-for-weight, speedier, safer, lower-cost SPEED WAGONS, and has maintained engineering dominance ever since.

Hundreds of thousands of REO SPEED WAGONS and TRUCKS have been placed in operation in 64 countries, hauling structural steel down congested Broad-

REO MOTOR CAR COMPANY, LANSING, MICHIGAN

way, bringing Brazilian coffee to coastal shipping ports, or patrolling the vast desert stretches along the Great Wall of China!

The same story of day-in-day-out reliability and astounding infrequency of repair has travelled the world around, and has won universal acceptance for REO products.

In face of these irrefutable results, the REO is deserving of a lasting place in your system of transportation service.

**SPEED  
WAGONS**

**REO**

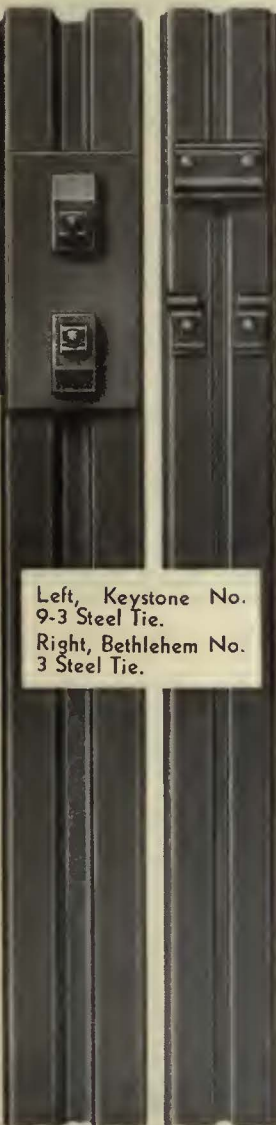
**AND  
TRUCKS**



Double track construction with Bethlehem No. 3 Steel Ties.

# BETHLEHEM STEEL TIES

◆ lower cost of construction



Left, Keystone No. 9-3 Steel Tie.  
Right, Bethlehem No. 3 Steel Tie.

# ◆ lower cost of maintenance

In large cities and in suburban communities with paved streets, Bethlehem Steel Ties are showing substantial returns in lower cost of track construction, and in maintenance.

These steel ties are more easily laid than wood ties. Their shallow section reduces the amount of excavation and concrete necessary to install them and brings a reduction in labor. Spiking, gaging and tie plates are eliminated. Less time is required to attach rails to Bethlehem Steel Ties due to the simplicity of their fastenings. The Bethlehem No. 3 Steel Tie has two broad stationary clips and four movable clips securely riveted to the tie. The Keystone No. 9 Steel Tie has a tie plate welded to the tie and four rail clips, which are securely held in position over the rail base by  $\frac{3}{4}$  in. bolts and Unit Lock Nuts. Bethlehem Steel Ties hold the rails to gage and in alignment.

The Long life of Bethlehem Steel Ties greatly



Keystone No. 9 Steel Ties used in construction of curve.

lowers the cost of track maintenance. In large cities where, due to the heavy traffic, the life of the rails is short, they may be renewed with a minimum of expense by removing the concrete immediately surrounding them and attaching the new rails to the steel ties left imbedded in the concrete.

## BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

*District Offices:* New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.

*Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

*Export Distributor:* Bethlehem Steel Export Corporation, 25 Broadway, New York City.

# BETHLEHEM

# Polarine passes test more severe

## Great motor oil test conducted by A.A.A. at Indianapolis Speedway



100,000  
MILES  
TRAVELED

1,000,000  
OBSERVATIONS  
MADE

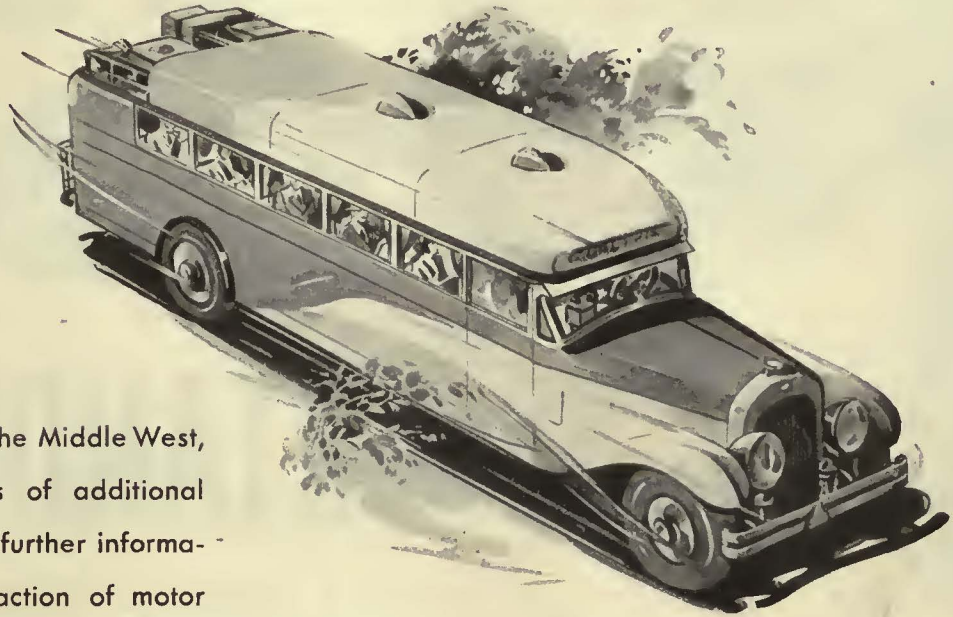
### Complete test to require seven months

For many weeks New Polarine has been subjected to what is probably the most thorough and comprehensive lubrication study ever made.

During the tests, conducted at the Indianapolis speedway under the direct control of the A. A. A., thirteen cars were run night and day, at all ranges of speed; each run of 1,000 miles made at a predetermined speed which was maintained. They rolled up a total of 100,000 miles while subjecting New Polarine motor oil to the most gruelling lubrication tests ever devised. No ordeal was overlooked. It has been estimated that nearly a million observations were recorded. Now, these cars are starting on a

POLARINE MOTOR OIL IS USED BY MOST

# than Motor Coach operation...



five months' tour of the Middle West, piling up thousands of additional miles and gathering further information regarding the action of motor oil under actual driving conditions. Special instruments have been installed to record oil and water temperatures at different speeds, fuel and oil consumption at various speeds. Also, a careful check is being made on carbon formation, cylinder wear, chassis lubrication and condition of oil after each test.

The information gathered during the speedway test runs checked the findings of our technical staff. The results have proved conclusively that Polarine is a competent, dependable motor oil.

## 2 great advantages from using Polarine Motor Oil

*First*—you are assured of positive, thorough lubrication. Polarine has proved its great lubricating qualities not only in this great lubrication test but also in hundreds of motor coaches throughout the middle west.

