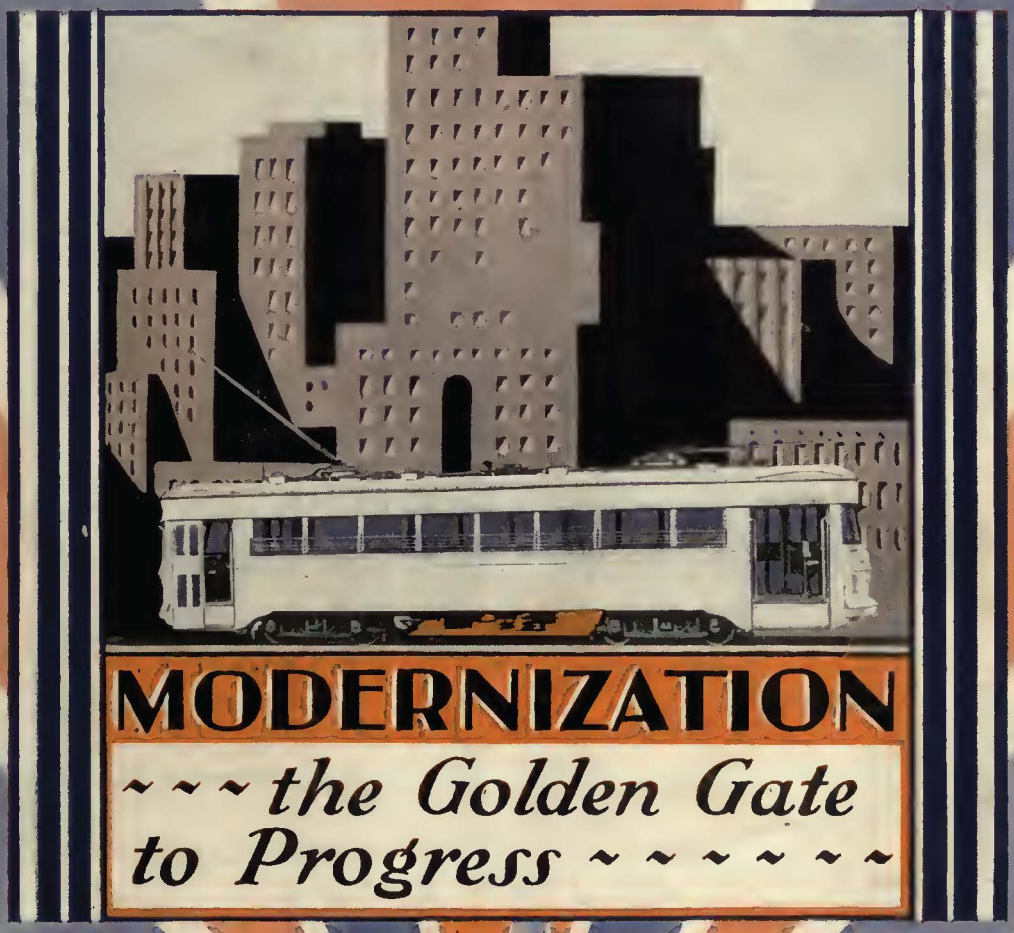
ANNUAL CONVENTION AND EXHIBIT NUMBER

ELECTRIC RAILWAY JOURNAL

aw-Hill Publishing Company, Inc. JUNE 14, 1930 Fifty Cents per Copy



MODERNIZATION

~~~ the Golden Gate to Progress ~~~~~

Electric Railway Journal

MORRIS BUCK, Engineering Editor
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J. W. McCLOY
JOSEPH R. STAUFFER

Consolidation of
Street Railway Journal and Electric Railway Review

JOHN A. MILLER, JR., *Managing Editor*

Vol. 74, No. 7 *Pages 355-426*

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JUNE 14, 1930

In the

July Number

will appear the full report of the

A.E.R.A.
SAN FRANCISCO
CONVENTION

McGraw-Hill Publishing Company, Inc.

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New York, N. Y.

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Official correspondent in the United States for Union International de Tramways, de Chemins de fer d'Intérêt local et de Transports Publics Automobiles.

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Annual Convention Number

CONTENTS

Comments from Western Executives:

Actual PERFORMANCE ...the proof of reliability

Automatic switching equipment for a 2000-kw. synchronous converter.

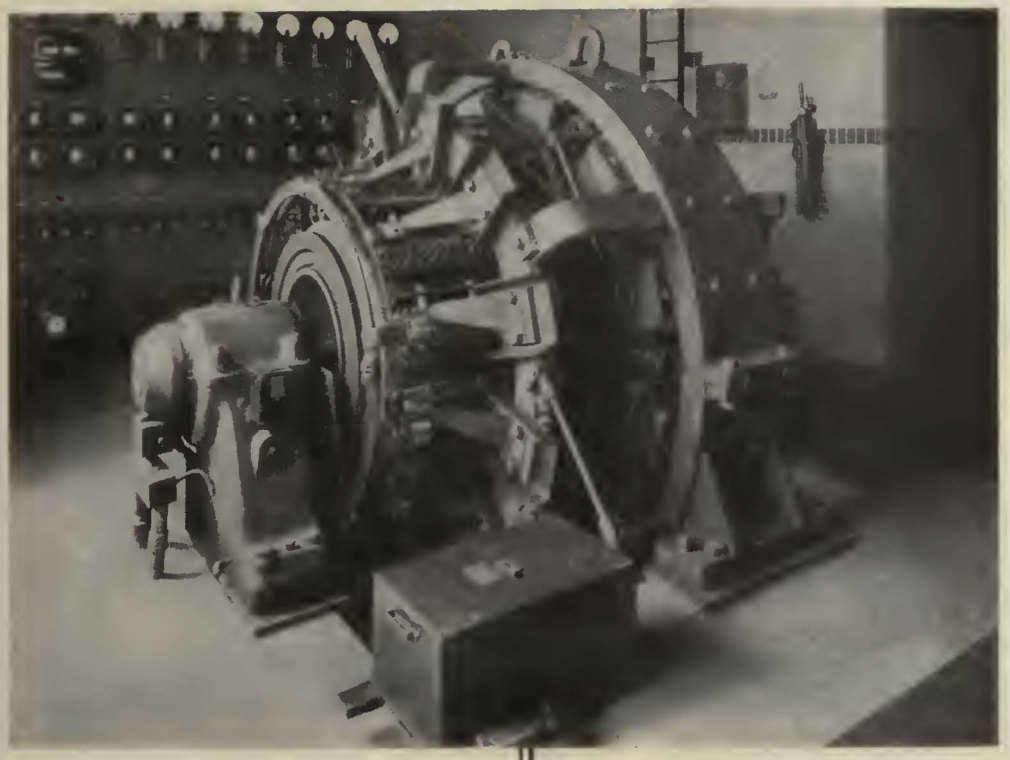
ACTUAL operating data on several large railway systems has shown the reliability of the Westinghouse automatic synchronous converter substations to be practically perfect. In many instances this type of automatic substation has operated for months without a single interruption.

Such reliability is the result of long experience with railway problems, and the development of power conversion equipment particularly adapted to this class of service.

High reluctance commutating poles, a system of flash barriers on the converter, and the simplified automatic switching equipment with the Rectox polarity-insuring device, are a few of the many features that provide this high degree of reliability.

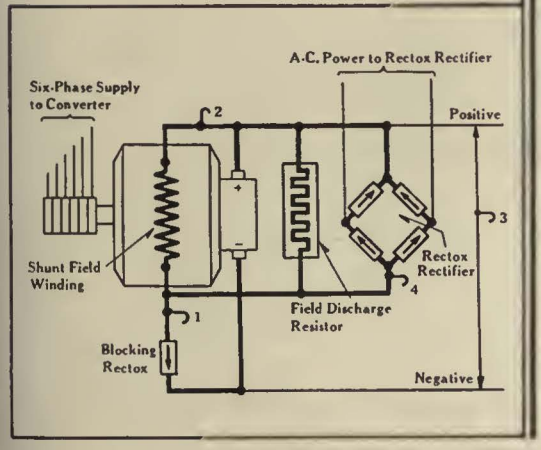
Included also, is the well-known type CH interrupter—a circuit breaker that has proved its reliability under the most severe operating conditions.

Specify Westinghouse automatic synchronous converter substations to assure the reliability of your next power conversion installation.

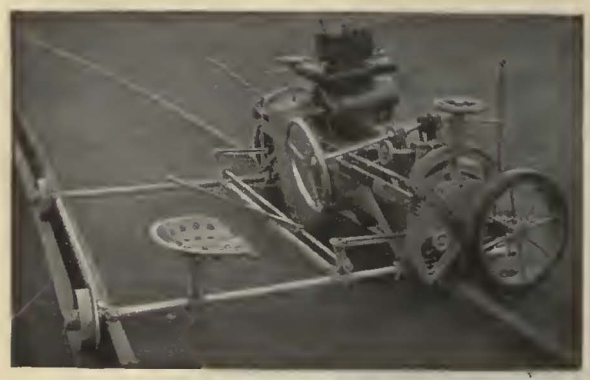


A 2000-kw., 600-volt d-c., 60-cycle, shunt-wound synchronous converter.

Typical installation of the pedestal-mounted interrupters and load-shifting resistance.

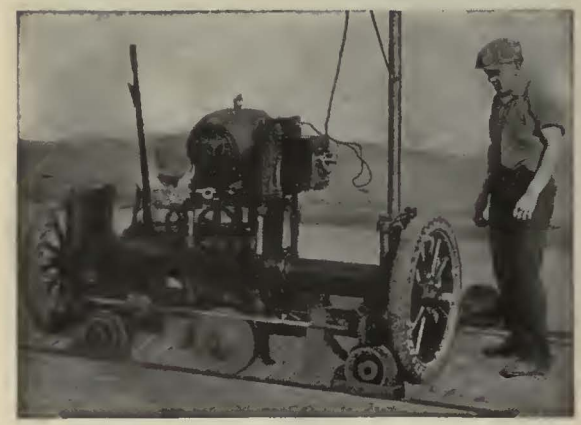


Schematic diagram showing the application of the Rectox polarizing equipment to synchronous converters.

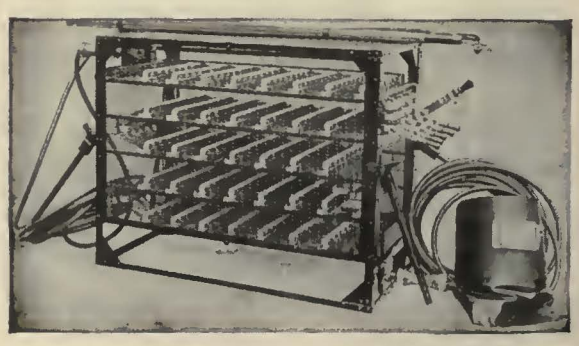


Improved Atlas Rail Grinder

Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Design's Bottle-neck

1 The new O-B Swivel Harp and Wheel, a recent development for Trolley Bus Service, being used successfully in Salt Lake City, Chicago and Knoxville.

2 The O-B Trolley Retriever is essential to Trolley Bus operation, for positive retrieving action is necessary to prevent damage to overhead or current collection equipment by a flying trolley pole.

3 O-B Featherweight (6-spring) Trolley Bases, designed especially for trolley buses, are proving their worth on *all* of the recently installed Trolley Bus systems.

4 O-B Dash-Illuminating Headlights, which provide adequate light forward and full illumination of the entire dash of the bus, are highly satisfactory in Trolley Bus service.

5 In addition to the Standar overhead materials used in T Bus service, O-B has devel number of special materials whic greatly to the efficiency of the overh

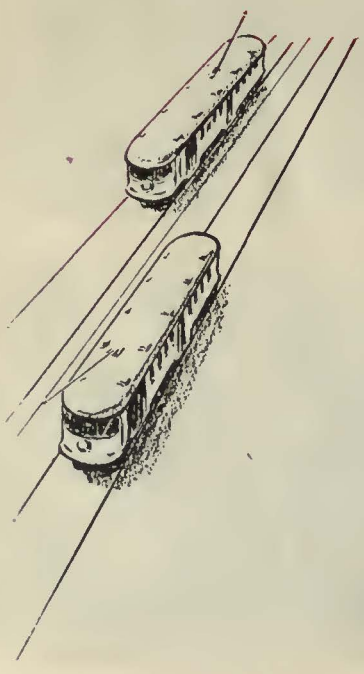
6 O-B overhead materials for railway operation need no duction to the industry. Op men the world over have found th service life and greater reliabili characteristics of O-B materials.

12 Factors that Ad

OPERATING expense eats up over 70% of the income from electri railway operation. Consequently, the problem always paramoun in the industry is ways and means for reducing this expense. Greate efficiency, longer life and lower maintenance of equipment and mat rials are essential if any appreciable reduction is to be effected.

O-B has constantly included these important considerations in the di cussions of its engineers and specialists—not only when a new produc is "on the board" but in the study of the older time-tested device The result has been apparent in O-B performance.

Wherever O-B materials are used, whether it be in the overhead, fo track bonding, or to equip cars or trolley busses, it is noticeable tha these O-B products do render appreciably better service—and onl because research, design, materials and manufacture have each cor tributed a share in the process.

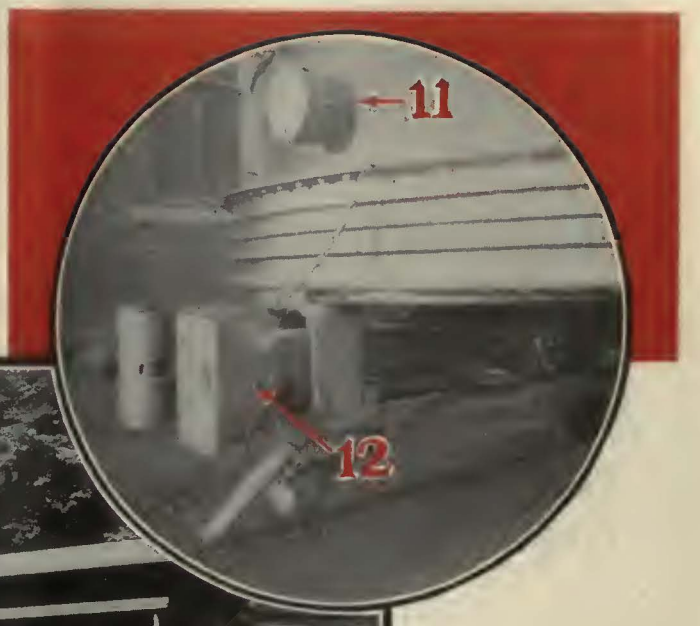


The O-B Feist Trolley Wheel, recently improved by the addition of graphite-composition side washers, redesigned harp, is being standardized by many important properties.

9 The O-B Dash-Illuminating Headlight, because it is the modern headlight and because it gives added safety to operation by fully illuminating the dash, is the first choice of operating men for both new and old cars.

Eight out of every ten of the new cars purchased since the introduction of the O-B Featherweight 5) Trolley Base are equipped with hter, stronger base.

10 O-B Rail Bonds, like O-B overhead materials, are recognized by the industry for their dependability and long life. 23 types meet every bonding requirement.



11 O-B Catchers and Retrievers assure operating men of dependable service, proved by many years of use, in keeping flying trolley poles free from the overhead.

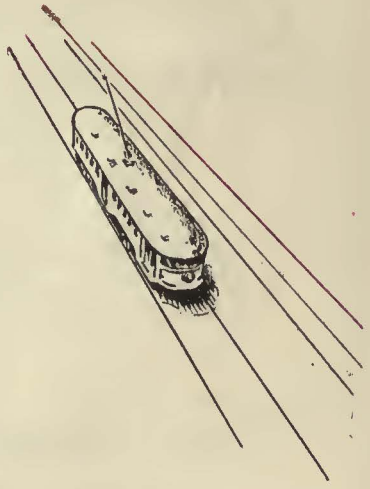
12 O-B Tomlinson Car Couplers, because they are absolutely automatic in operation, and because they provide for automatic coupling of air and electric connections, are chosen for up-to-date operation.

o Better Operation

e twelve factors illustrated above have proved operating advantages. Ineither street railway or trolley bus operation, the O-B materials and eqiipment indicated by the arrows are rendering dependable, long ied service, and are aiding materially in reducing maintenance.

e extensive use of O-B overhead materials, rail bonds and car equipmnt by more than 600 electric railway properties in the United States, Cnada, Cuba, South America, Europe, Asia, South Africa and Australiis ample evidence that the service advantage of O-B materials is apreciated by operating men everywhere.

e June A. E. R. A. Convention issue of *O-B TRACTION NEWS* dicusses the use of O-B materials in many of the leading cities of the Uited States and Canada. If your copy has not reached you, write th Ohio Brass Company, Mansfield, Ohio. In Canada, the Canadian O:o Brass Co., Limited, Niagara Falls, Canada.



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PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

"YOU need no elaborate surveys to discover what the Trolley Bus holds in store for your system. A ride on the new Chicago installation with this stop watch in your hand will help do the job."

Twin Coach
BY F.R. FAGEOL KENT, OHIO

The damnedest

ONE of the keenest minded railway managers last week rode a new Chicago Twin Coach Trolley Bus with one of these little truth telling timing devices grasped in his hand.

The route was three and one-half miles long and the trip made during a peak hour.

There were a possible twenty-one stops and eighteen of them were made.

The elapsed time was fifteen minutes.

At the end of the trip he made this comment:

"That's the damnedest ride I've ever had. They have talked about revolutionizing urban transportation. Here is a chance really to do it."