*Second*—Polarine and Red Crown Gasoline, work together with an efficiency of operation and economy that few gasolines and motor oils can equal. Red Crown and Polarine have been refined to give maximum efficiency and lowest possible economy of operation when used together.

Test Polarine and Red Crown in one of your motor coaches. Check the performance and cost.

**STANDARD OIL COMPANY**

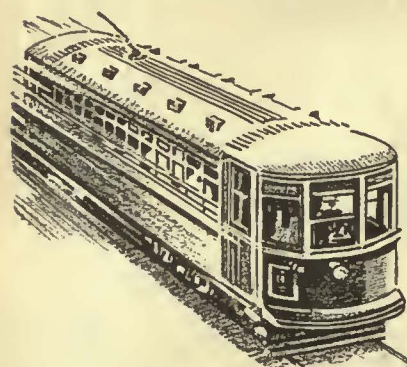
(Indiana)

910 S. Michigan Avenue

Chicago, Illinois

1205B

**LARGE MIDWESTERN MOTOR COACH OPERATORS**



# “STANDARD”

steel wheels, axles and armature shafts are good equipment for cars, when the operator desires safety, quick starts and stops, comfort and economy. The buyer is paid a just return for his wisdom in selecting “Standard” Parts.

## STANDARD STEEL WORKS COMPANY

GENERAL OFFICE & WORKS: BURNHAM, PENNA.

CHICAGO  
NEW YORK  
PHILADELPHIA

ST. LOUIS  
RICHMOND

AKRON  
PORTLAND  
SAN FRANCISCO

# DeVilbiss

**HEADQUARTERS FOR SPRAY-PAINTING**

**AND FINISHING EQUIPMENT**

**FOR**

**ELECTRIC RAILWAYS**

**I**N the electric railway industry, DeVilbiss Spray-painting and Spray-finishing Equipment has an amazing number of uses.

From bridges to seat brackets, every painting requirement among the electric railways can be met better by the use of DeVilbiss Spray-painting Equipment. There are many highly efficient DeVilbiss

Portable Outfits for painting bridges, poles and buildings on the roadway.

There are larger, permanently installed outfits with special exhausting equipment to keep rolling stock, passenger and freight, up to the minute in appearance and thoroughly protected against the elements. The new practice of "dress-

ing up" street cars and buses which draws traffic and increases revenue, could never have been practical without the economies made possible by DeVilbiss Equipment.

Electric railway executives striving to keep down costs should ask for interesting facts and figures on spray-painting operations. Call the nearest DeVilbiss office or write,

**THE DEVILBISS COMPANY · TOLEDO, OHIO**

**NEW YORK**

**PHILADELPHIA**

**CLEVELAND**

**DETROIT**

**INDIANAPOLIS**

**CHICAGO**

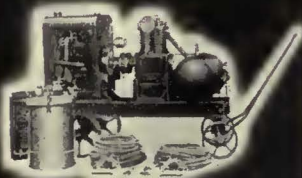
**ST. LOUIS**

**LOS ANGELES**

**SAN FRANCISCO**

**WINDSOR, ONTARIO**

*Direct sales and service representatives available everywhere*



**PORTABLE  
OUTFITS**



**SPRAY-GUN**



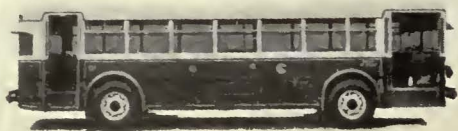
**EXTENSION  
SPRAY-GUN**



**PRESSURE  
TANK**

# After Four Years

1927



Chicago Surface Lines



N. O. P. & L., Akron, Ohio

1928



United Railways, Providence

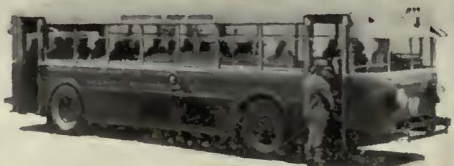


Boston Elevated Railway

1929

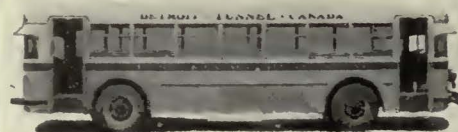


St. Louis Public Service Co.



Detroit Motorbus Co.

1930



Detroit & Canada Tunnel



Capital District Transp. Co., Albany

1931



Milwaukee Electric Railway



Youngstown Municipal, Youngstown, O.



*Their Design is Still Modern  
Their Style is Copied Widely  
Their Present Life Will Be At Least Doubled  
Their Capacity and Appeal Are Unshakable*



# Service . . .

# TWINS

## WHIP DEPRECIATION

**T**WIN COACH equipment for 1931 conforms to the same basic design and appearance as were established in 1927 because the continued experience has justified their permanency.

Every Twin is mechanically insured and protected against model and style changes . . . Every improvement in design is applicable to units already in operation . . . Obsolescence is reduced to a minimum.

Only in the purchase of this type of equipment do we believe it is possible for the buyer to operate with the rate of depreciation which assures profits.

Herein lie the reasons for the continual lowering of Twin Coach operating costs.

Twins of *standard design* are built in 21 to 23-27-33-40 seat capacity. We will be pleased to send you complete information regarding these coaches and also the story of our *new 17 to 20 seat Taxi-Coach model* with automatic fare collection.





## “How can I still further Reduce Costs?”

**T**HE Texas Company has some striking facts and figures on this question. They are records of actual savings accomplished in reduced shop costs on many of the leading roads. They show what can be done through the Texaco System of car journal lubrication.

This new Texaco System, of which Texaco Lovis Oil and Texaco Oil Seals are important parts, was introduced but a few years ago. Its economies were quickly apparent. Today, it is acknowledged by a number of well-known

Master Mechanics to have opened up entirely new sources of operating and maintenance savings previously thought impossible.

The advantages of this new lubrication can easily be proved—by the recorded experiences on other roads—and by tests on your own lines.

Texaco engineers will gladly arrange to go into this whole question. Would you like to have the data? The capital investment required is surprisingly low. Write The Texas Company.

**TEXACO**  
THE TEXAS COMPANY  
135 East 42nd Street, New York City  
**LUBRICANTS**

# MONOTUBE POLES MEAN . . .

**Low Cost** . . . **DESPITE** the many constructional advantages which have been incorporated for the first time in any pole, the cost of Monotubes compares favorably with that of ordinary steel poles.

**Long Life** . . . **UNION METAL** engineering has built into Monotubes many long years of trouble-free service. Complete ventilation, (in the case of anchor rod construction) no horizontal joints, and the lessening of ground line corrosion are contributing factors.

**Cold-Rolled Steel** **HIGH GRADE** open hearth steel plus Union Metal cold-rolling provides poles which are stronger and longer lived.