If the capacity and automotive comfort of the Twin Coach body design had been available in the earlier days, there would never have been a gap in the progress of this form of transportation.

ride he'd ever had

Then he explained this characteristic remark:

"We have all been working for years for a perfect acceleration and deceleration.

"We knew we had achieved the acceleration in the wonderful new Westinghouse and General Electric electrical equipment.

"All of us have marveled at the astonishing deceleration of the big 40-passenger Twin Coach.

"Every mother's son of us has wished we could secure the same perfect acceleration and deceleration in a single vehicle—here we find it in the new trolley bus.

"We must get busy and utilize this new unit on our systems."

The trolley bus modernizes without changing the method of propulsion. It fits your railway maintenance system but provides automotive advantages, including the ability to load from the curb and freedom from noise and odor.

Twin Coach
BY F.R. FAGEOL KENT, OHIO

"Do Not Pass Rear When Car Stops"

WITH the trolley bus in use, each piece of roadway equipment ceases to be a dam in America's city streets.

This economic improvement is inevitable.

With the trolley bus in use, urban transportation may seek the curb—no longer will prospective customers be required to dodge high speed automotive missiles to do business with you.

Twin Coach

BY F. R. FAGEOL KENT, OHIO

IT SHOULD be a great convention. When old friends get together and new friendships are formed. When the whole industry lays its cards on the table and checks up on progress. When policies and programs are mapped out for the next year.

We pause from the busy task of supplying the nation's tickets and transfers to wish you all success and a profitable time.

Our representatives will attend the convention. Won't you look them up?

And don't forget—we have a branch at 420 South San Pedro St., Los Angeles. Make it your "headquarters."

Cordially,

Globe

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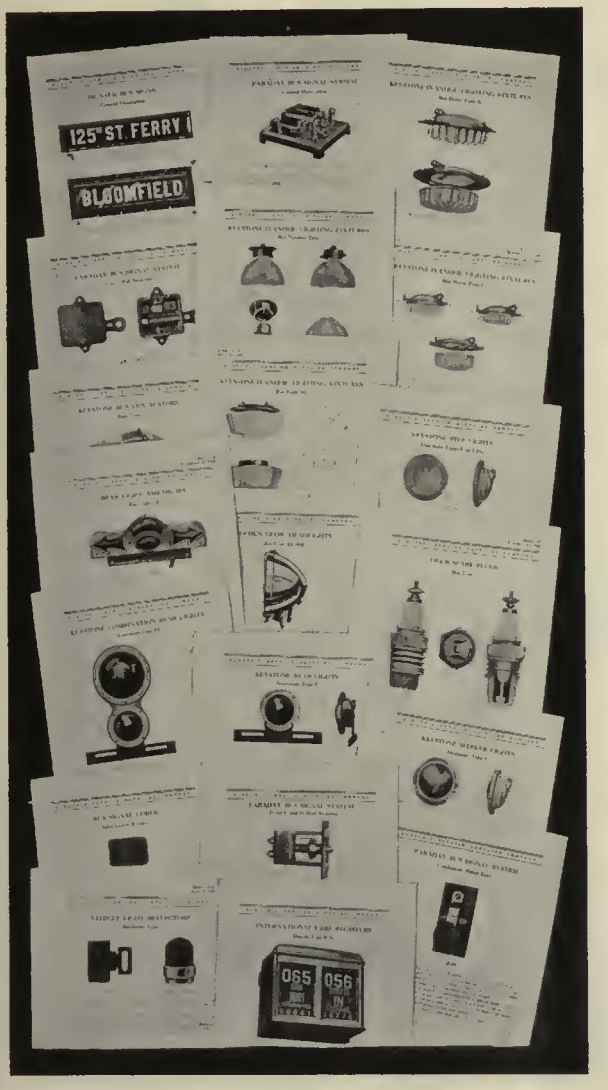


FOR

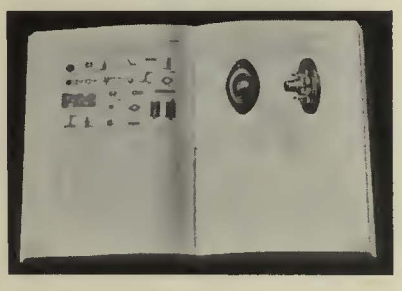
BUS

EQUIPMENT, REFER TO OUR CATALOG NO.

9

Check over the pages illustrated at left which are taken from our catalog No. 9—the first and most complete catalog of electrical equipment for buses. Perhaps you will find some items of equipment which should be installed in your buses to make them produce more revenue and to lessen up-keep costs. Bear in mind that Keystone bus equipment is manufactured in a plant which for many years has specialized in the production of equipment for transportation.

Always refer to your copy of catalog No. 9 for bus electrical equipment.



Catalog No. 9 was the first book listing a complete line of electrical equipment for buses. All equipment listed is so catalogued that you will find it very easy to make selections of equipment and parts. A new supplement has recently been issued which we will be glad to send you upon request.

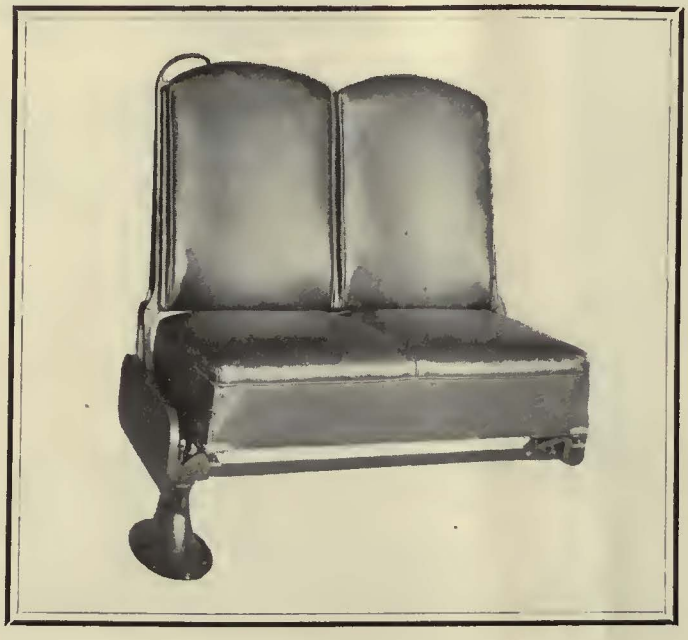
ELECTRIC SERVICE SUPPLIES COMPANY

MANUFACTURER

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home Office and plant at 17th & Cambria Sts., PHILADELPHIA; District Offices at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver, Winnipeg

FOR NEW CARS, OF COURSE



A Hale & Kilburn 392-A Walkover Seat with deep-cushioned double-deck spring-edge cushion and divided concave spring-edge reversible back. Specified by the West Penn Railways and Monongahela & West Penn Railways for their new light-weight cars.

An interior view of one of 15 new light-weight cars recently completed by the Cincinnati Car Corporation for the West Penn Railways and the Monongahela & West Penn Railways. These cars featured Hale & Kilburn No. 392-A Walkover Seats with heat treated aluminum supporting framework and mechanism.

BUT ALSO FOR THE OLD ONES ••

COMFORTABLE seating has so clearly demonstrated its ability to attract additional fares that new cars are being equipped for restful riding as a matter of course. The luxury of these soft and restful Hale & Kilburn trolley car seats is a recognized builder of good will.

Every operating company has dozens, scores or hundreds of old cars which can be modernized with Hale & Kilburn seats. Even a modest budget for the improvement of equipment by installing Hale & Kilburn seats or chairs will go a long way toward making these old cars earn increased dividends.

Why not investigate? Or nearest office will be glad to help you.

This Hale & Kilburn No. 392-A Walkover deep-cushioned leather-covered reversible back seat was used by the Market Street Railway in San Francisco in rehabilitating their cars.

HALE & KILBURN SEATS

HALE & KILBURN CO.

General Offices and Works: 1800 Lehigh Ave., Philadelphia

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Frank F. Bodler, 903 Monadnock Bldg., San Francisco.
W. L. Jefferies, Jr., Mutual Bldg., Richmond.
W. D. Jenkins, Praetorian Bldg., Dallas, Texas.
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In all branches of Mass Transportation

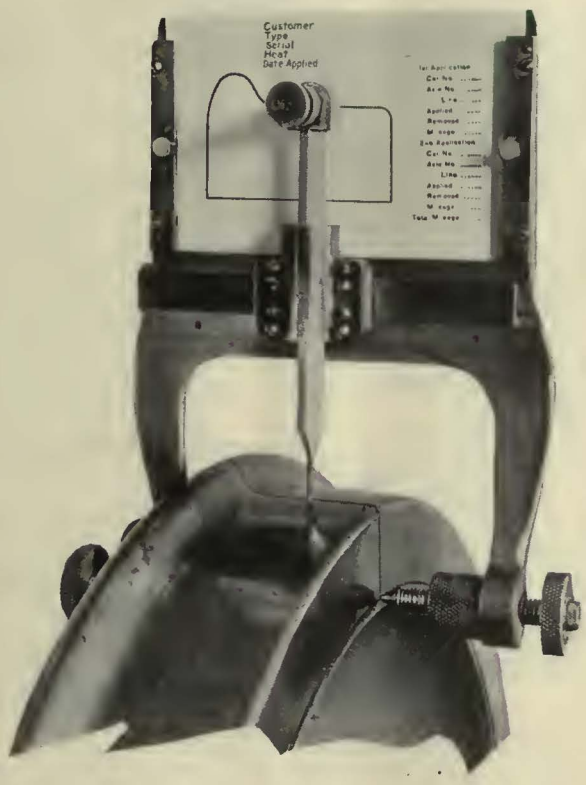
Safer Operation, Faster Passenger Interchange and substantial operating economies result from the use of N. P. Door Control.

CAN YOU afford to overlook the definite advantages National Pneumatic Equipment offers?

STEEL WHEELS

Operators of the Many Properties Now Using "NACO" WHEELPRODUCT Will Recognize the Device Pictured Herewith As A Simple and Accurate Means For..... "GETTING THE ANSWER" For Most Economical Car Wheel Service.

READ AND FLANGE CONTOURS RECORDED GRAPHICALLY



A PRACTICE WHICH WILL ENABLE EVERY OPERATOR TO DEVELOP COMPREHENSIVE FACTS RELATING TO LIFE-SERVICE AND ULTIMATE COST OF THEIR CAR WHEELS

This Practice Is Established and Identified with the Use of . . .
NACO SPUN STEEL WHEELS

CAR WHEEL•••

the
STEEL CASTINGS COMPANY
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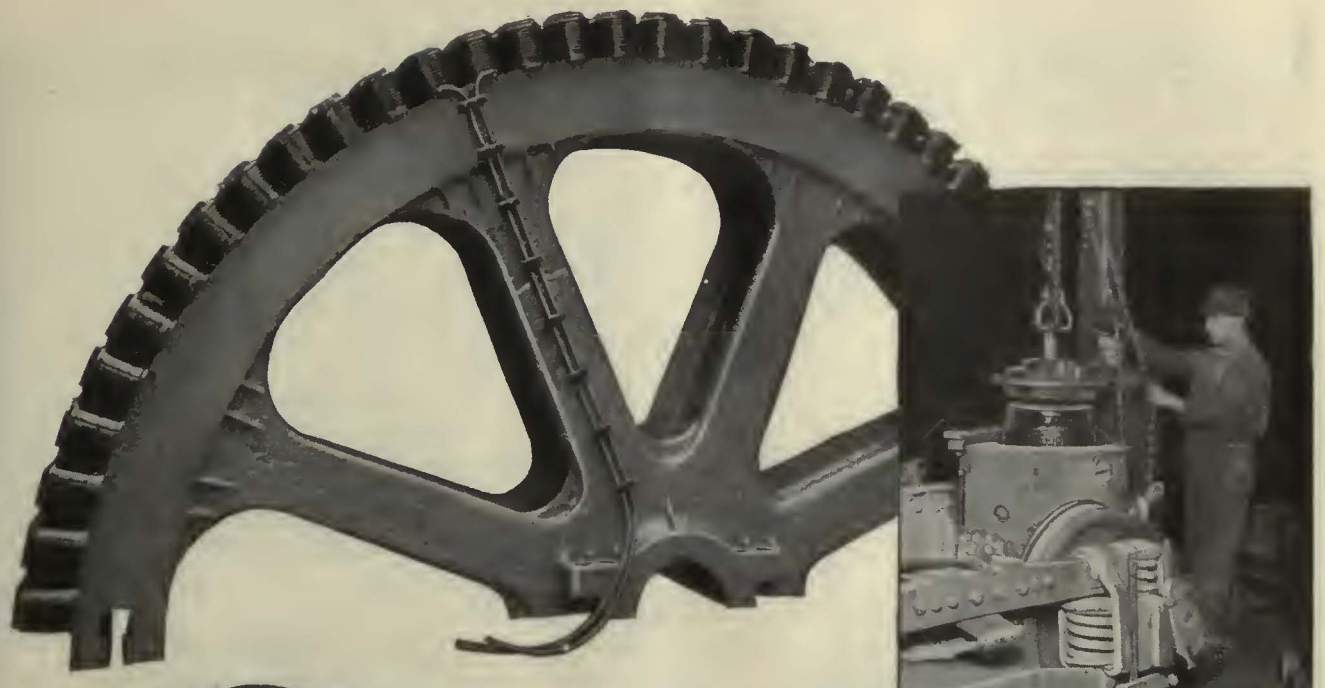

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Where there's G-E VARNISH —there's dependability

GREAT generators, husky railway motors, small electrical apparatus—General Electric dependability is sealed in every one if they're treated with G-E Insulating Varnish.

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You need only specify your exact requirements. General Electric can meet them with varnishes high in dielectric strength . . . tough to withstand abrasion, heat, oil, weather . . . flexible or hard . . . quick-baking or air-drying . . . clear or black—*every* kind.

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GENERAL ELECTRIC

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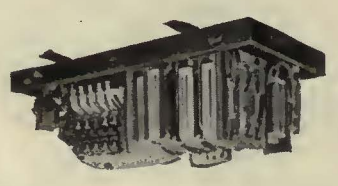
IMPROVING TRANSPORTATION

THROUGHOUT the United States, progressive railways are effecting sound economies and improving service with modern General Electric equipment. The following data are an indication of the extent to which various cities will benefit by this modernization.

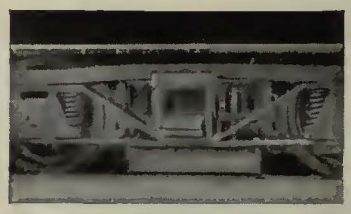
GE-265 motor (35 hp.)



PCM multi-point control for fast acceleration

Type K-75 controller with LB control handle

GE-301 motor (50 hp.)



G-E magnetic track brakes

CARS

BALTIMORE, MD.: 50 light-weight cars with GE-301, 4-motor equipments including PCM multi-point control.

Los Angeles, Calif.: 15 light-weight cars with GE-265, 4-motor equipments including PCM control and CP compressors.

Des Moines, Iowa: 40 light-weight cars with GE-247, 4-motor equipments including K-75 control and CP compressors.

Cincinnati and Lake Erie Railroad Co.: 10 light-weight interurban cars with GE-706 (100-hp.), 4-motor equipments including PC control, magnetic track brakes, and CP compressors.

TROLLEY BUSES

SALT LAKE CITY, UTAH: 14 trolley buses with GE-298, 2-motor equipments including PCM multi-point control and electric braking feature.

Chicago, Ill.: 19 trolley buses with GE-298, 2-motor equipments including PCM multi-point control and G-E air brakes.

Knoxville, Tenn.: 4 trolley buses with GE-298, 2-motor equipments including PCM multi-point control.

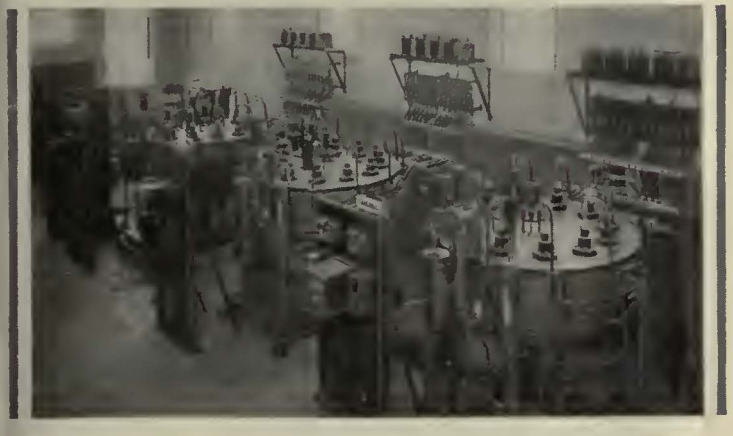
New Orleans, La.: 1 trolley bus, G-E equipped, for experimental purposes.

GENERAL ELECTRIC

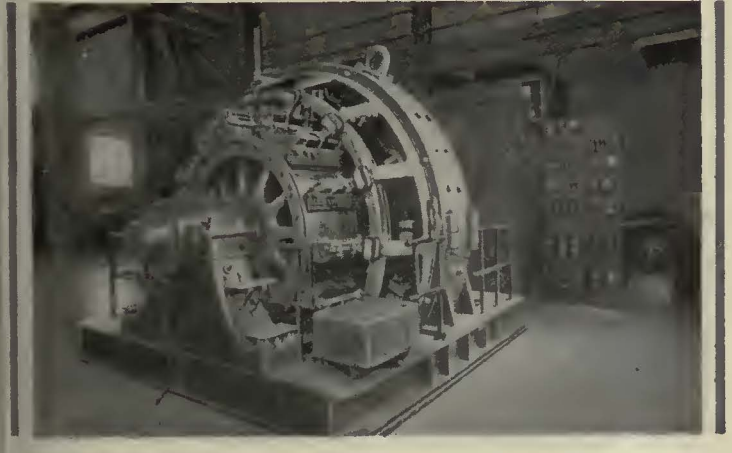
G-E equipped trolley buses have won their place in the modern transportation system. Above is shown a G-E equipped trolley bus as used in Salt Lake City

WITH IMPROVED EQUIPMENT

A G-E equipped gas-electric bus of the Public Service Coördinated Transport, Newark, N. J. The ability to increase schedule speeds has always been an outstanding advantage of gas-electric drive



Interior view of the Fall River substation of the Eastern Massachusetts Street Railway Company, showing three G-E mercury-arc rectifiers, each of 1000-kw. capacity



A recent G-E installation of synchronous-converter equipment for the Brooklyn-Manhattan Transit Company of New York City. This shows a 4000-kw. unit at the Bushwick substation

GAS-ELECTRIC BUSES

BALTIMORE, MD.: 12 buses with G-E gas-electric drive. These are high-powered, double-deck, 68-passenger vehicles for one-man operation.

Newark, N. J.: 180 buses with G-E gas-electric drive. These are single-deck vehicles for city service. When placed in operation, they will make a total of 1330 G-E equipped buses operating in Newark.

Philadelphia, Pa.: 10 buses with G-E gas-electric drive. These are for high-speed interurban service between Philadelphia and New York. More than 400 G-E equipped buses are now operating in Philadelphia.

SUBSTATIONS

FALL RIVER, MASS.: Of unusual interest is this new installation of G-E mercury-arc rectifiers. Normally, they utilize 25-cycle power at 13,200 volts. However, the equipment is so designed that in case the 25-cycle power is interrupted, 60-cycle power at 22,900 volts can be substituted instantly. Other G-E equipment at this station includes transformers and complete manual switchgear.

New York City, N. Y.: New synchronous-converter equipment has recently been installed at Ridgewood, Bushwick, and Coney Island substations to improve service on rapid transit lines. Among this General Electric equipment are included manual switchgear and automatic and supervisory control apparatus.

GENERAL ELECTRIC

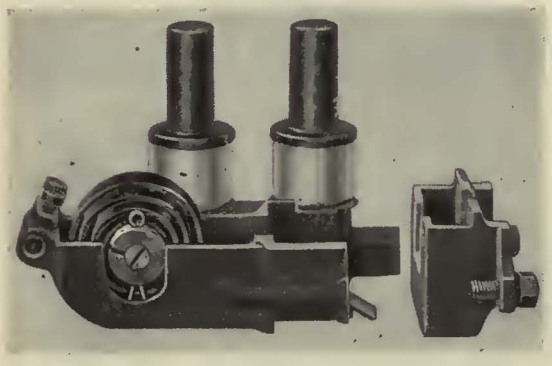
SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

IMPROVING TRANSPORTATION WITH IMPROVED EQUIPMENT

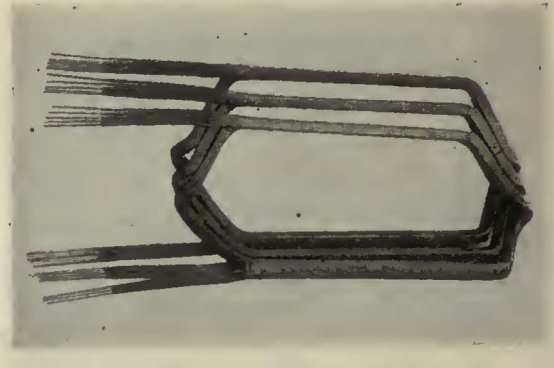
Ask for Catalog GEA-611

LINE MATERIAL

IN order to provide complete information in convenient form, General Electric recently published a new catalog describing all standard G-E line-material devices. Many of these devices embody improvements in keeping with the General Electric policy of making available the best equipment at the lowest possible cost. Ask for Catalog GEA-611



With the G-E renewable-carbonway brush-holder, only the carbonway need normally be replaced



In G-E armature coils are embodied those mechanical and electrical characteristics exactly suited to G-E motors

RENEWAL PARTS

THERE are two definite reasons why General Electric renewal parts for car equipment can help you to reduce operating costs and improve service. First: whether the part required is an armature coil or a pinion, you may be certain that the highest quality is embodied in its design, materials, and construction. Second: General Electric renewal parts can be obtained quickly from any G-E warehouse. These are located at important centers of industry throughout the United States.

General Electric renewal-parts stock rooms are modern department stores for the railway industry. Take advantage of this service. Buy from a single source. It simplifies accounting and storekeeping. It insures original-equipment quality.

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC

330-150

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Electric Railway Journal

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

JOHN A. MILLER, JR., *Managing Editor*

New York, June 14, 1930
Volume 74 *Number 7*

Annual Convention Number

Improving Design to *Improve Service*

TODAY, more than ever before, the interest of electric railway men is directed to improving service by improving the design of equipment and physical plant. Among the many problems before the industry none is more vital than this. True, traffic congestion and control is a live issue. Important questions of valuation and rates of fare are now under consideration. Relations between management and employees are being studied intensively. Methods of publicity and merchandising are prominent in the minds of many operators. Means to cut costs are receiving concentrated attention. But the cornerstone upon which rests the whole structure of electric railway progress is the design of equipment and physical plant.

Many advances have been made in recent years. More will be made in the years to come. Where are these trends leading? Are these various improvements separate and unrelated, or are they parts of a definite and correlated program? While at first glance the relationship between the many different developments may not be evident, deep down below the surface practically all of them will be found to have the common objective—to improve the quality of the transportation service rendered.

OF PARTICULAR interest at the present time are the improvements being made in the electric rail car. For some years the industry has been awake to the need of modernizing its rolling stock. While other forms of transportation had undergone revolutionary alterations, the car, the heart of the electric railway, remained unchanged. It was realized that the electric railway could not continue to hold its rightful place in the transportation field unless the car was brought up to date.

Modernization plans inaugurated during this period are now beginning to bear fruit. Great strides have been made in improving the appearance of cars. Certainly the utility of the vehicle is not impaired by making it attractive. Many improvements have been made which provide greater comfort and safety for the passenger. Operating speeds have been increased by means of more rapid acceleration and braking. Effective means to lessen vibration and noise have been developed by scientific study. Though these may be small things in themselves, in the aggregate they constitute an important contribution toward improving the quality of service.

LESS SPECTACULAR, perhaps, but none the less important have been the improvements in track construction methods and machinery. Demands on the track structure under conditions existing today differ widely from those of a few years ago. To meet these new conditions, engineers have effected far-reaching changes in design. Likewise, in the field of power conversion and distribution for the electric railway, a variety of equipment is available today which is vastly more efficient and more economical than that in general use a decade ago.

Spectacular growth of our cities has created new problems. Population is increasing and at the same time is spreading over a much wider area. The distance between home and work is becoming ever greater. Heavier demands have been placed upon existing rapid transit facilities, and new facilities have become necessary. Efficient operation of these lines demands improved equipment.

Along with the intensive service in the congested area, there has developed a demand for service in many less densely populated districts. Here the motor bus and the trolley bus have entered the picture. Like the electric car, both have undergone many changes in design which have greatly increased their usefulness.

From every standpoint demands made upon public transportation service are far different today from those of a few years ago. These conditions present a challenge to both the transportation operator and the manufacturer of equipment. That the challenge to improve service will be met there can be no doubt. But that it shall be successfully met demands untiring effort to improve design.

How the Convention Will Benefit the Industry

By

PAUL SHOUP

President Southern Pacific Company
President American Electric Railway Association

THERE is no activity in our national life more important and all-concerning than transportation. For this reason the entire country has a direct interest in the 49th Annual Convention of the American Electric Railway Association. More than 2,000 members of the association from all over the United States and Canada will gather in San Francisco June 23 to 26. These men, actively engaged in the transportation of people and merchandise, will bring to the convention the story of their problems and accomplishments and from the discussion of these topics all of us will receive helpful suggestions and healthy stimulation.

A convention is an institution for the exchange of ideas. The program of the 49th Annual Convention of the American Electric Railway Association covers a wide range of important and timely subjects. Those who come may be sure that the time given to attending this gathering will be well spent.

The electric railway industry should benefit by this convention in other ways as well as from the discussion of its problems. Among those who attend the convention will be representatives not only of the industry itself but also of many western communities. Governors of states, mayors of cities, members of legislative bodies, educators and other leaders in public life have been invited to attend and we have reason to believe that many of these invitations will be accepted—with benefit, I am sure, both to the electric railway industry and to the communities they represent. Understanding is an important factor in progress and there is no better way to develop understanding than by giving the party of the other part a seat at your council chamber.

The development of closer acquaintanceship among ourselves is another benefit of a gathering such as this convention. In the days of the Don, California hospitality was a sacred rite. Those were the days of which the historian Bancroft wrote: "A man could ride from San Diego to Sonoma without a coin in his pocket and never want for a roof to cover him, a bed to sleep on, food to eat, and even tobacco to smoke." In those days transportation facilities were of the four-legged variety and there were no hotels. The visitor who galloped up to the door in the late afternoon expected to spend the night as a guest—and was never disappointed. His horse or mule was given a rubdown and a well stocked stall. The visitor was escorted to the guest chamber where his host waited on him with a basin of water and clean towels. These the host carried himself, but a queue of servants walked behind the master to indicate that had he not wished to show his guest the courtesy of personal service, he could have delegated its performance to hired retainers. When the guest awoke in the morning he found on his bedroom table a clean shirt and a jar containing money—both for his use if he needed them. If his horse was still tired he was given another horse which he exchanged for his own later on the return journey.

On this and similar old Spanish customs, California hospitality was founded. It is the same today as it was 200 years ago, and judging by the plans which have been made for entertaining the visitors to the A.E.R.A. convention, they will long remember their visit to the "land of the Don."

Co-operative Effort *Is Greatest Need*

By

J. H. HANNA

President Capital Traction Company

First Vice-President
American Electric Railway Association

SERVICE furnished by the urban and suburban transportation companies is absolutely essential to the welfare of American cities, and if it should be eliminated or seriously crippled the public as a whole would suffer grievously. The business is no longer a monopoly, if it ever was, and while unregulated competition should and must be curtailed, the industry's plans for the future must be based on meeting rather than eliminating competition.

There are probably no more important matters affecting urban transportation agencies today than traffic congestion and the various plans for preventing or correcting it. Unfortunately, many of the studies and plans for improving the traffic situation in cities have been based on a consideration of the movement of vehicles rather than the movement of passengers, resulting in entirely inadequate provision being made for mass transportation vehicles. Parking regulations, traffic lights and signals should be considered on a basis of the greatest good to the greatest number of individuals to be transported. An attempt to handle mass transportation by individual vehicles, either private cars or taxicabs, would result in practical stagnation unless street capacities are doubled or quadrupled.

It is noticeable that in those cities where engineers of transportation companies take an active part in the drafting of traffic regulations and establishing signal systems, the results have been much more satisfactory than in cities where the companies' assistance has not been utilized.

The American Electric Railway Association can do nothing which will be of more benefit to its members and to the public at large than to impress upon municipal authorities and city planners the fact that mass transportation vehicles must be given more consideration in traffic regulation. The vast majority of people now depend upon public transportation service and must continue to do so if traffic conditions are not to get very much worse instead of improving.

All of these factors emphasize the importance of co-operative effort and call attention to the activities of the association and their importance to every operating and manufacturing company. The present tendency in the association's work is towards detailed technical study of the various elements of the business and it is through such detailed technical study that the industry can improve the value and attractiveness of the service which it renders, and thereby get back customers it has lost.

The Committee on Fare Structures, recently established, has great possibilities. The flat fare for city companies has been considered practically inviolate in spite of numerous efforts made to break away from it in the last ten or twelve years. There is no doubt that the flat fare is economically unsound and has driven away much profitable business. Many and varied plans have been suggested and tried out for the establishment of a more scientific fare scheme but none has so far been entirely satisfactory. It is quite possible that this committee's work may go far towards helping solve the industry's difficulties. In any event, the necessity for co-operative effort has never been so great as at the present time.

Waterfront and downtown business section of San Francisco as seen from the bay

San Francisco, Scene of the 49th Annual Convention of the American Electric Railway Association

Night scene of the convention city

Market Street, with its four parallel tracks, is the main business thoroughfare of San Francisco

DESIGN of street cars is undoubtedly one of the important factors in revamping service to satisfy more nearly present-day demands. Any increase in comfort features, consistent with carrying capacity and loading requisites, is of vast importance. Any improvements contributing to speed, noise reduction and smoothness likewise raise the street car ride in the estimation of the public.

SAMUEL KAHN
President Market Street Railway
San Francisco, Cal.

IMPROVEMENT *in the* RIDE

Is the Most Effective Stimulant of

Public Interest

By

CHARLES GORDON

Managing Director
American Electric Railway Association

ALTHOUGH there is much room for optimism in the electric railway industry at the present time, prompted by the general feeling that its major problems are being attacked with renewed vigor, we should not minimize the great task before us. Eleven years have elapsed since the close of the war, but this industry has not been able to balance its operating budget in the true sense of the word. Its net earnings have been subnormal; the return upon its capital investment has been inadequate, and it has lost ground in number of passengers carried in relation to population increase. In consequence of these conditions, new capital can be secured only with difficulty and at high cost. There is a general feeling, not only in the minds of bankers and investors, but also on the part of the public at large, that the future of the industry is highly problematical.

News of the abandonment of electric railway lines is widely disseminated, and the significance thereof magnified beyond all reason. A large section of the public believes that the future useful life of our surface transportation systems will be comparatively short, and that the electric railway car will soon disappear as the stage coach and the canal boat have done. This lack of confidence in the future of our industry affects us adversely in attempting to attract the capital needed for refinancing and for improvements.

Pleas for public co-operation with respect to franchises, taxes and traffic regulations, as well as for consideration of public along with private transportation in city planning and highway construction do not attract public interest because the average man is not inclined to be interested in an industry which he considers obsolete. There is a strong tendency to overlook the plight of community transportation and of the vital part which it plays in the life of modern cities. This is attributable in large measure, if not entirely, to the impression of obsolescence which is created by the character and condition of the equipment which we operate.

All studies of the requirements of the industry lead to the inevitable conclusion that the cars which we operate represent an important phase of our problem. The industry has for several years been aware of the evils attendant on the operation of the large number of obsolete and heavy cars that are in service. In considering the economics of replacing a large proportion of its present equipment, however, it was faced with the fact that the type of equipment currently offered did not

meet present-day traffic requirements to the degree which would warrant the investment. Nor was the evidence as to the economies which would result from the operation of this equipment sufficiently impressive to lead to the belief that replacement with such rolling stock would re-establish the railways upon a firm foundation.

Three interested groups must be considered in any study of the requirements of present-day transportation equipment: the public, the electric railway and the manufacturer. Of all the objectives to be attained in car design, probably the most important are those which are necessary to meet the demands of the public. In this respect, the electric railways must compete with individual automobile transportation, and their cars must be suitable for that purpose. They must meet the requirements of modern conditions, both in their performance and in the impression which they make on the public. They must be in keeping with their surroundings in the modern city. They must be able to keep up with other traffic on the street, and must meet the demand for quick transportation. They must, by their very appearance and by the impression which they make on an observer, create the desire to ride in them. There must not be the slightest hint of being out of style. The American public refuses to be associated with anything which even gives the impression of being out-of-date, and it will tolerate such a thing only so long as it is forced to do so. Future rolling stock must be quiet in operation. It must be smooth and pleasant to ride in. It must be comfortable, convenient, and easy to use. It must, in fact, meet the automobile on its own ground, for the public has become automobile-minded.

From the standpoint of the railway, it must be able to accomplish all these things at the lowest possible cost. In fact, the cost must be far below that of individual transportation. Managements are faced with the problem of providing satisfactory service with a fare which, in most instances, is inadequate to provide the revenue needed to insure adequate returns to investors. Therefore, the question of reducing cost is a vital one to the continued operation of their systems. Considering cost, the car must be light, but care must be taken not to reduce the weight below the point where the high initial cost, through the use of expensive alloys and other costly materials, overbalances the saving resulting from the lighter weight made possible thereby. Its structure must be as simple as is consistent with necessary strength. The possibilities of weight and resulting cost reductions seem to be the most attractive in trucks, motors, electrical control apparatus, braking equipment and miscellaneous apparatus. The many specialties which go into a car, such as seats, doors, trolley retrievers, headlights, etc., seem to offer further possibilities for simplifying the design and reducing the cost.

From the manufacturer's point of view, the many improvements demanded must be made in face of a continual clamor for reduced first cost. The very conditions under which cars are built and sold militates against the accomplishment of this objective. Car building has been largely a contracting rather than a manufacturing business. A builder influences the details of construction, but rarely sponsors the complete unit as a distinctive manufactured product. It has been suggested that the car builders should take the initiative in developing cars to be sold as other manufactured products are sold. On the other hand, some builders hold that street cars cannot be sold in that way because the operating companies will continue to insist upon specifying their own design. Only experience can prove or disprove this point. It is worthy to note, however, that bus manufacturers have succeeded in selling to transportation companies, many of them electric railways, models of their own design.