**Better Appearance** **ONE PIECE**, tapered construction, eliminating all horizontal joints makes Monotubes the most attractive tubular steel poles on the market.

**Great Strength** . **MONOTUBES** can be supplied to meet any ordinary strength requirement while allowing an adequate factor of safety.

**Adaptability** . . **MONOTUBE POLES** are used for the support of trolley span wires, distribution and transmission lines, traffic signals — in fact, wherever a general service pole is required . . . They may be embedded directly in the ground or in concrete or may be attached to a concrete foundation by means of anchor rods.

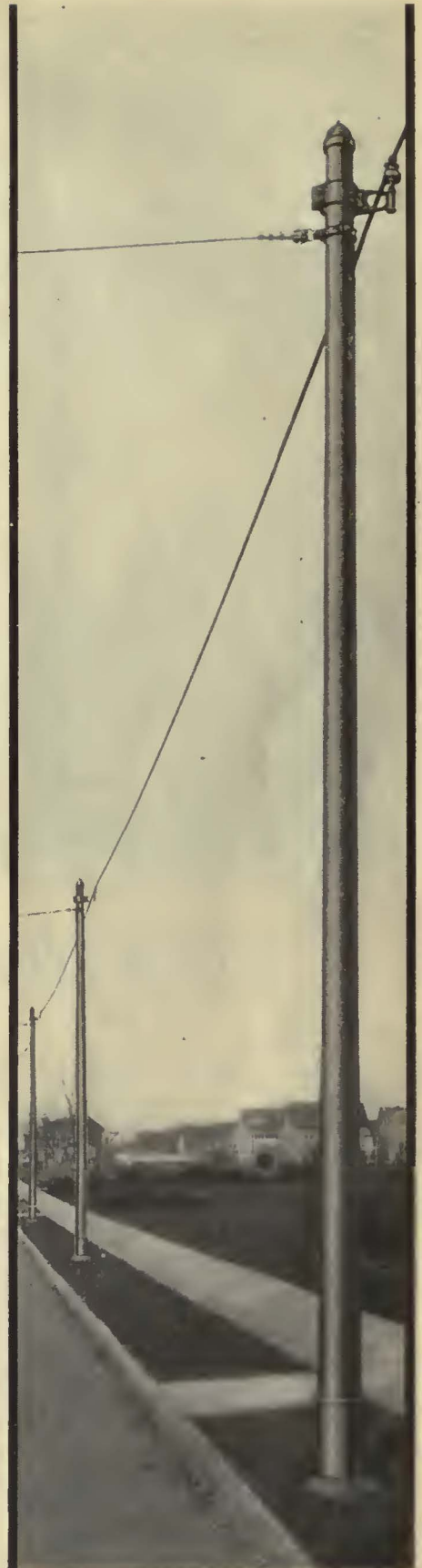
Write for prices and catalogs.

**THE UNION METAL MANUFACTURING COMPANY**  
GENERAL OFFICES AND FACTORY . . . CANTON, OHIO

SALES OFFICES • New York • Chicago • Boston  
Los Angeles • San Francisco • Seattle • Dallas • Atlanta

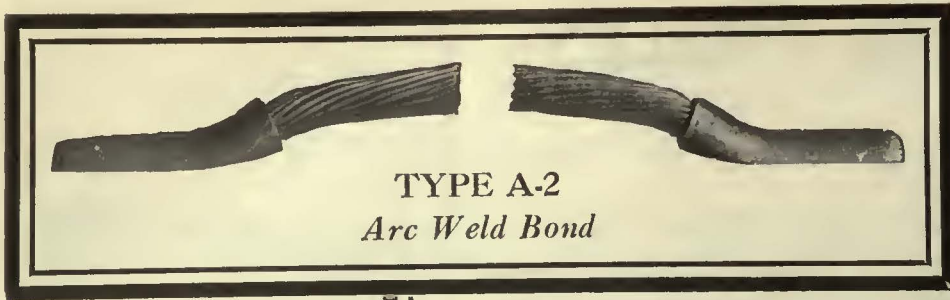
DISTRIBUTORS

General Electric Merchandise Distributors Graybar Electric Company, Inc.  
Offices in all principal cities

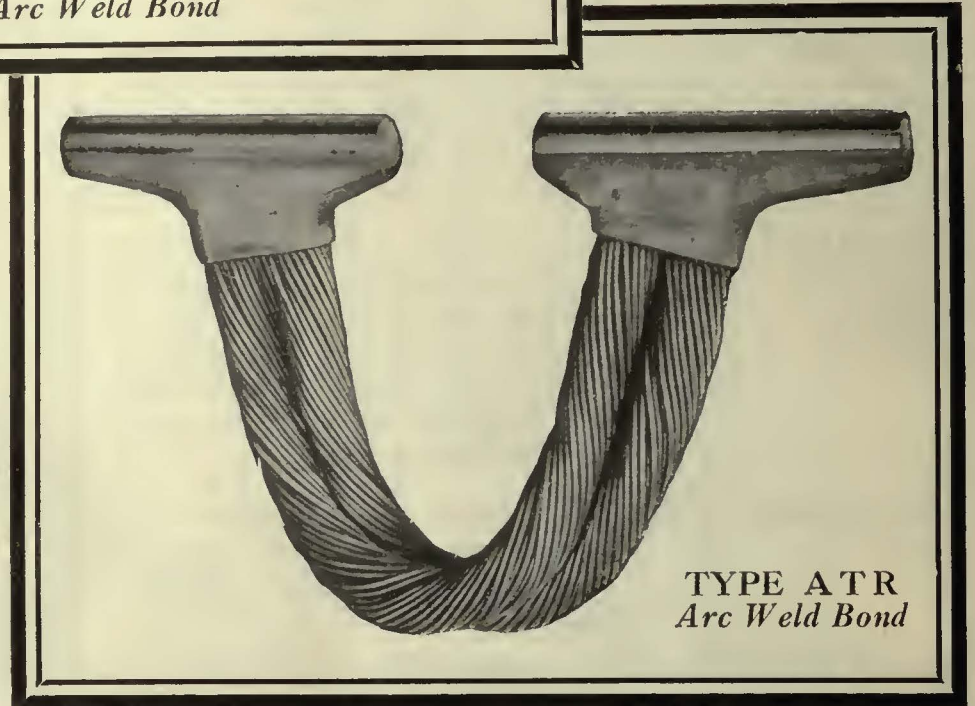


Monotube Pole with ground collar, embedded in concrete.

# UNION METAL MONOTUBE POLES



*the* **A-2**  
*and the*  
**ATR**



## *they complete your set-up* **for ARC-WELDING**

These two bonds will meet all your requirements for arc weld bonding. Both are designed to make welding easy—and sure.