To meet the public demand for speed in transportation, cars are needed which, as nearly as possible, will accelerate and stop as rapidly as the best powered private automobile on the street and which have a sufficiently high free-running speed to hold their place in traffic. At the present time we have no standards by which to judge the speed of the street car, except by comparing it with its real competitor—the private automobile.

The ideal characteristic curves of acceleration and retardation for a street car have never been determined, nor has the industry undertaken to find the maximum values which may be considered practical. The rates, no doubt, in the end will be controlled by the ability of the standing passenger load to accommodate itself to rapid movement. This involves not only standing passengers during the rush hour, but also passengers walking from the doors to the seats, or vice versa, while the car is moving. The maximum attainable rates of acceleration and retardation cannot be achieved in any city until the public has been educated to conform to higher rates than now prevail. The present-day public is alert and is quick to adjust itself to new conditions.

Transportation men disagree on the relative merits of speed and frequent headway in attracting riders. Both are important. In this respect, there was much discussion two years ago about the use of smaller units brought about by the development of experimental four-wheel cars. Undoubtedly, the idea of a comparatively small unit, operated on a short headway by one man is fundamentally sound for a great many lines in many cities. Only when traffic densities go up considerably above the average are larger units necessary or justified.

The electric railway man has always been susceptible to the temptation to use large units. It seems such a simple way to reduce the cost per seat, or per passenger carried. But of what good is a reduction in cost, if it is achieved by driving away business? Frequency of service, along with speed, is necessary to increase the volume of riding. But even from the standpoint of speed, small units have an advantage over large cars, for speed is affected by the number of stops. The smaller the total load carried on a single vehicle, the fewer will be the number of stops which it is required to make. Putting this whole matter in another way: the smaller the individual unit that is operated, the closer does the service given approximate that of the individual automobile.

The load factor on the system is all too often overlooked in yielding to the temptation to make sure, when selecting new cars, that they are ample in size. The use of larger equipment in the rush hour is, of course, frequently required, but there are cars now available on most properties for that purpose, and in any replacement program, first consideration should be given to equipment for all-day service. This question of the proper size of cars is an important one in considering rolling stock.

The idea behind the single-truck safety car was sound for a great many lines in many cities, so far as its small size and the implied objective of frequent headway were concerned. But the limitations of the existing types of four-wheel trucks were a serious handicap. The appearance and riding qualities suffered. The car looked too much like what it really was—cheap transportation. It is one of the idiosyncracies of human nature that though

we demand economy and an attractive price, we refuse to buy a thing that looks cheap if we can possibly find the money to buy something that looks more luxurious.

Improvement in the proportions, lines and general appearance of street cars to the end that they may be in keeping with their surroundings in modern cities is a second very important objective from the standpoint of the public. Here again the standard of comparison is the automobile. The principal object seems to be to make the street car a more graceful looking and attractive conveyance. The same general objective applies to the interior. There must be proper balance between attractiveness and utility. The design, equipment, fittings and decorations should be in keeping with the purpose for which the vehicle is intended; namely, the mass transportation of passengers in cities.

Only during the past few years have we been giving the question of car appearance serious consideration. In this we have been forced to feel our way slowly, because relatively little attention was formerly given to the appearance of street cars. We are beginning to ask the engineers to fit structural details into a design to produce a given appearance, instead of letting the latter take care of itself after the structural elements are determined.

In answer to the steady demand for a smooth and quiet ride, the manufacturers have developed a number of trucks, differing in many respects from the older conventional types. The objectives sought in the designs are reduced weight and noise, faster and smoother starting and stopping with lighter equipment, and reduced unsprung weight. Reduction in unsprung weight is expected not only to improve the riding materially and save wear on the car itself, but also to reduce both noise and wear of expensive special work and tracks. Of almost equal importance is the arrangement of the springs.

Noise has been reduced in some of the newer models by more accurate fitting of gears and other parts, by simplifying the design, and by insulating the springs, brake rigging and other parts from adjoining portions of the structure. The introduction of higher-speed motors made possible by the newer arrangements to support the motors on the truck frame instead of on the axle, has led to the development of several new types of drives. The single-reduction unit, the double-reduction unit and the worm-gear drive are all available for use. The present need seems to be merely the perfection of experimental models and the building up of a record of experience with them that will insure their practicability for the severe conditions of regular service.

From the standpoint of the operator, one of the most important objectives to be attained in car design is a substantial reduction in operating and maintenance costs. Both are largely controlled by the design, age, condition, performance, weight and first cost of the equipment which is operated. The other important operating elements entering into the problem are labor, track maintenance and power. We cannot hope to reduce the cost of labor except as we use labor more efficiently by increasing car-miles per man-hour through improvement in the performance of cars. We have relatively little opportunity of decreasing track costs, except as we are able to reduce wear and tear and maintenance through reduced weight of cars, better suspension design and reduced unsprung weight. Likewise, the largest opportunity for reduction in power cost is afforded by reducing the weight and increasing the efficiency of our cars.

It is imperative that the cost of new cars be brought down to a point where a retirement period of perhaps ten years becomes practicable. Otherwise, with a continuation of the present rate of progress in automobile design, it is probable that new equipment, even of the most modern type that could be expected to be available within a reasonable time, would be entirely obsolete before it could be retired.

A ride through Mission Park over the private right-of-way of the Municipal Railway affords an unusual view of San Francisco

MANY steps have been taken in improving the physical plant and personnel of the municipal railway to give better service. An extensive track reconstruction program, the purchase of several new buses, the maintenance of equipment at a high standard and the work of an efficient instruction department stand out as the most important of these activities.

F. BOEKEN
Superintendent
Municipal Railway of San Francisco
San Francisco, Cal.

Simplicity in line and contour, as well as carefully balanced proportions, reflect efficiency and utility in the new Youngstown cars

Obtaining an

Attractive Appearance

with *Simplicity* and *Utility* in Design

By

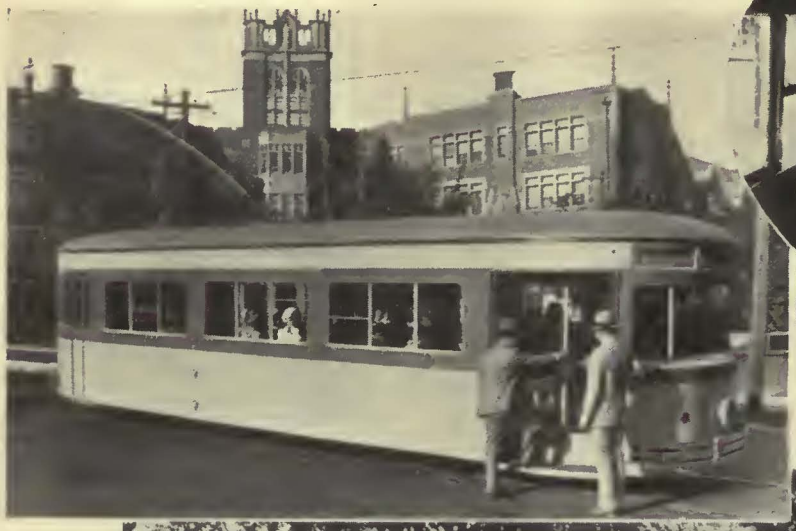
R. N. GRAHAM
Manager of Railways
Penn-Ohio System, Youngstown, Ohio

APPEARANCE, external and internal, is a very important feature in the units of modern city transportation. There has been a general tendency in all American cities to devote thought to the impression the city and the component parts of it make upon the individual. Modern buildings are designed with an eye to beauty as well as to mere utility. The urban transportation company can not be alien to the general movement toward improved city appearance.

It has been found that true beauty is harmonious with efficiency and utility. Something added merely for decorative effect we view as "gingerbread" and "Victorian." On the other hand, the harmony in line and contour which reflects efficiency and utility requires studied thought and plan.

The beautiful simplicity of the exterior of a British or Continental locomotive does not in the least interfere with such a locomotive being an efficient piece of machinery. Neither do the long, sweeping lines of perspective of the modern skyscraper interfere with a most economic use of the cubic space contained in it. There has been a tremendous improvement in the appearance of automobiles in the past ten years. This is not the result of adding ornamental appendages but rather is the result of true artistic effort in so designing the proportions of the surfaces of the automobile that the finished product is pleasing to the eye, not only as a result of beautiful proportions but because the finished product so clearly sets forth the power, speed and comfort of the vehicle.

Although the recently-completed Blackhall car in Joliet is of unusual interest because of its specially-designed single truck, worm drive, low floor and all-aluminum construction, giving a weight of 17,000 lb., it is distinguished also by its striking appearance, obtained by the streamline design and painting, continuous base line, grouped side windows, and pleasing color combinations



The single sash, composition flooring, leather seats, smooth headlining, dome lights and vestibule paneling give the Youngstown car interiors an air of cheeriness

Visibility is not sacrificed to obtain a pleasing and harmonious color scheme in the new Des Moines cars now being delivered

The square front of this Lynchburg car affords good vision for the operator and also makes possible the most efficient use of the available space

In every detail, the appearance of this Montreal car reflects the purpose for which the vehicle was designed

The modern street car should, therefore, be well proportioned with the simplest possible lines. Since an extremely bulky object is out of place on the street, the lines of the street car should tend to diminish and not increase its size. For this reason, the roof should be as low as possible. There is no use for vertical space in the body of the car beyond that which is adequate to take care of standing passengers. The cost of the cubic content produced by greater size than this is wasted. A low car of any dimensions is more attractive on the street, and the saving of unnecessary height produces a saving in direct proportion in the vital matter of weight. Since acceleration and retardation, the chief factors of the modern fast schedule, depend directly upon weight, unnecessary height in a car is not only unsightly but detrimental to the efficiency of the car.

Cincinnati's new cars are in keeping with the tone of the fine residential areas in which they operate

The appearance of bulk in the street car is also minimized through the adoption of single sash. Even though the single sash be as great in vertical dimension as the double sash, it does not accentuate the height of the car as much as the double sash.

Prominent roof construction also emphasizes the bulk of the street car. This construction may result from the roof being too strongly arched, from a monitor deck, from conspicuous ventilators, trolley boards or other appendages. A curved roof with very flat arch and as few added structures as possible makes the most graceful and least bulky roof with the best possible use of the space underneath.

Under modern traffic conditions, the most desirable front end of a street car, from the standpoint of economical use of space and vision of the operator, is afforded by a square and not a rounded contour. The whole tendency in urban bus transportation has been toward the use of buses with the largest seating capacity. Due to the development of the high-speed electric motor, the trolley bus with its high rates of acceleration and retardation has again loomed as an important factor in city transportation. All modern trolley buses have been designed with square ends approximating those of the large capacity urban bus. The street car with a square front end thus will harmonize in appearance with the trolley bus and the gasoline bus, permitting all the essential elements of the modern transportation utility to be harmonious in appearance.

Street cars have been placed in operation in many cities within the last year or two which have shown the appreciation by the designer of the benefit of careful proportion and construction of external elements of the car which reflect credit on the progress that is being made in this important matter.

In choosing the color scheme of the urban transportation system, consideration should again be given to the general effect created on the street. In a city of any size the units of the transportation company, be they street car, bus, or trolley bus, comprise a large part of the picture presented on the street. An essential factor of this effect is color. Color, in looking merely at the street car itself, is one thing; the color of the street cars on the street, when taken along with everything else in the view on the street, is quite another matter. I am firmly of the opinion that orange, which in the past has been a favorite street car color, does not fit in well with the general scheme of things on a city street. It is necessary, from the standpoint of safe operation and the prevention of accidents, that visibility be considered in adopting a standard color. There are a variety of tans, greens, browns, creams and similar colors that can be adopted to produce not only visibility but a pleasing and harmonious appearance. But, whatever colors may be adopted, they should be used to produce an effect of simplicity. If two colors are used, one should be placed

The design of the North Shore interurban cars suggests power, speed and comfort

below the base of the windows and the other above that line; if three colors are used, one below the base of the windows, the second from that point to the roof and the third on the roof. Complicated striping, large ornamental designs, sunbursts and dragons are entirely out of place on a transportation vehicle.

Whatever color is adopted, it must be kept up as a color. Any mercantile establishment in a modern city that looks decrepit and run-down is going to pass out of the picture. A street car or bus that has been painted a distinctive color that has been allowed to deteriorate and become old and patchy is an offense to every one in the city that sees it, whether or not it is realized. The use of modern lacquers makes it possible to restore the color of the transportation unit comparatively cheaply. In no respect can a transportation company make good its boast of furnishing a real service to better effect than by insistence upon keeping up the color of its vehicles.

The most economical floor for a street car is wood. However, there are other floor coverings that have a great deal more passenger appeal that possess no element of frill or "gingerbread" and the use of which is dictated by ordinary business instinct. The three alternatives in most general use are linoleum, rubber and flexolith, or similar mineral preparations.

Linoleum, particularly battleship linoleum in a solid color, presents a pleasing appearance but is more or less subject to wear. Rubber floors are not satisfactory on city cars because of the inability to keep them smooth and level under the conditions of city transportation. Flexolith flooring seems to have no serious defects. While it costs more to install than the ordinary wood floor, it presents a pleasing appearance, is not slippery and has splendid wearing qualities.

Any city transportation unit should be well lighted. The tendency in modern life is to be content with no middle ground in illumination. A street car should be so well lighted that passengers can easily read and so that the cars present a brilliant appearance on the street.

The lights in the car should be carefully placed to insure the best possible diffusion and the highest degree of comfort to the passengers. The latter consideration dictates that there should be two rows of lights from the front end of the car to the rear end, one over each row of seats. The modern dome fixture presents a most pleasing appearance, creates the best diffusion of light, permits lower headroom in the car and is easily cleaned.

Another modern development in street car design is the paneling-in of the air pipes to the air valve, controller and switches. It is another praiseworthy development which has no essential drawback. Of course, in inspecting such apparatus it may be necessary to remove certain panels, and in case of a collision involving the vestibule it may be necessary to replace these panels, but these are comparatively minor factors compared to the positive improvement in appearance. Simplicity should be the outstanding feature of the transportation unit and this simplicity of appearance can not be gained if a miscellaneous collection of pipes, switches and other apparatus clutters up one or both ends of the car.

The tendency in the modern car is to insist upon having headlining. Of course, it should be as light in weight as possible and should be perfectly smooth and painted in a light color to conserve the illumination of the car.

The whole tendency in modern design is to have cross seats the full length of the car. Since a handhold is provided on the corner of every seat, there is no real necessity in the average city of hanging straps. These straps are unsightly, are associated with the cry of "strap-hanger," the relic of an older and unhappier day, and are wholly unnecessary. Stanchions should be as few as possible and should be of non-corroding material.

With large sash, composition floor, comfortable leather seats, smooth headlining, dome lights furnishing brilliant illumination, all machinery concealed, no straps and few stanchions, the interior of the modern street car is an attractive place and it has the true beauty of simplicity and efficiency. It would be less attractive if there were Turkish rugs running down the floor and costly hangings were at the windows, because it has that beauty which comes from adaptation to its purpose; nothing cheap and nothing gaudy. The exterior, too, should express the same ideal.

WELL-MAINTAINED equipment, reliable operating schedules and the general appreciation of business, reflected in our attitude toward the public, have enabled the Napa Valley to retain the maximum patronage and general public good-will, not only essential but necessary to continued operation. Although we have suffered from the competition of the private automobile we have been able to compensate some of the loss in passenger business by increased revenues from other service developed, principally mail, express, freight and motor bus.

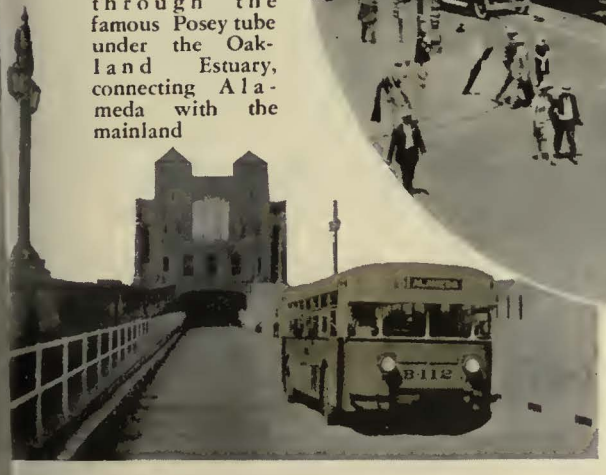
C. E. BROWN.
Vice-President & General Manager
San Francisco, Napa & Calistoga Railway
Napa, Cal.

Train of the San Francisco, Napa & Calistoga Railway in a beautiful setting along the Napa Valley route

Oakland, sister city to San Francisco, as seen across Lake Merritt

Two-car train of the Key System Transit Company in the business district of Oakland

Buses are operated through the famous Posey tube under the Oakland Estuary, connecting Alameda with the mainland



Along the Key System's trans-bay line which joins the east bay cities with San Francisco

THERE is no doubt that the development of better mass transportation vehicles, both rail cars and motor coaches, is one of the most vital problems in the industry at the present time. Improvement must be made toward faster speed, greater comfort and convenience, longer life, lower maintenance, better appearance and greater appeal to the public we serve.

In spite of many handicaps the mass transportation systems continue to be the backbone of the community, the circulatory system of business and the chief factor in the making and stabilizing of property and business values. Yet the public at large does not understand our most obvious problems and their vital relations to the progress of the community. It is our own job to change this situation. Scientific and sustained effort to improve our equipment will be a very important step in this direction.