Type A-2 bonds are for application on the top of the rail base, around special work and for cross bonding. The wide welding vee, formed between the terminal and the rail, makes it easy to secure a good, sound weld with the very first bead of weld metal applied. Full conductivity of the bond is developed.

Type ATR are applied to the ball of the rail. They are designed to make it easy to hold a short arc, resulting in a superior weld. Note a sleeve protects the bond cable from the arc. It is necessary to deposit only a very small amount of weld metal to secure a large contact area with the rail. The current path through the arc weld metal from the bond to the rail is a minimum making a very low resistance bond. A good bond, well made, the ATR will solve your bonding problems.

These bonds and other arc weld types are shown in Circular No. 16.

*Let us send you samples—no obligation.*

---

**The ELECTRIC RAILWAY IMPROVEMENT CO.**

2070 E. 61st Place, Cleveland, Ohio



(Above) North Illinois Street, Indianapolis, Ind.

(Right) Same paving partially completed



*Carey*  
*Elastite*  
 THE CAREY COMPANY  
 "THEY NEED US" "WE'VE GOT IT"

## RAIL FILLER

# INSURES TRACK PAVING

Paving next to tracks must be protected from track vibration. The more permanent the paving, the greater the need. The combination of modern, heavy rails and large cars means that the track transmits terrific shocks which attack even the most resistant pavement. The damage is progressive because vibration play increases as vibration limits grow larger.

Carey Elastite Rail Filler placed in the web of the rail, absorbs vibration which would otherwise cause speedy damage. The material is a tough asphalt compound which offers maximum resistance to shock, temperature changes and moisture. Premoulded to fit any rail section, it is quickly installed and repays its cost in a short time by reducing paving repairs.

Prices and complete engineering data will be mailed on request.

THE PHILIP CAREY COMPANY \* Lockland, Cincinnati, Ohio  
 Branches in Principal Cities

BUILT-UP ROOFS  
 ASPHALT PRODUCTS  
 ELASTITE EXPANSION JOINT  
 WATERPROOFINGS  
 ROOF PAINTS



HEAT INSULATIONS  
 ASBESTOS MATERIALS  
 CAREYSTONE CORRUGATED SIDING  
 ASFALTSLATE SHINGLES  
 BUILDING PAPERS

# One Man in Forty— *and YOU are the Man*

**D**ID you ever stop to think that *you* are one of the comparatively small percentage of men whose "yes" or "no" really matters to American business?

Every morning 40,000,000 men start to work—in factories and mines, banks, railways, stores and other centers of industry or trade. Forty million men turn the wheels that keep America clothed, sheltered and fed.

But only one million of them make business decisions. Only one man in forty has the ability, the responsibility or the authority to say yes or no in business matters. Hence the *real* managing power of the country lies in the hands of these million men—less than one per cent of its total population.

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"Goodrich Tires have played a vital part in helping us to expand our operations and maintain our schedules."

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"30% more mileage—10 m.p.h. faster."

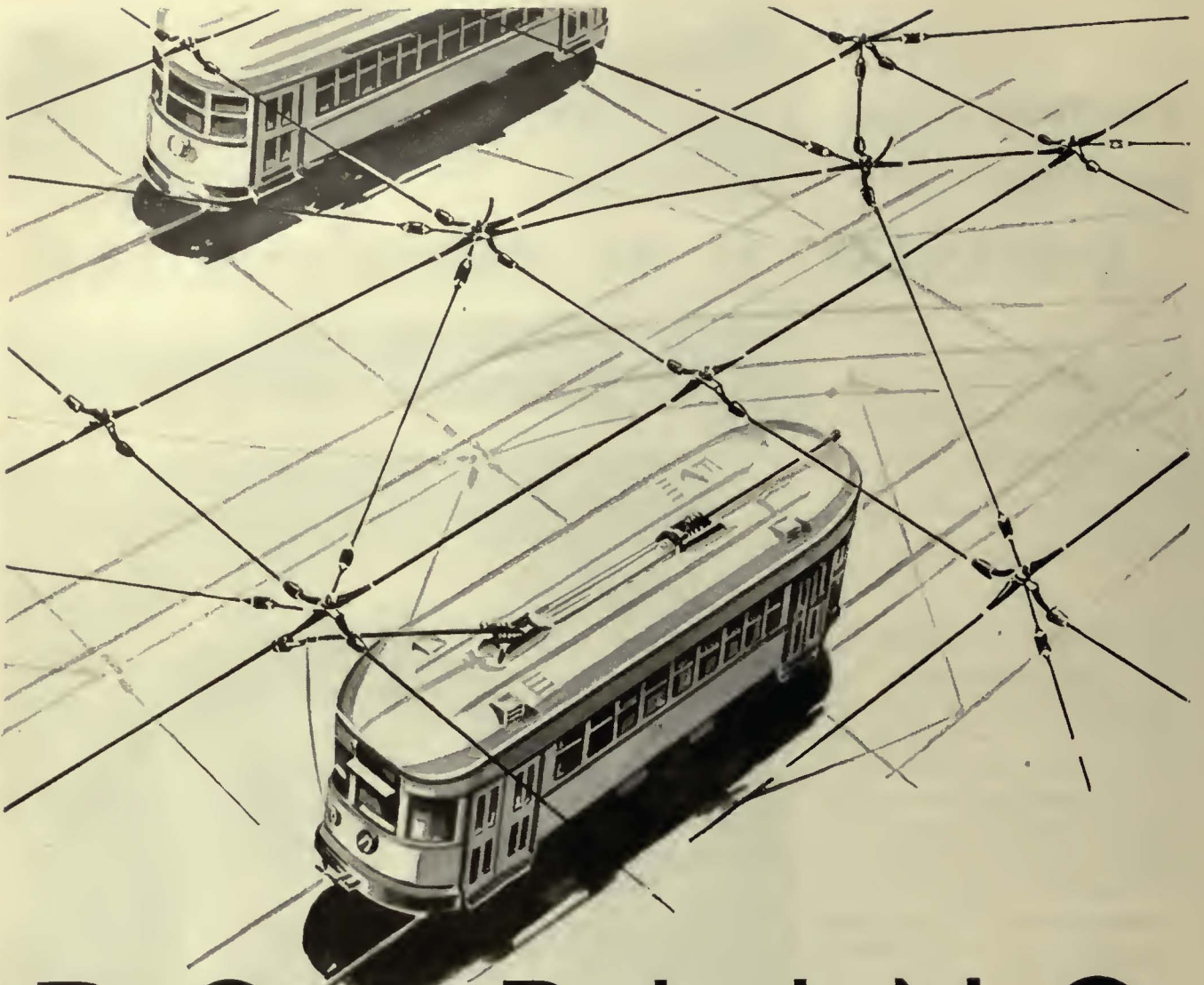
"Out of 301,600 trips, 3,784,007 bus miles per year—only ten trips lost due to tire trouble."