A. J. LUNDBERG.
President
Key System Transit Company
Oakland, Cal.

Latest type of car designed for speedy operation on heavy traffic routes in Brooklyn

SPEED —*an Essential of* Street Car Performance

By

W. T. ROSSELL
Vice-President and General Manager
Brooklyn & Queens Transit Corporation
Brooklyn, N. Y.

IT IS difficult for the old and impossible for the young really to comprehend the progress of urban transportation. Within the span of 30 years, the horse-drawn and the "horseless" carriages have evolved into the modern automobile, the hack into the taxicab, the carry-all into the motor coach, the wagon and the dray into the motor truck. At the turn of the century vehicular speed was ordinarily limited to 8 m.p.h. A horse, traveling at 15 m.p.h. was a runaway, causing great excitement. Into this bucolic scene of 30 years ago came the modern electric street railway car, startling in its beauty of line, its power and speed, controlled by powerful air brakes. This product of inventive genius and pioneering courage took its place as the unchallenged leader of urban street traffic.

Where are the vehicles of that day? It is as though they had never been. Innumerable models have come and gone. The streets are filled with the rush of automobiles. They seem commonplace now with their streamline bodies, their power and speed, their four-wheel brakes and easy, accurate steering. We accept as natural speeds of 30, 40, even 50 m.p.h. And yet, today, may be seen in many places the identical electric street railway car of 30 years ago moving through the streets. The car is the same, but all else is changed.

To bridge this gap is the problem. Public acceptance of the automobile clearly points the way. Limited by function, street car performance must approximate that

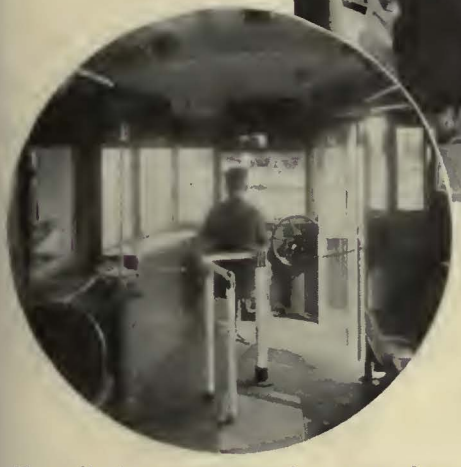
of the automobile. The street car must be made capable of holding its own in traffic. This means more speed, and the bare essentials involved in making greater speed practicable can be classified under the subjects of braking, acceleration, running speed of motors, weight, and rate of handling passengers.

There are natural differences of opinion as to the relative importance of these items. In the following discussion, where figures are given, they are not meant to be arbitrary or final, but merely indicative of opinion.

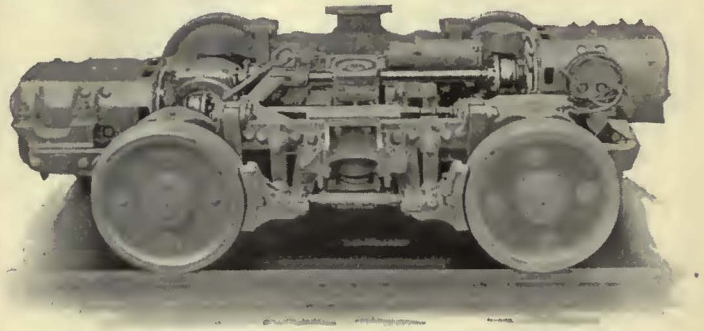
Safety is presumed to be included in the sum total.

One of the most important steps in automotive design and one which has added greatly to the average speed of traffic is the development and application of the four-wheel brakes. Many street cars have an average braking rate no greater than 1½ m.p.h.p.s. This accounts for much of the slow, hesitant op-

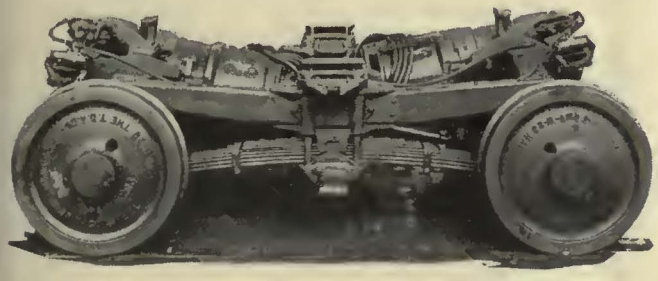
Wide doors and low steps reduce the loading time to a minimum on the Jefferson Avenue express line in Detroit



Turnstile for passengers with correct fare speeds up operation in Brooklyn



New Brill truck with motors mounted longitudinally, worm drive and wheel brakes



High-speed motors, worm drive and armature shaft brakes are features of the Timken-Detroit truck

Latest Chicago Surface Lines car equipped with four 50-hp. motors for maintaining faster schedules

Brill truck used under recent cars for Youngstown has motors mounted parallel to the axle with WN drive

eration, so common to street cars. It is not even as efficient as a one-wheel brake on a rubber-tired vehicle would be. Rates up to 5 m.p.h.p.s. on street cars are possible without a rail brake. The latter would probably be necessary for emergency use and to give the needed assurance. Rates of braking should be variable and selective at the will of the operator. Much progress has been made in this matter, but there remains opportunity for still further improvement.

The power plants now in use in automotive equipment are significant. The "get-away" is the important element in taking advantage of the "breaks." Rates of acceleration should be variable and selective at the will of the operator with a maximum up to 5 m.p.h.p.s. A rapid rate of acceleration should be continued into relatively high running speed.

It is imperative that the passengers be handled gently. Sudden changes in velocity create an accident hazard, make the ride uncomfortable, and discourage the passenger from leaving his seat before the car stops. It should be understood that it is not the high average rate of braking or acceleration that causes these evils, but the momentary sharp changes in rate. Specifically, the rate of change of braking and acceleration must be kept within limits to be determined experimentally.

All cities have large areas where vehicles are run at high speeds. Here automotive performance points the way. The same vehicle must have sufficient flexibility to operate satisfactorily in either congested or in free running areas. Whether obtained through series winding, tapped fields, variable line voltage or other means, the ideal is that the free running speed be variable and selective to suit the conditions. A maximum of about 40 m.p.h. is suitable, giving rapid operation uphill and first rate suburban service. A minimum of about 30 m.p.h. is suitable for congested areas. These figures approximate average automotive performance. They may be used as guides and compromised to the extent made necessary by limitations in electrical equipment design.

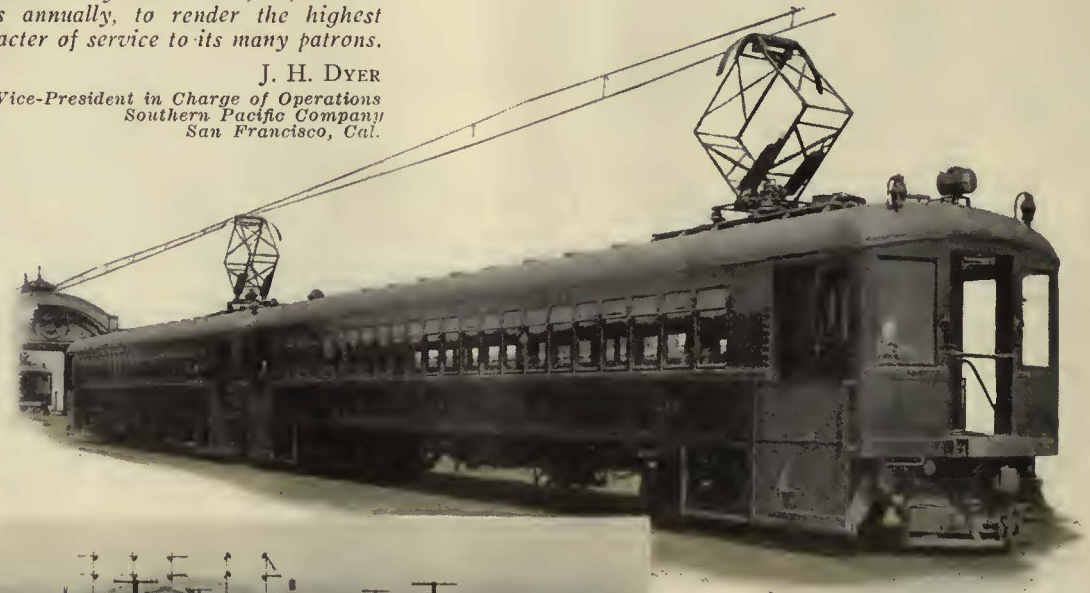
The control of weight permits higher average speed by keeping power costs within reason. Weight of a 45-ft. car should not exceed 30,000 lb., and should be brought nearer to 25,000 lb. through skillful design and careful selection of materials.

The rate of handling passengers has been given careful study and great strides have been made in improving equipment and method. Besides the training of the operator, many other things also are involved, such as steps and ramps, floor height, door and aisle widths, fare collection devices, heating arrangement, stanchions, hand holds, etc. Specialization of bodily functions of the one-man car operator is an important advantage obtained by foot control.

More and more, the subject of speed is claiming the attention of electric railway operators. Recent improvements in design have done much to increase operating speeds, but the goal has by no means been reached. Every fraction of a second regularly saved per stop is worthy of effort.

FREQUENT improvements in the cars to increase their attractiveness and changes in the track to increase the riding qualities have enabled the East Bay Electric Division, which operates 780 trains daily and about 4,000,000 car-miles annually, to render the highest character of service to its many patrons.

J. H. DYER
Vice-President in Charge of Operations
Southern Pacific Company
San Francisco, Cal.



Trains of this type are used by the Southern Pacific Railroad on its electrified system reaching the Bay cities of Oakland, Alameda, San Leandro, Emeryville, Berkeley and Albany

Right-of-way of the East Bay Division, leading to the train sheds and ferry slips at the Oakland pier

By

G. A. RICHARDSON
Vice-President and General Manager
Chicago Surface Lines

Second Vice-President
American Electric Railway Association

The extensive trolley bus system recently inaugurated in Chicago serves a well-developed section of the city

The Improved Trolley Bus

Makes a Bid for

POPULARITY

RADICAL changes in the design of the trolley bus, incorporating the best features of both the street car and the gasoline bus and eliminating the faulty characteristics of the earlier vehicles, have definitely brought back this vehicle as a type of transportation worthy of consideration for many kinds of service. Although the first trackless trolley appeared in Germany in 1899 and the first one in this country in 1902, comparatively little progress was made in its development until recently. The earlier types were not satisfactory and as a result the vehicle was not adopted to any great extent. However, the adoption of the light-weight, high-speed motors developed for street railway operation, the use of pneumatic tires, the creation of excellent riding quality, and the building of a large capacity light-weight bus body, equipped for circulating loads, overcame the earlier defects and resulted in a design which has proved to be very satisfactory.

First recognition of the newer models of trolley buses came with the installation of ten vehicles in Salt Lake City in September, 1928, and of eight in Manila, P. I., about the same time. In November, 1929, New Orleans placed two in operation, and in April of this year Knoxville inaugurated a system using four. The largest system in the country was inaugurated in Chicago recently, when a total of 55 vehicles was ordered to serve more than 35.5 miles of route in the northwest part of the city. Detroit is just beginning to operate trolley buses and other cities are seriously considering the installation of this type of vehicle. It appears that it is definitely beyond the experimental stage and well advanced toward widespread adoption.

Analyses of the characteristics of this type of vehicle, its first cost and maintenance expense, its advantages and disadvantages, its performance and the public response seem to indicate that it has a very definite usefulness. Because of varying conditions in different cities and on different routes within one city no definite rule can be stated covering the use of the trolley bus, but general statements can indicate the possibilities.

The type of trolley bus developed for the Capitol District Transportation Company for its Cohoes line in 1924, represented a big advance over previous designs

Briefly summarized, its advantages with respect to the street car are its complete absence of noise and its ability to load and unload at the curb. Among its disadvantages it is to be noted that the smallness of the unit and the difficulty in getting adequate widths of aisle and lengths of platform, make it somewhat slower and more inconvenient for loading and unloading with a large interchange of passengers. Because it is a steered vehicle it operates as do all such large units, in a way that requires more clearance space on a street than a street car, and in weaving from the curb lane out toward the center of the street and back it creates more traffic interference than does a street car on fixed rails with safety zones at the loading points. The rocking of the bus due to the irregularity of the pavement, and the swinging of the unit due to the steering, cause greater inconvenience to standing passengers or those walking to or from the doors than the relatively smoother movement of the street car on good track, provided the street car is one of equally modernized design.

The trolley bus is greatly superior to the gasoline driven bus in that it has more rapid and smoother acceleration, can develop higher schedule speeds on lines with frequent stops, has complete absence of noise, and eliminates entirely the unpleasantness and danger from exhaust fumes. Because of its unlimited supply of power from the trolley wires it has opportunity for better heating, lighting and ventilating. It uses a more effective source of power at a much lower cost per car-hour. The trolley bus can be maintained by the existing shop force trained for street car maintenance, and it does not involve serious fire risk. Because the trolley bus may be treated as a street car in limiting the routes over which it may travel, it is quite likely to obtain permission in all states to build the bus at least 6 in. wider than is permitted for gas buses which are likely to operate at times even on state highways outside of cities. This additional width used for the aisle makes a tremendous improvement in convenience for the passenger. If this width can be obtained it will make an asset out of the use of fixed poles and wires.

Operating Cost Low

The relative costs of operation are much in favor of the trolley bus in spite of the interest on the investment in overhead structure and the maintenance costs of that structure. It is a very slim service indeed that will not justify the additional expense in poles and wire, providing the service is likely to be continued. Naturally, if the investment in trolley structure is already made for street car service, the cost of the changes would be still more easily supported.

In analyzing these differences one arrives at the conclusion that the trolley bus is best suited for service on routes which do not yet have sufficient traffic to warrant street car operation. From an investment standpoint it is more attractive than the street car on such streets because of the lower first cost and because no permanent way is needed. From an operation standpoint the trolley bus is superior to the motor bus because of its ability to maintain a higher schedule speed with maximum comfort to the passenger and at a lower cost.

Because the trolley bus requires only the installation of overhead wires the investment is small enough to be justified when the patronage of the line is limited. With an appropriate increase in traffic, street car operation can be substituted for trolley buses by laying tracks. Thus, the trolley bus serves better than the bus in developing new areas and in serving as an extension for electric railway lines.

In some places trolley buses have been substituted for street cars on routes where the track was in need of complete reconstruction and where the travel was not sufficiently heavy to warrant this additional expenditure. Other installations will doubtless be made for the same

Trolley buses were substituted for street cars on an outlying shuttle line in New Orleans late in 1929

reason. On car lines where traffic has decreased to a considerable extent the substitution of trolley buses may be an economical and satisfactory move. Such a change usually substitutes the new buses for rather old street cars of a less desirable type, and is quite likely to encourage much new riding.

In middle-size and small-size cities, the trolley bus may prove the salvation of many electric railways. In general, patronage is falling off in the smaller cities, due to the competition of the private automobile. Rehabilitation of the track and rolling stock in these communities would no doubt help them in regaining lost patronage and securing new, but few of the railways are financially in a position to undertake such a program. The substitution of trolley buses would seem to be a logical step in the majority of these instances, because the vehicle would be able to give long service, would preserve a large part of the investment, would offer a service comparable to that given by the private automobile and would retain a permanent form of transportation for the community.

The old trackless trolley, with truck chassis, high body, projecting hood, heavy railway motors and hard rubber tires

Co-ordination of Three Types of Service

Depending on the size of the city and the number of prospective patrons along any given route, the trolley bus will find varying possibilities as substitution for or co-ordination with street cars and buses. It is quite probable that, as experience with the trolley bus increases and its economic field is more clearly established, the three types of units will be found in operation in American cities all fully co-ordinated.

Although the street car has been improved materially in the past decade, it still lacks a number of the more important characteristics demanded by the automotive minded public of today. Some of these characteristics are possessed by the trolley bus. The great improvements just now being made in street car design will tremendously improve the desirability of the coming street car over anything yet in use, and will retain for the street car a position of good standing as a public carrier unit.

Fundamentally, there is a definite field of usefulness for each of the three types of vehicles. The street car, as improved in the very near future, will retain its position in first place as the right vehicle for public transportation service on heavy traffic lines, except where rapid transit is necessary. The trolley bus can well be adapted for extensions, for some residential streets of a boulevard type, for lines which are too light for the street car and for other supplementary service in co-ordination with the street car or rapid transit. The bus will no doubt continue to prove the best vehicle for extensions into very light traffic areas of uncertain future, for temporary supplements to the permanent forms of transportation, for special express type service or for service along some boulevards and in such parks where the advantage of the trolley bus in giving relief from gases and an excess of noise may be outweighted by the undesirability of having an overhead system with poles and wires.

Many factors influence the choice of type of service, and differing weight may be given to the various factors under varying conditions. Modernizing the street car is being undertaken in a very aggressive way, and its material advantage in large cities or in heavy service will remain. The value of the trolley bus will be widely recognized, and to many cities it will prove of tremendous value in restoring public confidence and interest in the public carrier as well as in providing an earning power to the operating company. It is not an equipment that can serve to replace the street car on the important routes. But it is an excellent new development of which the railway organizations should avail themselves for much supplementary service.