"The finest tire we know of for trouble-free mileage."



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Your fleet, too, can be operated with equal satisfaction and economy with Socony products.

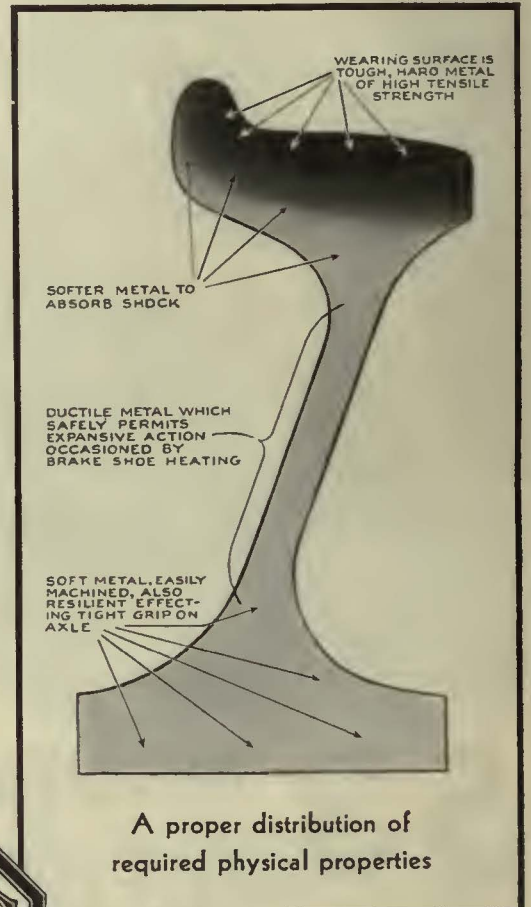
\*The Brooklyn-Manhattan Transit System's subway equipment in New York City is lubricated with Socony industrial lubricants.

## SOCONY

BANNER GASOLINE · NEW SOCONY MOTOR OIL  
SPECIAL GASOLINE plus ETHYL 

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# Meeting Conflicting Requirements



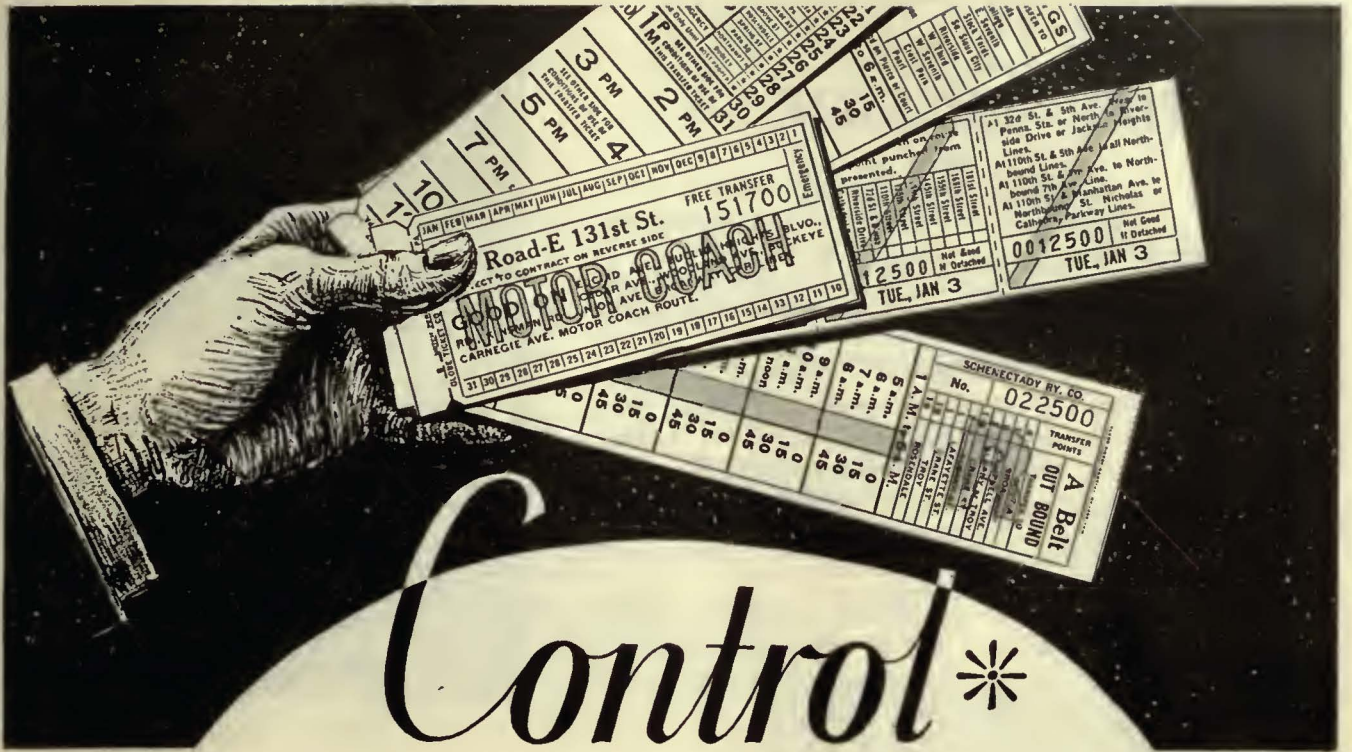
**T**HE tread and the hub of a wheel won't agree as to what constitutes good material. One wants hardness and wear resistance, and the other wants ductility and shock resistance. To reconcile these opposing views and develop precisely the qualities needed in each part is the purpose of the special heat-treated composition of the Davis "One-Wear" Steel Wheel. Only such a special material can develop the unusual characteristics that make a steel wheel truly "One-Wear."

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Properly designed tickets and transfers are absolutely essential for control. Take transfers, for example:—

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**PRIVILEGES:** Color, coupons, bar designs, skeleton lettering, IN or OUT forms, all are signals controlling proper use according to lines, transfer points, direction, car to bus, re-transfer and like privileges.

**DATE:** More and more properties are adopt-

ing Daily Dating to control abuse and to control loss of time in issuing and collecting.

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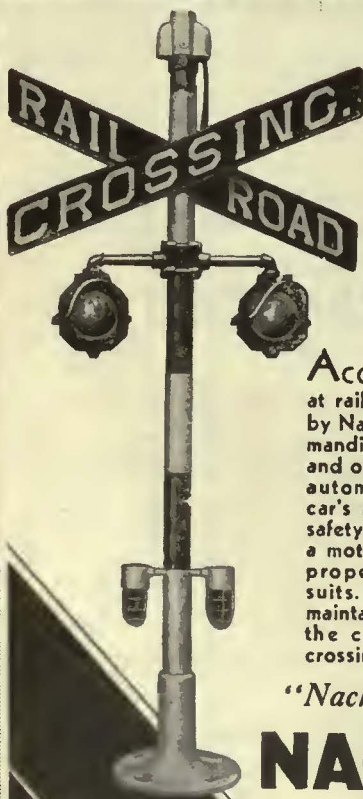
Ohmer Fare Registers are made to meet every possible need. Let us show you a definite way to better business through more effective control of your income at its source.