Electric coach lines in Salt Lake City extend from the central business district to the residential areas

Spence Airplane Photo

Los Angeles, the country's fifth largest city

At left — View of West Seventh Street in the business center of Los Angeles

The temperate climate of southern California permits the use of open-top double-deck buses the year round

Suburban line of the Los Angeles Railway, using private right-of-way

An unusual view of the Pacific Electric Railway's 3½-mile line from Echo Mountain to Mount Lowe, near Pasadena

Avalon Bay, Santa Catalina Island, a beautiful resort 18 miles from Los Angeles harbor

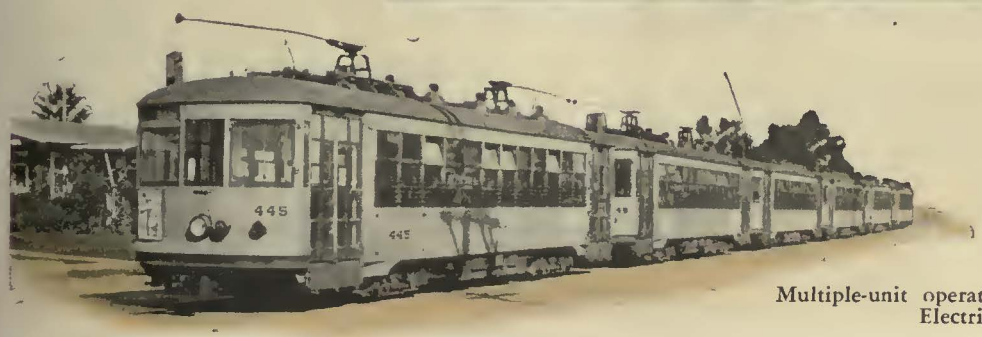
San Gabriel Mission, one of the many points of interest in the territory served by the Pacific Electric

OF paramount importance to the suburban and interurban railways is the cultivation of the good will and constant patronage of the commuter. He is the regular customer—the standby we can count on throughout the year; and, to him, we owe first consideration.

He has been taken very largely into account on Pacific Electric properties in the purchase and rehabilitation of equipment. His comfort has been provided for in seating, lighting, heating and ventilation; and in car arrangement and other appurtenances, his desires have been thoroughly studied. Schedules have been rearranged to meet his needs best. Monthly passes have been adopted, for he prefers them. And in his journeyings he has been surrounded with an atmosphere of ease, comfort and quietude, and the courteous attention of skilled trainmen. D. W. PONTIUS

President
Pacific Electric Railway
Los Angeles, Cal.

San Diego and its harbor as viewed from the near-by Coronado shore



Multiple-unit operation on the San Diego Electric Railway

This sample car in Detroit embodies practically all of the latest noise reduction features—light weight, reduced unsprung weight, insulated floor, worm gearing, insulated trolley base and special air compressor mounting

Lowering Costs and *Bettering Public Relations* by

REDUCING NOISE

By

H. S. WILLIAMS

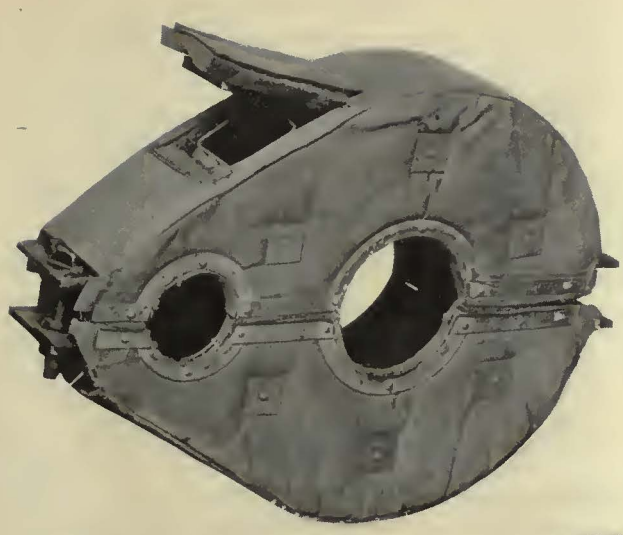
Assistant Superintendent of Equipment
Department of Street Railways
Detroit, Mich.

IS NOISE reduction worth while, or is it merely something which would be nice although not of sufficient importance to justify the effort needed to obtain it? We have demonstrated in actual practice that cars can be made much quieter than they are. We know that this is a vital thing and it can be proved that it is the practical thing to do.

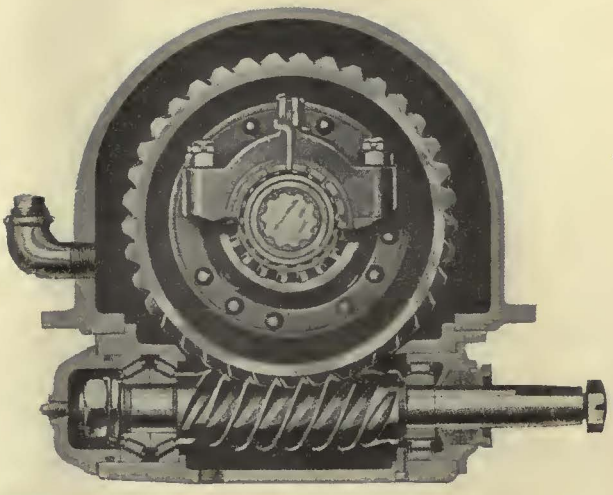
Quite naturally one of the first considerations is the cost. With railways striving to make every dollar yield its utmost in value, this aspect of the case must be of prime importance. It is fair to assume that if it can be proved that noise reduction can be accomplished with a saving in maintenance expense it will be adopted, for economic practice is the only one which will survive.

Common sources of noise in a street car are loose parts. These parts vibrate or by rebounding set up vibrations which are interpreted as noise. For example, take the motor axle bearing. When this is new its movement in the vertical plane is so nearly zero as to be negligible. When wear sets in, the movement is increased and heavy hammer blows are delivered, which mean noise. In the initial stages of service a wear of 0.001 in. means a life of approximately 5,000 miles, but when the bearing has worn so that the clearance between axle and axle bearing is $\frac{1}{16}$ in., a wear of 0.001 in. meaus a life of only 500 miles. It is at this state that it becomes a noise producer of consequence.

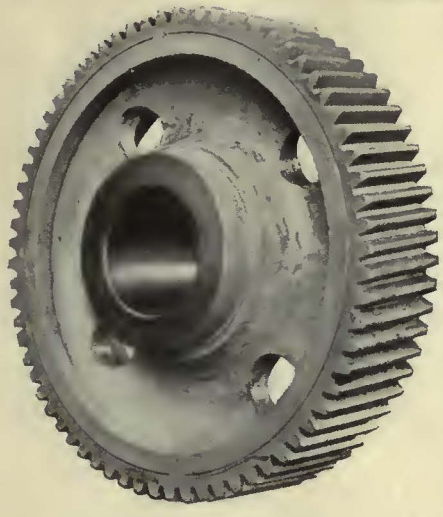
Let us now examine the economics of this case. The bearing is worth approximately $6 installed. It has produced, up to the time represented by the $\frac{1}{16}$-in. wear, a mileage of 69,000. If the bearing is allowed to run to double this wear, the total mileage amounts to but 77,000 or an increase of only 8,000 miles. (See ELECTRIC



Gearcase pad of the Chillingworth Manufacturing Company for muffling the gear case which otherwise acts as a sounding board



Cross-section of Timken-Detroit Axle Company worm-gear driving unit. This type of gearing effectively eliminates noise



Quiet gear of the Westinghouse Company, using a wrought-iron band welded at several points to the gear rim

RAILWAY JOURNAL, issue of Feb. 19, 1927, p. 347.)

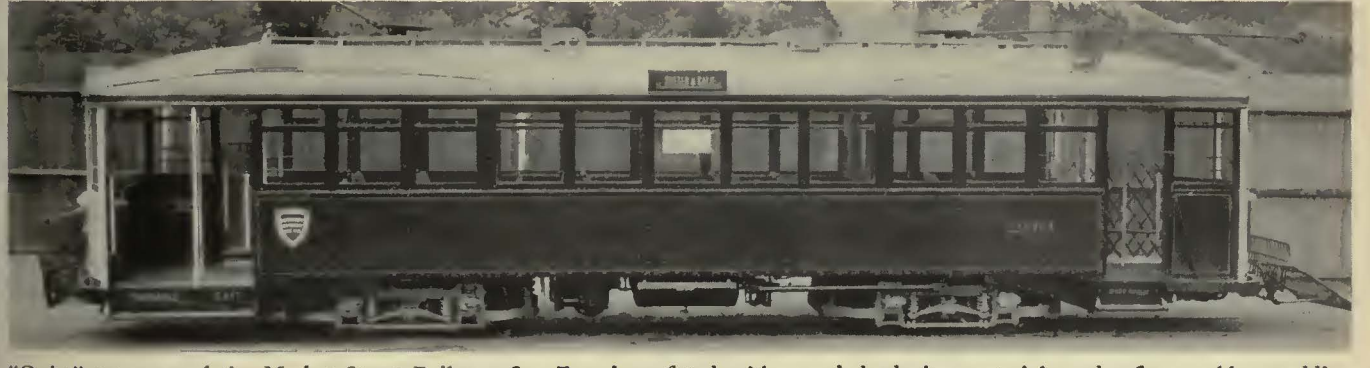
If the bearing be removed at the end of $\frac{1}{16}$-in. wear, the cost per 1,000 car-miles will be 8.7 cents, while if allowed to run to a wear of $\frac{1}{8}$-in. the cost per 1,000 car-miles will be 7.8 cents and the net saving will amount to 70 cents. To secure this saving, it is necessary to consume an excess amount of energy amounting to approximately $6.55. This figure represents the frictional loss in the bearing during the added 8,000 miles which is equal to the loss occurring during the previous 69,000 miles. Summarizing this phase of the problem, it has cost $6.55 to save 70 cents.

This only the direct saving by taking the proverbial stitch in time. In addition to this is added gear wear caused by allowing abnormal separation of gear centers. This in turn lowers the efficiency of the gears. The gear loss from a set of spur gears when new and operating under the best of conditions is approximately 2 per cent. If we allow an added loss of 0.1 per cent for the spread centers, a conservative estimate, then with an 18-ton car in ordinary city service an added energy loss of approximately 45 cents per bearing is entailed. This amount should be added to the $6.55 previously mentioned.

In addition to this is added gear wear greater than the normal wear. It is difficult to evaluate this factor, but it is present and a very definite thing nevertheless. Moreover there is the intangible nuisance of noise which has been added to the sum total of other noise of the car. In an age like the present where everyone is becoming noise-conscious there can be no question that noise suppression has a value even though it is impossible to reduce it to dollars and cents as concerns its reaction upon our patrons.

To sum up the above case, the bearing which has been allowed to run its limit of wear instead of being changed when it should have been, has given an increased mileage of 8,000, or 11.6 per cent, and represents a saving of 70 cents. But to secure this saving it has cost $7 plus added gear wear, plus the annoyance of noise. So in reality there has been an economic loss of $6.30 per bearing in addition to the intangibles mentioned. Such a thing is indefensible.

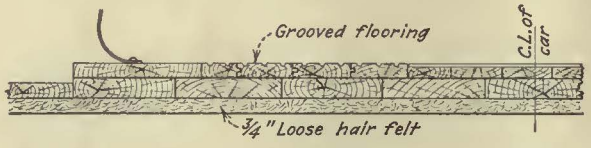
We have taken this case of delayed maintenance because we have definite data concerning it upon which to build a case and which we can prove to be true. Other



"Quiet" type car of the Market Street Railway, San Francisco, fitted with sound deadening materials under floor, rubber padding between car bolster and frame, leaded master gears, insulated gear boxes and quieted air compressors

wearing parts of the car are in the same category and wear proceeds in a similar fashion in them. Delayed maintenance and its consequent noise is much more expensive than maintenance applied at the proper time. Perhaps it might be better to say that reconditioning of parts in the early stages of wear is true maintenance, while letting wear run to the limit is nothing but repair. True maintenance is something that is orderly, scientific and economical; repair is a slipshod makeshift and very expensive.

Having shown that noise reduction means cost reduction from the maintenance standpoint, let us now look into some of the features which should be built into cars to make them inherently quieter. One of the points of greatest importance under this heading is weight reduction, especially the reduction of unsprung weight. Much thought has been devoted to this idea and a great deal has been accomplished in a developmental way. To be sure, the great objective has been reduced operating cost but the noise-reduction value of the lighter weight should



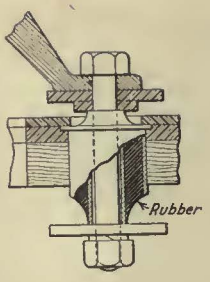
Floor design of the Detroit Department of Street Railways using a ¾-in. layer of loose hair to absorb sound

not be overlooked. To give an idea of this expressed in percentage it may be stated that if the weight of a car be decreased 10 per cent, the noise due to wheel impact will be reduced 3.64 per cent; if the weight be reduced 20 per cent the noise will be lessened by 7.72 per cent. Inasmuch as noise due to wheel and rail contact is one of the major sources of annoyance, the reduction of weight is very important.

Gearing is another important source of noise. Spur gears with large teeth which have been standard up to the present time are prolific noise generators even when new and, of course, to a greater degree after wear has set in. The remedy for this on present equipment is to muffle the gear case which acts as a sounding board. This has been done effectively by the Chillingworth Company which has perfected a padding for this purpose. The Westinghouse-Nuttall gears have the ringing deadened by means of a wrought-iron band welded at several points to the inner side of the gear rim. A lead-filled groove is used by the Tool Steel Gear & Pinion Company for damping the ringing of gears. Were it not for imperfections in the gear teeth resulting from heat treatment, there would be greatly lessened demand for means to stop gear noise. Another efficient method of elimination of gear noise is to use worm gearing, a typical example of which is shown in an accompanying illustration.

As the greatest proportion of car noise originates beneath the car floor, the comfort of passengers will be greatly helped by the use of sound absorption material under the floor. There are two methods of doing this which have been tried out in actual service and which have proved satisfactory. The plans developed by the Market Street Railway of San Francisco and the Department of Street Railways, Detroit, are shown in accompanying drawings. The latter scheme by actual measurements shows a reduction of noise as heard by the passenger of 8.9 per cent.

The side sheathing of car bodies may be effectively



Method of mounting trolley base to eliminate noise. Rubber is used in tension rather than in compression

sound-proofed by a method similar to that used for flooring in Detroit, but in this case the material should be cemented to the steel panels.

Trolley-wheel noise is annoying. It may be conquered, however, by the employment of a trolley base mounting as illustrated. Tests have shown this to be so effective in city service that no sound could be heard except when the wheel passed an overhead frog or crossing. The vital point in this mounting is that the rubber is used in tension. Rubber when used as a vibration insulator is much more effective when it is in tension than when in compression. The noise of air compressors, too, may be minimized by the use of mountings similar in nature to those employed for trolley bases.

Often in fitting new pinions to worn gears, both in the case of car propulsion motors and air compressor motors, the profile of the new pinion does not properly match that of the used gear. Recently we have used a new lapping compound to run in the pinions with success.

The points previously discussed are a few of the major points having to do with the car equipment. What of the track? That, too, has a most important bearing upon car noise. Rail, in order to contribute its share to the reduction of noise, must be smooth; it must be free from corrugation and loose or cupped joints. It should have flange bearing crossovers. It must have a measure of resilience so that sound vibrations will be absorbed or damped. A soft and rough surfaced paving will be quieter than a hard smooth surface. The modern monolithic type of track construction in which concrete pavement is integral with the track ballast is a serious offender to the noise sensitive public.

Car noise is not merely a nerve irritant. It bears a

Industrial Karpet, acoustical cloth and rubber padding are used by the Market Street Railway for floor insulation

direct relation to cost in a different way than has been pointed out previously. Noise in many instances is an indication of something wrong—that reconditioning has been too long deferred. But noise is basically a vibration of parts and that in turn is an indication that metal parts are being subjected to millions of successive stresses. This in turn leads to fatigue of the metal and failure of parts. Consequently whatever may be done to reduce noise has a beneficial bearing upon the life of equipment

The subject of noise reduction is being given much study by different bodies. The electric railways and automotive concerns are interested in it to make their transportation vehicles more popular. The National Safety Council is studying it to determine its effect upon the nervous systems of workers. Civic bodies are taking up the question and demanding the suppression of noise. To summarize then, noise reduction is necessary from the eocnomical standpoint, from the humanitarian view and because of bettered public relations.

Plush-upholstered seats and a combination hot water and electric heating system, add to the comfort of passengers on the latest type of North Shore car. A thermometer and thermostat may be seen above the windows on the right

By

H. A. OTIS
Engineer Car Equipment
Chicago Rapid Transit Company
Chicago, Ill.

Meeting the Passengers' Demand for GREATER COMFORT *and* CONVENIENCE

LONG STRIDES have been made in the last few years to provide greater comfort and convenience for passengers in the design, arrangement and equipment of electric railway cars. Heating, ventilation, lighting, seat design and trucks all have been improved to an encouraging extent in the general move of the industry to attract more patrons. Equipment engineers have made much progress, but are continuing to work on this big problem of the railways. They realize that many more changes in design must be effected to make the service even more attractive, comfortable and convenient to the rider, and more economical for the operator.

When the electric railway properties were first built, they filled a great need and were an indispensable part of the community in which they operated, being practically the only satisfactory means of local transportation. The city car made it possible for people to move out and live in less congested areas. The interurban, with its frequent headway and moderate speed, made it possible for people to go from town to town or farm to town in a short interval of time. In those days they performed a service far superior to any that existed and enjoyed a good patronage.