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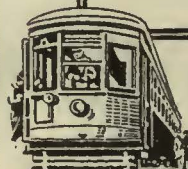
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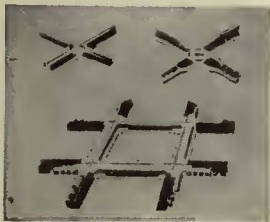
The PANTASOTE COMPANY, Inc.  
250 Park Avenue  
NEW YORK

# SERVING and Saving

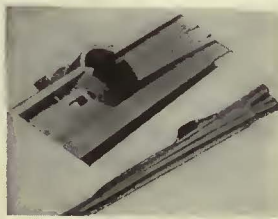
under Modern Traffic Conditions

# WHARTON

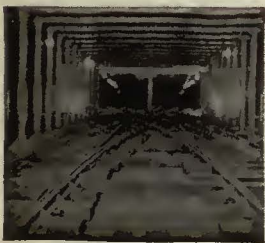
## Special Trackwork



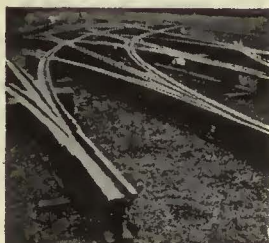
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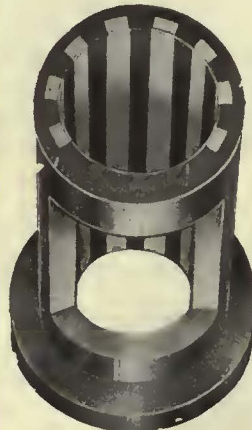
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# NATIONAL ELECTRIC RAILWAY SPECIALTIES

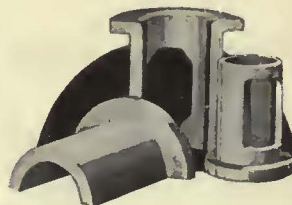
You can be sure of successful and economical results by including these specialties in your plans for modernization. It pays to standardize on National Products.



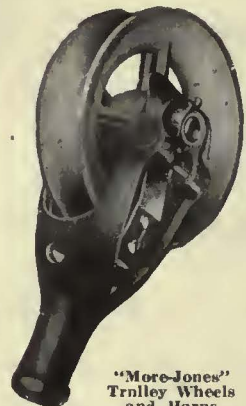
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Find those broken bonds with a Roller-Smith Bond Tester. It's a one man proposition, accurate, direct-reading, easily handled and fast. Fits every kind of rail-head.

*Bulletin G-200 describes different types of testers. Write for this Bulletin.*

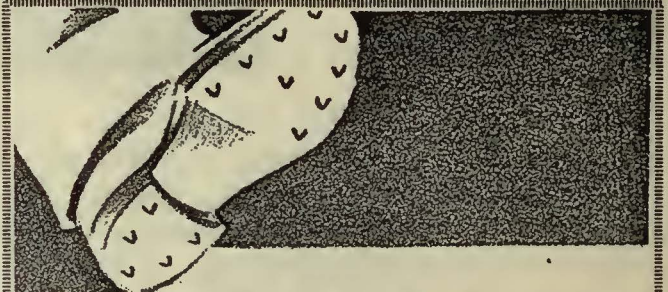
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For track areas  
use

# Brick Pavements

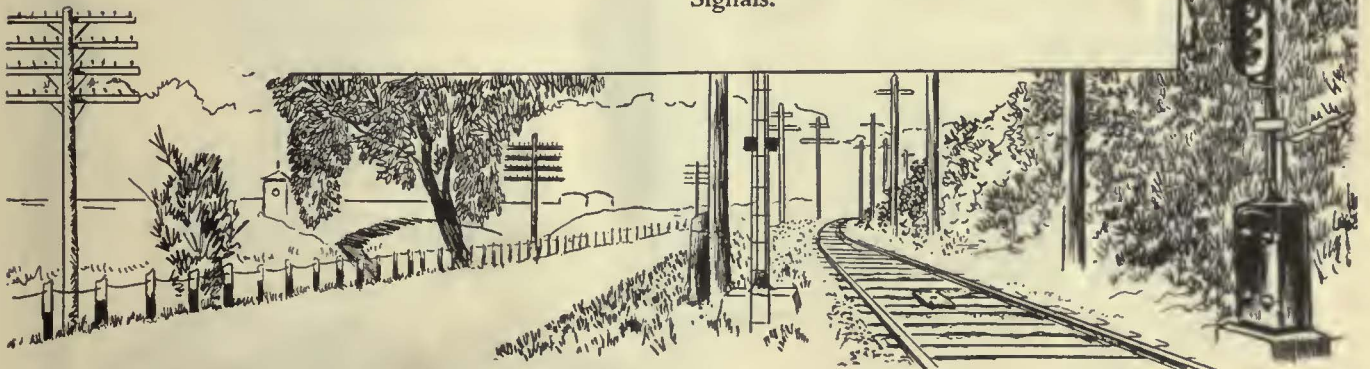
+  
Improves your service and  
lowers your costs  
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Write National Paving Brick Manufacturers Association,  
1245 National Press Building, Washington, D.C.; for data.

## WHEN COMPETITION BECOMES SERIOUS

When competition seriously threatens the position of an established transportation business the reason can be found, usually, in the time saving which competitors offer. And there is no better way for an electric railway to create savings than to signal its right-of-way with "Union" Automatic Signals.

"Union" Automatic Signals, interlocking installations, and remotely controlled, power-operated switches, produce definite savings. The higher average speed and the consequent saving in time per trip which results can be represented as return on investment. When competition becomes serious, the answer is "Union" Signals.



1881



Union Switch & Signal Co.



1931

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# IT ISN'T ALL FUN FOR A TROLLEY WHEEL

**I**T'S easy for any trolley wheel to run smoothly and provide ample conductivity in balmy weather.

But when rain, snow, and sleet whip trolley wires, it isn't fun for trolley wheels.

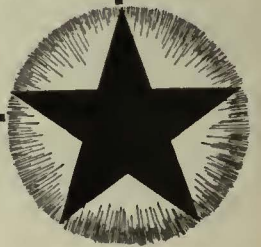
That's where Kalamazoo Trolley Wheels prove their value. Ample conductivity is always present for those who standardize on Kalamazoo Trolley Wheels.