Many features to increase comfort and convenience are incorporated in the designs of the three Louisville sample cars

Top view—Two rows of dome lights, a reflecting ceiling and wide windows give ample artificial and natural light

In center—Automatic acceleration allows a high rate of starting without disturbing passengers

Bottom view—For the convenience of standees a wide aisle, projecting grab handles on the seats and horizontal stanchions are provided

The general introduction of the automobile, the bus and improved roads, however, brought very keen competition to the electric railway. Street and interurban cars of the old type lost their appeal to the public and many passengers adopted a newer form of transportation. The private automobile set a new and higher standard and the public rapidly showed their preference for vehicles with greater appeal. With these facts in mind the car equipment designers were faced with the problem of developing cars comparable or superior to the private vehicle. Their efforts to solve this problem have resulted in the development of many new cars, several including radical departures, and all showing a vast improvement in appearance and comfort over the older type. In the following paragraphs are listed many of the changes that have been incorporated in car design.

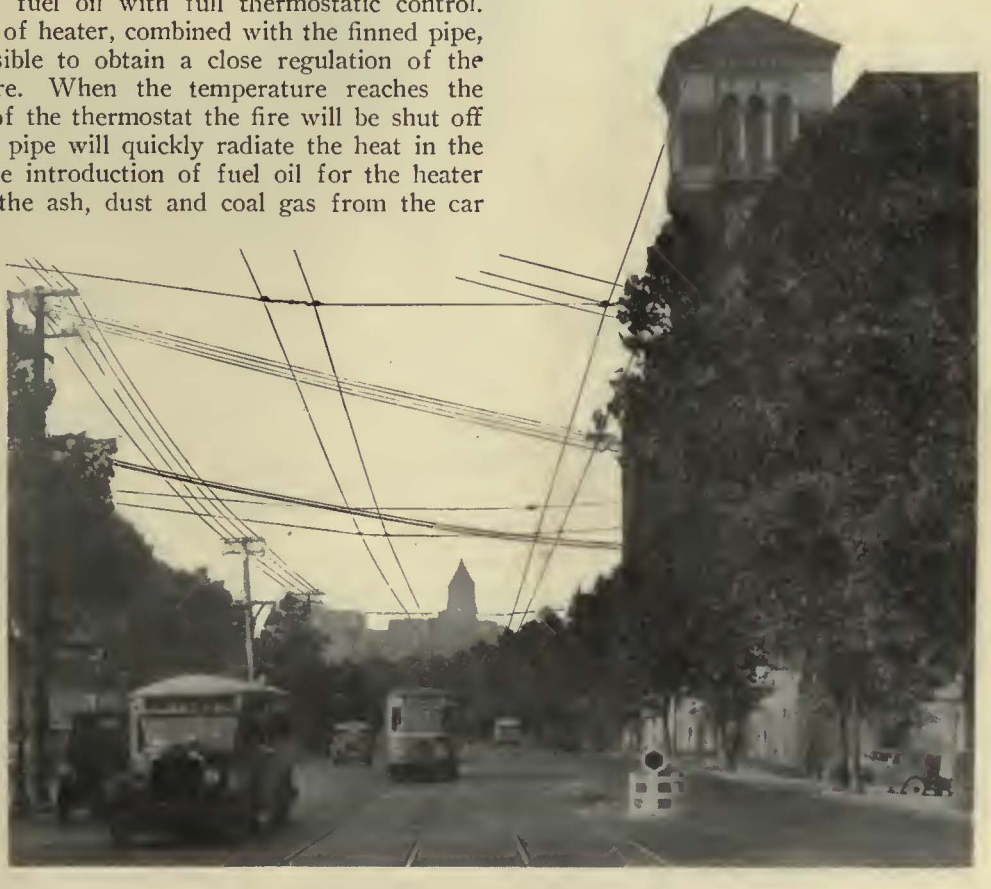
Heating—A new type of electric heater has been developed in which the heating element is entirely inclosed in a protecting steel sheath. This arrangement reduces the possibility of fire and electric flash which may occur when the open type element breaks with current on. A larger number of heaters have been installed on the newer type cars, many with full thermostatic control, thus giving a better distribution of the heat and a uniform regulation.

Many of the older interurban cars are heated with coal burning, hot water heaters with iron radiating

An extensive adoption of leather-upholstered, semi-individual cross seats for heavy city service was made in Chicago's 100 new cars

pipes along the sides of the car. The radiation of the heat has been greatly improved by the recent introduction of finned pipe. This finned pipe consists of ordinary iron pipe or steel tubing to which are attached vertical steel plates, thus greatly increasing the radiating surface. The biggest objection to the hot water type of heating cars has been its difficult regulation. Tests are being conducted at the present time on a hot water heater burning fuel oil with full thermostatic control. With this type of heater, combined with the finned pipe, it will be possible to obtain a close regulation of the car temperature. When the temperature reaches the upper setting of the thermostat the fire will be shut off and the finned pipe will quickly radiate the heat in the hot water. The introduction of fuel oil for the heater will eliminate the ash, dust and coal gas from the car interior and the necessity of having additional men during the winter months to tend the heaters.

Ventilation—The old deck sash type of ventilation has been replaced with automatic exhaust ventilators and in some cases with automatic intake ventilators. Tests are being conducted at the present time with forced ventilation. One system consists of a number of fans installed in ventilators in the roof; another



Many comfort and convenience features are found in the latest cars and buses of the Cincinnati Street Railway

consists of a large exhaust fan mounted under the floor, connected to registers in the floor by means of a duct. With the automatic type of ventilator the amount of air exhausted depends principally upon the speed of the car and the direction and velocity of the wind. With the forced exhaust ventilation the amount of air exhausted is entirely independent of the external atmospheric conditions.

Seats—A great improvement has been made in car seats. The older type of cars were equipped with uncomfortable longitudinal or cross seats, some made of solid wood, others upholstered with carpet or hard rattan. The new cars are equipped with the greatest number of cross seats possible, and the design of these has been changed so that they are much more comfortable. The seats in these newer cars are upholstered with plush, leather or a good grade of imitation leather. The seat spacing also has been increased to allow more room for the knees of the passengers.

Lighting—The older type of cars were equipped with bare light bulbs and no fixtures. Lamps were of insufficient candle power and so few in number that there were only one or two foot candles at the reading plane. The new type cars are equipped with light fixtures, many of the dome type, and a sufficient number of high candle power lamps to give five or six foot candles at the reading plane. Too much emphasis cannot be placed on the necessity of good illumination, as a well illuminated car greatly adds to the convenience of the passenger and to the attractiveness of the car from the outside.

Acceleration—New types of control have been developed, one of which has a larger number of resistance setps and another of which has the feature of automatic acceleration. Both of these give a much smoother acceleration. By eliminating the jerky starting which accompanied the use of older types of controllers, the discomfort to the passengers from this source has been reduced.

Trucks—The design of trucks has been materially changed in an endeavor to improve riding qualities and reliability, and to reduce weight. While the older type trucks had rigid bolsters and stiff elliptic springs, the newer type trucks are equipped with swing bolsters, very flexible elliptic springs and coil springs. Many cars are also equipped with roller journal bearings to improve the riding qualities.

State Capitol of California at Sacramento, situated in a beautifully-landscaped park. The lower view shows the business section of Sacramento, with the State Buildings and grounds at the right

Use of safety devices on the cars has contributed in a large measure to the excellent safety record made in Atlanta

SAFETY DEVICES

Aid Materially in

Reducing Accidents

By

F. L. BUTLER
Vice-President
Georgia Power Company, Atlanta, Ga.

ANY PUBLIC utility company worthy of prospering is possessed of a conscience. It is this conscience which, if the company be a public carrier, recognizes the heavy moral responsibility of operating its cars, or vehicles, with the least possible hazard to the community it serves. This moral obligation is one reason for the increasing attention and study which has been given by electric railways in the past ten years to the reduction of accidents involving the public. An additional incentive to safe operation is the ever-increasing cost per claim to the company.

The often-used expression, "no accident is unavoidable," is probably true, but not from the standpoint of just one of the parties to it. Certainly many of the accidents involving the cars of a street railway are unavoidable as far as the company is concerned. Yet on the other hand, it must be admitted that the railways, even the best of them, have a long way to go before

Foot control and convenient, plainly-marked auxiliary control handles simplify the duties of the motorman and make operation safer

they have done all that they can and should do to eliminate the accidents which, through effort on their part, are avoidable.

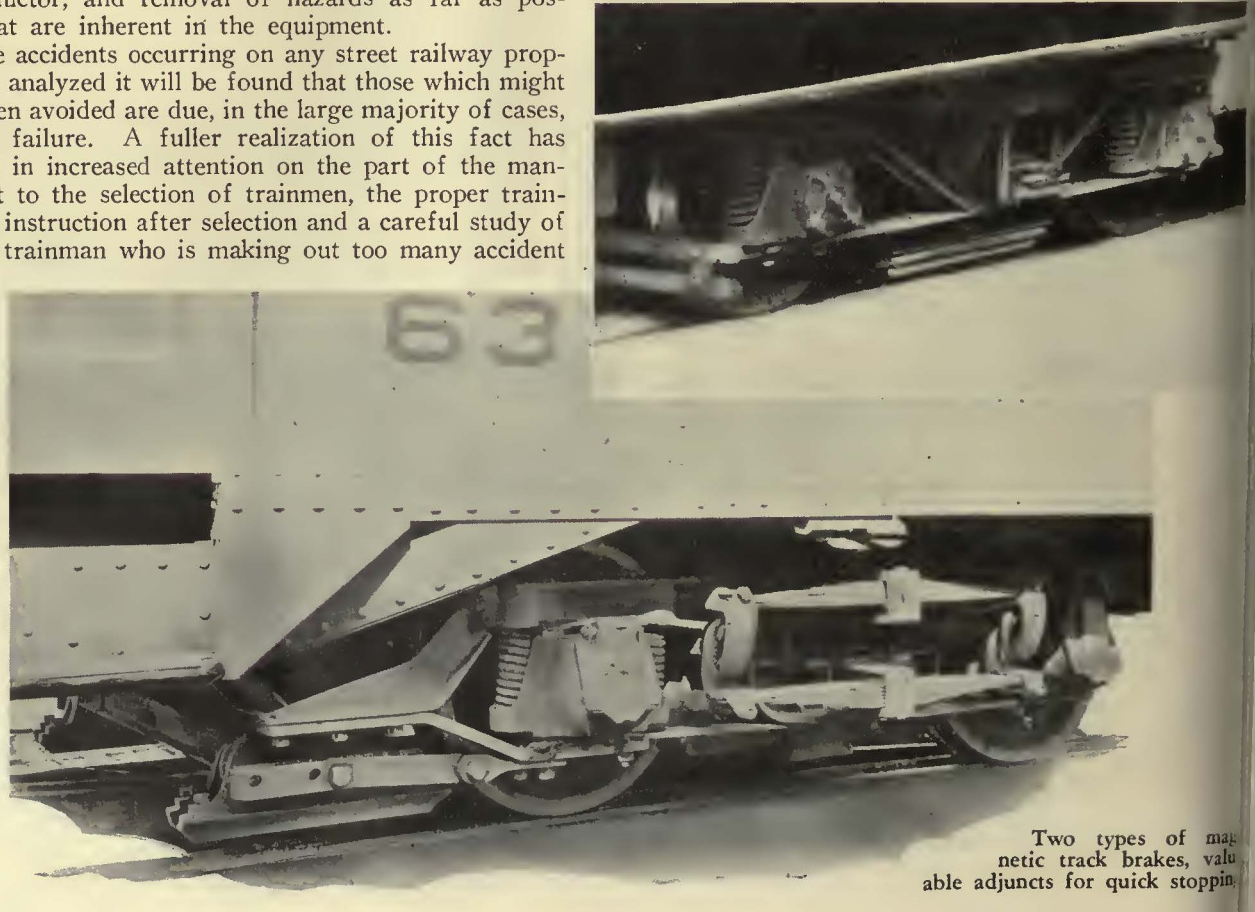
Activities pertaining to accident reduction divide naturally along two lines: reducing the number of cases of man failure on the part of the motorman, operator or conductor, and removal of hazards as far as possible that are inherent in the equipment.

If the accidents occurring on any street railway property are analyzed it will be found that those which might have been avoided are due, in the large majority of cases, to man failure. A fuller realization of this fact has resulted in increased attention on the part of the management to the selection of trainmen, the proper training and instruction after selection and a careful study of the old trainman who is making out too many accident reports. The greatest results can be obtained by upgrading the man who operates the equipment. However, much can be done to reduce those avoidable accidents which are charged to the equipment.

Taking the electric railways of this country as a group, it can be safely said that equipment is being more efficiently maintained than at any time in the history of the industry. This may be partly because of necessity, but it is in the interest of better service, as dependable service is better service. At the same time well maintained equipment is safer equipment and results in fewer accidents.

With the advent of the one-man car many new safety features and devices came into use and improved safety records have resulted. It is fundamental that divided responsibility creates a tendency to let the other fellow do the job with the result that, on cars operated by two men, accident hazards that either might avoid are overlooked by both. The one-man car puts the job directly and solely up to one man, as it should be.

To the public, ignorant of the many safety devices with which it is equipped, the one-man car does not appear as a step toward greater safety. A proper understanding of the equipment in use on the modern one-man car would clear up many misunderstandings on their part in regard to the safety of this type of car. In the industry itself there are also differences of opinion as to the value of various safety devices that have been designed and put on the market to assure the safe operation by one man of a street car through the busy streets of large cities. The question as to whether or not certain equipment should be installed on a car should not be decided from a standpoint of the first cost or maintenance cost. Executives and officials responsible for the operation of cars should realize their responsibility to the community



Two types of magnetic track brakes, valuable adjuncts for quick stopping

and see that every precaution is taken so that the operation of the cars will cause no undue hazard to pedestrians or other users of the streets.

Very often a car can be so burdened with safety apparatus that its operation not only becomes complicated but also the speed of the car is reduced. In an effort to make up lost time the operator may possibly have an accident that would not have occurred if his attention had been on the operation of his car rather than on maintaining his schedule. Simplified control is in itself a measure of safety.

In discussing the devices and methods in use on the modern car only a short outline of their purposes and their advantages and disadvantages will be given.

"Dead Man" Controller—The "dead man" feature of the controller handle which is so arranged that the handle is depressed against a slight upward spring pressure, has been the subject of considerable discussion among operators. Having had some cases, however, when operators have fallen dead at their controller and other cases when they have fainted or otherwise lost consciousness, this feature, in the opinion of the writer, is a very important adjunct to the one-man car. Certainly its use has enabled companies to introduce successfully the one-man car. Of course, the type of accidents it is designed to prevent are rare and may possibly never occur on a small system. However, if an accident should occur from this cause, the result might be so serious as to cause legislation against the use of one-man cars.

Magnetic Brakes—There is no discounting the value of the magnetic track brake, but the cost and the difficulty of application to a great many existing trucks has curtailed the use of this valuable adjunct for quick stopping. Certainly its value is increasing with the higher speeds of the modern car and the increased congestion in city streets. It has the advantage of being the only type of brake that is affected but little by rail conditions. It is not unlikely that this type of brake will receive a great deal of attention in the near future.

Dynamic Braking—The use of dynamic braking is not very extensive at present. Its use requires ample power and often, with larger motors, commutation troubles develop. As a safety factor its value is still questionable since its ability to stop the car is limited by wheel slippage.

Air Brakes—Operation of the conventional air brakes has recently been speeded up by the installation of quick-application and quick-release valves, and more recently by the coming into use of an improved "self-lapping" brake valve, which is designed so that cylinder brake pressure corresponds to brake-handle position. This valve should have a tendency to reduce lost motion in braking, due to the habit of some operators of "fanning" with the brake valve handle.

Passenger safety in boarding and alighting is increased by low step heights, step lights and properly-located stanchions

Mirrors, windshield wipers and wide vestibule windows aid the motorman in avoiding accidents

Window Guards—Window guards detract from the appearance of the outside of the car and also increase the difficulty of window cleaning. Nevertheless, it must be admitted that window guards serve to reduce the number of accidents, unless track centers are unusually wide.

Window Wipers—Certainly no one would drive an automobile these days without an automatic type of window wiper. Certain designs of window wipers for street cars are a great help during storms, and in cities where single-end cars are in use, the use of window wipers should be considered as essential. In cities with double-end equipment, however, it is difficult to keep them on the cars and to keep them in proper operating condition.

Motorman's Mirrors—Motorman's mirrors are located in two positions, one on the inside of the car and the other on the vestibule corner post outside. The purpose of the inside mirror is to enable the operator to see his passengers and also to get a vision of the rear door. To accomplish this purpose to the best advantage, the location of the inside mirror should be such that the reflected beam is over the heads of seated passengers on the right side of the car. If the mirror is located, as in general practice, so that the beam is reflected down the aisle of the car, a few standing passengers can defeat the purpose of the mirror.

The outside mirror is probably more effective in preventing step accidents, but in cities where automobile and truck drivers are not accustomed to projecting accessories it would be a difficult matter to keep them from being destroyed. Also, with loaded aisles or platforms, passengers standing on the platform between the rear end and the front end of the car would seriously interfere with the operator's seeing what is going on at the rear door.

Warning Signals—There is a need for a satisfactory electric gong which, up to this time, has not been developed. At present, the air-operated gong is probably the most used method of warning signal for city service. Eliminating the trouble from air leakage and freezing during the winter months, to which they are more or less

susceptible, they are moderately successful for city use.