It is significant that many Electric Railway Companies use them as a basis for comparison.

Write for details and bulletins.

## THE STAR BRASS WORKS

KALAMAZOO, MICHIGAN



# KALAMAZOO

THE COST IS  
SMALL—  
THE  
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A CROSSETT WATZEK GATES INDUSTRY

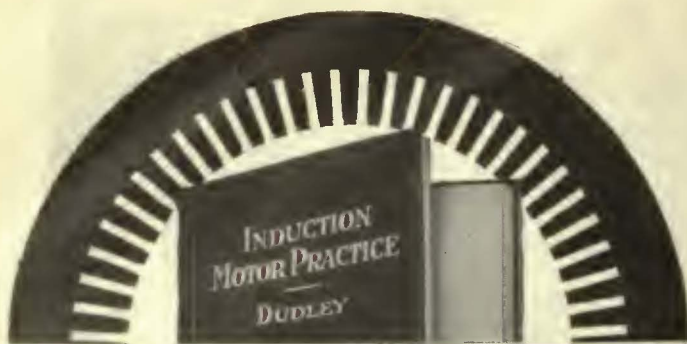


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**M**AINTENANCE engineers will be quick to appreciate the advantages of this Heywood-Wakefield seat. The cane webbing backs and cushions offer a generous measure of comfort, yet they do not soil readily, are practically indestructible, and very easy 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.

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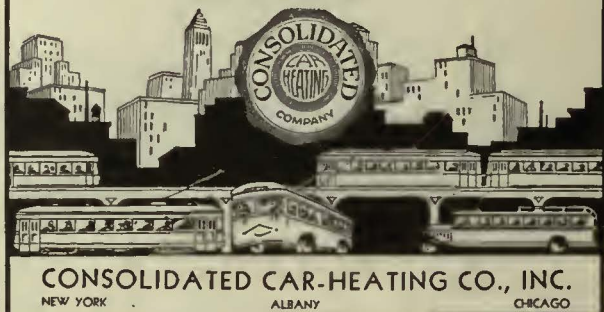
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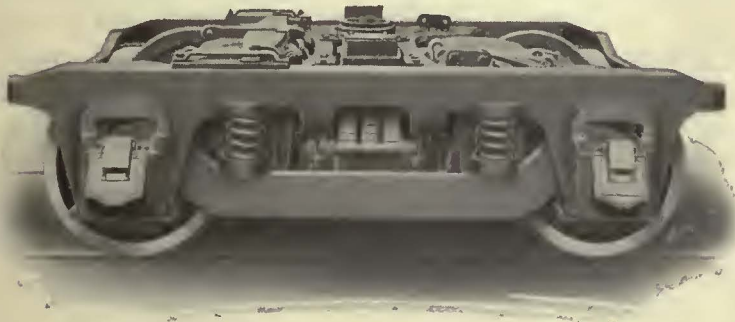
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## Trucks . . . . .

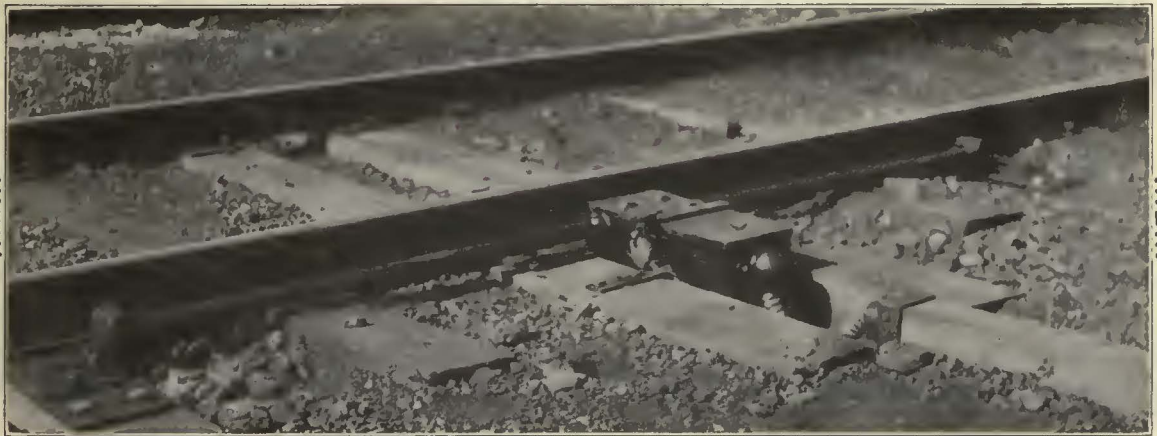
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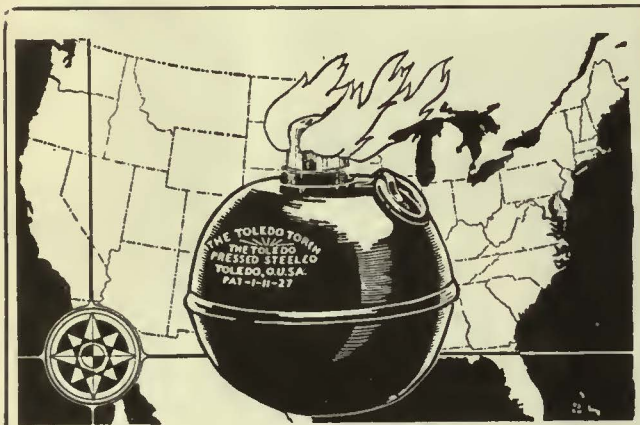
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Of Electric Railway Journal, published monthly at New York, N. Y., for April 1, 1931.  
State of New York } ss.  
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electric Railway Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 41, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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5. That the average number of copies of each issue of the publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

C. H. THOMPSON, Secretary  
MCGRAW-HILL PUBLISHING COMPANY, INC.  
Sworn to and subscribed before me this 31st day of March, 1931.  
[SEAL] H. E. BEIRNE,  
Notary Public N. Y. Co. Clk's No. 203, Reg. No. 3B102. Kings Co. Clk's No. 636, Reg. No. 3129.  
(My Commission expires March 30, 1933)

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If you don't see the equipment you need advertised on these pages, send a list of your requirements to the Searchlight Department, Electric Railway Journal, 10th Ave. at 36th St., N.Y.C. You will be put in prompt touch with reliable sources of supply.

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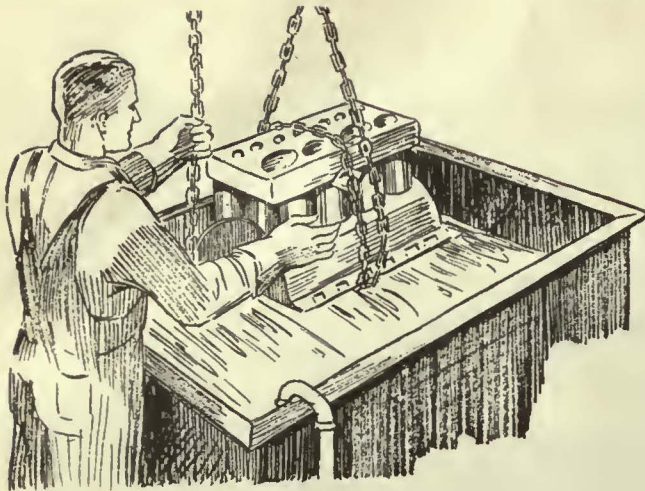
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## Industrial Cleaning Materials and Methods

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# Preventing trolley breaks and excessive wear on overhead IS important - - -

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**Let us tell you how other operators are getting these worthwhile results with**



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**Efficiency Products Corp.**  
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# Experience of others is the **BEST PROOF!**

Dear Sir:

I am answering the questions in your letter of January 10, as follows:

I have had charge and observed track construction using the Dayton Ties.

Our first installation of this type of construction was in 1920 and up to date there has been no cost of maintenance and from all appearance this track is good for another thirty years.

The thickness of the concrete slab in the street was  $7\frac{1}{2}$  inches. In the track area it was increased to 15 inches.

I think you are using very good judgment in using the Dayton Mechanical Tie, together with the Carey Rail Filler and 85# T. Rails, A.S.C.E. standard. This type of construction has been our standard for the last eleven years and we are fully convinced that on account of the slight resiliency existing by reason of using the Dayton Mechanical Tie and the Rail Filler, this is the primary reason that we had no failures with this type of construction.

A few years ago, the Wisconsin Utilities Association was paying for a railway fellowship at the University of Wisconsin and it has been my pleasure to be chairman of the committee for the last five years. One of the students who took the course a few years ago made a study of reducing noises in car operation with particular attention being paid to noises caused by gears and wheels by their contact with the rail. His study proved that where the Dayton Mechanical Tie and Carey Rail Filler was used, the noise was 41% less than where this material was not used.

The Dayton Mechanical Tie will also save considerable in the first cost of construction and it will not be necessary to use as much concrete with this type of construction.

Yours very truly,

★ **NAME ON REQUEST**

When railway properties want the low down on Dayton Mechanical Ties—we are glad to refer them to other properties where they have been installed. The above letter is a typical example of the result of such correspondence. It constitutes voluntary evidence of the success of Dayton Tie Installations.

**THE DAYTON MECHANICAL TIE CO.**  
DAYTON, OHIO

# From Baltimore

## AROUND THE TOWN PLENTY FAST, THESE NEW STREET CARS

Balto. Post 2-27-31

By CLINTON H. JOHNSON  
 Maj. Malcolm Campbell, who went a mere 247 miles an hour on the sands of Daytona Beach recently, still has his biggest thrill coming to him.

Wait until he tries to pass one of Baltimore's new street cars.

Baltimore motorists, having learned their lesson at the expense of considerable brake lining and tattered nerves, are content nowadays to follow docilely in the wake of the new trolleys until they see an open path ahead at least two blocks long. Even that isn't enough sometimes if the old buggy isn't clicking so well. The street cars, it seems, don't ever develop a carbon knock on a quick pull; and they'd give a jack rabbit a good run for his money getting away from a traffic light. Assuming, of course, that a rabbit could be made to understand about traffic lights.

Since the new cars have been placed in service many residents of suburban Baltimore have revised their ideas of really rapid transit to and from the city. Nowadays, when the Woodson commuter oversleeps and gets a late start for the office, he leaves his own car in the garage, takes the trolley, and waves derisively at his motorist friends as

Motorists Get Gray Hairs Trying to Outdistance Latest Model Trolleys; Commuters Leave Own Machines At Home to Ride Downtown in Rapid Conveyances

It's in those sections that the old cars lost their time and earned the imprecations of every motorist who ever got caught behind one.

The new cars can jump away from a stop at the rate of three miles per hour per second, which is just twice as fast as the old type cars and considerably faster than many autos. They do it with four motors of 50 horsepower each and a series of automatic controls that are supposed to eliminate jerks—and will, except in the hands of a novice.

A new car, consequently, can be clicking off 30 miles an hour 10 seconds after the first turn of the wheels. The faster acceleration means many costly minutes saved by the time 75 stops have been made. An idea of the time economy can be guessed at from the fact that nine minutes have been clipped off the one-way running time of the No. 25 line since the new cars were introduced. By the time the line is fully equipped the company expects to reach

of the new type cars in service. Most of them are on a one-man basis of operation, now that the company's motormen have had sufficient training in handling them. During rush hours, however, a few of the cars still carry both a motorman and a conductor.

There isn't any speed limit fixed for the cars, either by law or by company rules. The motor vehicle regulations exempt anything that runs on a track and the company requires only that its motormen operate their cars "safely," a term which leaves plenty of room for interpretation.

Clocked in Suburbs  
 Actual tests along Liberty Heights Ave., from whence have come most of the reports of speeding street cars, showed that the "cruising" speed of the trolleys on clear, straightaway stretches, varied between 25 and 43 miles an hour. The tests were made with an auto whose speedometer first had been checked for accuracy and approved by the state police.

The first car paced was No. 6139, which was picked up about

This car, incidentally, gave a good demonstration of the rapid pickup by attaining 25 miles an hour within 100 yards after a stop on Gwynn Oak Ave.

The same car, picked up again at 10:55 the same night, set the maximum speed encountered during the entire test by attaining 43 miles an hour on the same stretch where, earlier in the day, it had reached the 30-mile figure.

It Seems Fast, Anyway  
 In these days of good roads and high-powered autos, 43 miles an hour doesn't sound particularly fast. It's only, for that matter, 18 miles an hour faster than autos are permitted to travel legally within the city limits. The size of the trolleys, however, and the noise they make at high speed combine to create the impression that they're going a great deal faster than they really are. Try driving along beside one at 43—or even 30—miles an hour and you'll get the idea.

Also, don't be surprised if one of the old type street cars suddenly steps out and gives you a run for your money. The company has been experimenting with those, too, with the idea of amplifying its fleet of new trolleys.

As a result the motors of 110 of the older cars have been speeded up to almost double their former capacity, giving the quick getaway of the new cars. It's been an experimental experiment for the company, but it's worth a try for those who can get a new car.



# Brill Modern Cars Speed up Service

"Plenty fast" means ability to at least keep abreast of other street traffic. It means public patronage in this age of speed, and public patronage means increased revenue. New Brill Modern Cars are popular because they're attractive in appearance, comfort and speed—in keeping with the present day idea of modern transportation.

What Mr. Johnson says about Baltimore's new cars might just as easily be said of those in other cities.

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