Interlocking Door With Brake and Controllers—A number of cars were brought out with rear door interlocking both with the controllers and the air brakes. This combination made it impossible for the operator to start the motors or to release the brakes until the rear door came almost to the closed position. This resulted in longer stops. Some companies have removed both the interlocking features; others have removed the brake interlocking device but have retained the electric interlock between the rear door and the controller. Both features have certain advantages in accident prevention work but evidently the disadvantages have been such as to convince certain operators that their use is not essential. On our property the brake interlocking has been dispensed with. However, the interlocking between the rear door and controller is considered an important feature and is still retained.

Air Compressors—Proper pressure of air in the reservoir is one of the essentials in safe operation. The present type of air compressor has generally proved reliable, but a reduction in weight and the elimination of the commutator end bearing would be desirable.

Variable Load Brakes—While variable load brakes have always had certain advantages, the introduction of the modern light-weight, high-capacity car has increased these advantages so that now we consider them a necessity.

Electro-pneumatic Door and Step Control—On one-man cars where the passengers board at the front and leave at center or rear exit doors, the electro-pneumatic door and step treadle are necessary features. The exit door should be connected with signal lamps in front. Some operators claim that signal lamps are more efficient, because the rear-door mirror distracts the motorman's attention from the front of the car and because they are not absolutely dependable. Similar criticism might be made of signal lamps as they may burn out. Their replacement, however, is simple.

The various requirements in different communities for a safe vehicle make it impracticable to lay down an arbitrary standard for which safety devices should be installed on the ideal car. All operators with the proper understanding of their responsibility to the community will equip their cars with all necessary safety features to meet the requirements on their property and will have their trainmen thoroughly instructed on the proper operation of their equipment. It should be borne in mind that the cost of a serious accident does not stop with the payment of claims, as accidents are given a great deal of newspaper publicity and discourage the use of the service so that the loss in revenue from one serious accident may go on for years. Whenever the problem is squarely met and fairly solved the return in accident prevention and in improved public relations will more than justify the cost of equipping the cars and the cost of an efficient instruction department.

MANY benefits are derived from the use of automatic control. Rapid progress is being made by the Sacramento Northern Railway in converting fifteen of its seventeen manually operated substations to automatic control. When the work is completed there will be a total of nineteen automatic and two manually operated stations having a capacity of 11,100 kw.-hr. In addition to this, the power company furnishes direct current to our lines from five of its substations at various locations. The voltage is more evenly distributed through automatic control, as the machines are governed by the power demand. Extremely satisfactory results thus far have been obtained from twelve stations which have been converted.

J. B. ROWRAY.
General Manager
Sacramento Northern Railway
Sacramento, Cal.

Speeding through a scenic valley near Mount Diablo in Contra Costa County—a three-car train of the Sacramento Northern Railway

By

CARL W. STOCKS
Editor
Bus Transportation

Developments in bus design have made this vehicle suitable for a wide variety of transportation uses

Improving the Bus to INCREASE ITS USEFULNESS

CONTINUED improvement in bus design is having a marked effect on the growth of bus use in connection with local electric railway operations. Bus designs are now available for a wide variety of traffic conditions found in city operation. Almost any seating capacity can be secured. The most popular sizes, however, are those with 21, 29, 33 or 40 seats, with some few operators still utilizing double deckers of even larger capacity.

The growing popularity of the bus is not surprising when the comparatively small investment necessary to furnish service and the ease with which credit can be obtained are considered. Nearly half the investment in an electric railway must be buried in the ground in the shape of tracks and paving, which have little or no value for any other purpose, while adequate bus operation can be furnished for approximately the same investment that would be required for the railway cars alone.

Nothing emphasizes this fact more than the rapid increase in the number of cities where rail and bus services have been closely co-ordinated. In the seven years ended Dec. 31, 1929, the number increased from 177 to 357; and in the first four months of the current year the number of cities has shown a further increase, although complete figures are not available to show the exact number.

During this period, the sphere of the bus has greatly changed. A new conception has arisen as to how buses can be economically used in connection with electric railways and as a co-ordinated part of a local transportation system. At first, buses were looked upon merely as potential feeders to existing rail lines, in order that the railway investment might be preserved without loss to security holders. But the patrons of these feeder routes failed to take kindly to the necessity of transfer from car to bus and it soon became apparent that unless through bus routes were operated into the business centers of the community, the traffic would not support the bus service. The bus service, instead of being profitable as was anticipated, incurred losses that could not be absorbed. Then followed the idea of changing the feeder bus lines to through bus routes, the gradual elimination of poorly patronized trolley lines, and the substitution of suitable capacity buses.

Buses are now being successfully used in a wide variety of ways for handling local traffic. The extreme flexibility of this easy riding, rubber tired transportation unit has demonstrated that it has many advantages both

to the traveling public and to the transportation merchant. Instead of making extensions with track, buses have been used to develop new territory. Many single-track trolley routes have outgrown their usefulness and the bus is now giving better and more frequent service. Except where the volume of traffic to be handled can justify the investment for double-track railway lines, buses usually can perform with better results.

But what are the significant developments in design that have brought about this changed viewpoint toward the motor bus? From a transportation standpoint there is a bus for almost every traffic need and almost any seating capacity can be obtained. The more recent designs have adequate headroom to permit standees being carried without discomfort. For routes with extra heavy traffic or where there is considerable interchange of passengers en route, the body is fitted with a rear exit door. These doors are either manually operated by the driver or are treadle controlled and air operated. Interior illumination is better. Ventilation has been improved, although there is still opportunity for further development. The use of direct exhaust heating is gradually disappearing and in its place has come forced-draft hot air or hot water heating. Nevertheless, the obnoxious smell of burnt gases in the engine exhaust too often permeates the body interior. In cold weather it is especially noticeable with a following wind and in the warm weather it rolls in the open windows when the vehicle stops to pick up or discharge passengers. Even with the tail pipe at the rear this trouble still exists.

Nothwithstanding these defects, the bus is steadily growing more popular as a medium of transportation. It is fast; its acceleration is improving; and the time which is lost due to low acceleration is made up in smooth rapid braking, for the modern bus has a retardation with airbrakes of from 10 to 12 m.p.h.p.s. without excessive discomfort to passengers. This is far greater than is ordinarily obtained on steel rails.

Larger capacity buses are one of the most important recent developments. For routes on which there is heavy passenger interchange, many are equipped with rear-exit doors

From an engineering viewpoint developments in bus design have been extremely rapid. One design has followed another with such rapidity that style and mechanical obsolescence have become factors of considerable importance for the operator. Probably no other use of the gas engine has had to meet such rigorous demands. The same can be said of the clutch and gear set. Notwithstanding this, engines have increased steadily in size and horsepower to meet the demands of the transportation service for which they are intended. In fact, engines and body shell are competing for chassis space, even though wheelbase has grown from 198 to 265 in. In the larger capacity vehicles of conventional type, the engine now protrudes into the passenger compartment. Weight distribution has thus become a factor, not only in steering facility but in tire life. Whether or not six-wheelers will again come to the front is a question that remains unsettled.

Outstanding, perhaps, is the development of the power plant. Starting with four-cylinder engines of less than 300-cu.in. displacement and rated at substantially less than 50 hp., both the displacement and horsepower have been steadily increased. Today the four-cylinder engine has been

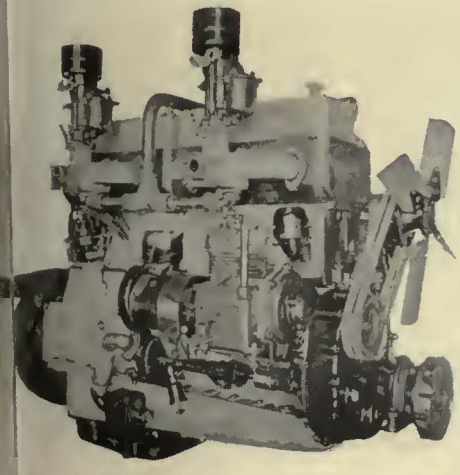
Six-cylinder Diesel bus engine used in experimental work by Public Service Co-ordinated Transport

Recent types of small-capacity buses for city service

almost entirely supplanted by the six in order to meet the demand for better acceleration, faster schedules and smoother running, all of which are deemed necessary to compete with the ever increasing private automobile competition. In one instance a manufacturer has used dual engines. Engines found in the larger buses of conventional type have a displacement of from 450 to 600 and more cubic inches and a rated horsepower of 85 to 150. The rate of acceleration has likewise increased, though not in direct proportion to this greater displacement.

A word should be said with regard to the gas-electric type of drive. This unit has proved itself of value in cities where bus routes are operating in a larger measure through heavy vehicular traffic. In such places, the turn-over in passenger traffic is naturally heavy and often requires from twelve to fifteen stops per mile. Gear shifting under such conditions of operation is a severe strain on the driver and the varying rate of acceleration is annoying to passengers. It is in such service that the gas-electric unit has proved most satisfactory.

Recent designs of bus engines give greatly increased power. This is a six-cylinder 150-hp. type



Much progress has been made in the design of several of the important gas-electric bus units and the excess weight formerly found in chassis of this type has been materially reduced. Satisfaction with these units for city service is best demonstrated by the steadily increasing number of carriers using these vehicles.

Recent experiments conducted by Public Service Co-ordinated Transport, the largest single operator of gas-electric vehicles, with a six-cylinder Diesel bus engine to drive the generator should not go unmentioned. It is understood that other companies are exceedingly interested in this Diesel-electric combination and it is confidently expected that within the next year there will be several other installations in the eastern part of the country.

Next among major improvements comes that of the brakes. The manually operated type of brake has largely been superseded by some form of power brake for two reasons: first, to assure greater safety to passengers and to other highway users; and, second, to relieve the driver of considerable physical effort and resulting fatigue. Fabric linings and two-wheel brakes on the rear axle or a single brake on the propeller shaft have given way to the four-wheel type of power-operated brakes using some form of molded linings. Steel shoes were tried at one time but current practice leans heavily toward molded linings today. The use of these substitutes for fabric linings permits the use of higher braking pressures and consequently produces higher rates of retardation. These changes permit faster and safer operation in traffic lanes that are used by other vehicles fitted with four-wheel brakes and capable of stopping quickly.

So much for the chassis in general. With the continued demand for vehicles of even larger capacity and ability to carry the maximum number of standees, the manufacturers have been beset with the problem of furnishing deeper and heavier frames with more substantial cross members and body outriggers. For this reason, bodies have had to be built more substantially, thus causing unforeseen stresses to be set up between the frame and outriggers due to chassis weaving. The net result has been a battle between the chassis and the body. Instead of the frame holding up the body, the body at times holds up the frame until outriggers become distorted or broken, or the body gives way at its weakest point. It seems that there is yet much to be learned through experience as to body stresses. Whether existing designs

or methods of mounting will be discarded is difficult to say at this time, but it is evident that something needs to be done that will permit the chassis to become the load-carrying unit under any and all road conditions. One manufacturer has developed a four-point system of attaching the body to the chassis frame in an effort to eliminate transferring the body stresses, due to weave, to the frame.

Notwithstanding that over-all weights are greater on a passenger-capacity or seat basis, much progress has been made toward more effective utilization of weight-saving materials. A great deal yet remains to be done, of course, and if fuel consumption is to be reduced, one way is through greater use of light-weight alloys for strength supporting members of both chassis and body. Analysis of weights on the basis of pounds per cubic inch of engine displacement also indicates that marked progress has been made.

In refinements and redesigning of unit parts to give longer service without increased attention many advances have been made. Bus engines now reflect the last word in power and performance. The sleeve-valve engine still holds its popularity for heavy-duty city service. For use in connection with electric motor driven units, the overhead-valve type engine is being more extensively used. Noiseless and more effective tappet features have been included in the valve mechanism of this type engine by one manufacturer. Other features of the modern engine are the use of steel-backed bearings for the crankshaft or the so-called chocolate bearing, both of which are intended to produce longer life and consequent lower maintenance costs. Alloy pistons, forced feed to all wearing parts, such as pins and rod bearings, oil filters and counterflow oil circulating systems, all are playing their part in reducing engine maintenance.

Nevertheless, as the engines have increased in size not all of the increased power has become available for direct propulsion purposes. Larger engines naturally require more power for auxiliaries. Fans are larger and their operation takes a proportionately greater amount of engine output. Water pumps and oil pumps are also of larger capacity. The same is true of lighting generators and air compressors. These all demand more power. Hence all the gain in effective horsepower can not be said to go to the driving wheels. Some of these power demands have been lowered through closer study of the operating characteristics of the auxiliary units. Oil cooling is another feature recently considered, but this practice is far from being universal in the design of all types of engines.

As has been noted, real progress has been accomplished in engine design. Speeds have been decreased for the maximum torque with the result that the lineal piston speeds have been held within reasonable lubricating bounds. Compression ratios have also been stepped up to permit the use of low grade fuels without too much loss in power.

Tire developments can not be overlooked. The progress made by the tire manufacturers in selling service by the mile has produced one bright spot in the expense accounts. Tire construction has been materially improved through the use of a greater number of plies and the mileage secured from these tires is far more than at any time heretofore. The development of the heavy-duty balloon type to meet the increased weights of buses and their greater passenger capacities has increased the comfort of bus riding. What was once considered a rough road has thus been smoothed out if proper air pressures are maintained in the tires. High-pressure tires are now almost unknown, except on the older types of buses, and tire costs under the mileage contract system have materially decreased within the past few years. The rate of 1.5 cents has decreased to 1 cent or less, even with service, a figure that is difficult to meet where tires are purchased outright and maintained by the carrier.

Success in bus operation is not accidental. It can be secured only by selection of the proper type and capacity vehicle, backed up by an adequate inspection and maintenance plan to give dependable and reliable schedules. Because no two systems are alike, because road conditions between different systems are not uniform, because traffic conditions vary, and because driver training is different on each property, there can never be a standard inspection and maintenance plan. True, the methods followed can be similar but the period between inspections and their thoroughness, whether based on vehicle-miles operated, on engine revolutions, on kilowatt-hours generated, or gasoline consumption, or any other unit, must be worked out independently for each separate operating system. Every property must of necessity experiment with inspection periods of varying duration until the one best suited for the property in particular is developed.

What the future will develop in the way of further requirements in design is difficult to foresee. It is evident, however, that closer attention has soon to be paid to decreasing the weights of chassis, body shell and accessories. One way can be through greater use of lightweight alloy metals; another through simplification of accessories and the elimination of devices and attachments that are not essential to passenger convenience. Close study of the weight problem is but one of the factors involved in profitable operation at the rates of fare now current in most cities. With operating costs varying directly with the number of vehicles required for peak load conditions, it is essential that proper selection of the vehicle be made and that rush hour vehicles be of larger capacity. In order that this may be done effectively, a careful analysis of route and vehicle costs must be made periodically. With operations properly conducted there is no reason to doubt the important part that bus operation will play in the future of local transportation.

The latest type cars of the Boston-Cambridge subway accelerate and decelerate at approximately 1.75 m.p.h.p.s. and have a free-running speed of 40 m.p.h.

Answering a

GROWING NEED *for*

Adequate Rapid Transit

By

EDWARD DANA

General Manager

Boston Elevated Railway, Boston, Mass.

AMID all of the confusion regarding the future methods of handling mass transportation in cities there is one conviction that stands out prominently. It is that the backbone of the transportation system in very large cities is bound to be rapid transit. The very conditions which are making surface transportation more and more difficult are correspondingly making rapid transit more and more necessary.

In testimony given last summer before the ways and means committee of the Massachusetts Legislature, I summed up the situation regarding rapid transit somewhat as follows:

"The need for adequate rapid transit has been accentuated in recent years by the increase in private motor-vehicle transportation. This type of transportation is most extravagant in the use of street space and has led to a condition of delay and waste time. Individual transportation by automobile will probably increase, but it should go hand in hand with adequate mass transportation facilities if the city is to prosper. The situation is illustrated by the following table, showing the relative capacities for delivering passengers for a maximum one hour in one direction:

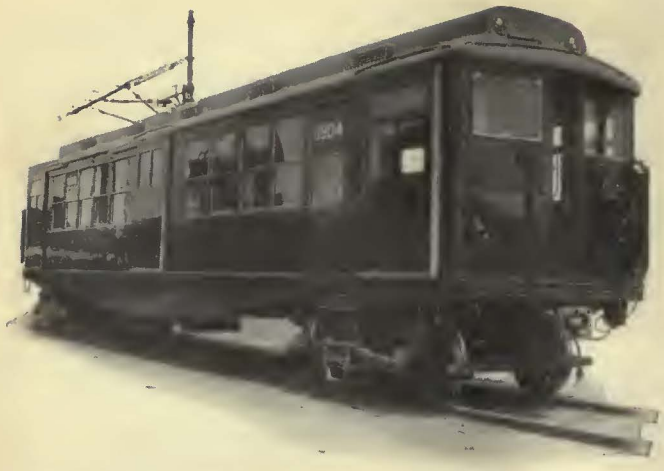
Automobiles can transport (100-ft. streets, three lanes)	4,100
Buses can carry (maximum performance record on Fifth Avenue, New York)	7,300
Street cars	13,500
Two-track rapid transit	60,000
Express and local-track rapid transit	115,000"

In a few cities in the United States there are now sections where surface transportation is already out of the question. If skyscrapers continue in favor and automobiles are allowed freedom of the streets, in every very large city there will have to be rapid transit in the congested sections. This will extend as far out as economically possible, connecting with surface car lines and bus routes at the edge of the rapid transit district.

The doors on the new Cambridge cars are mounted on the outside rather than inside, and are electrically operated. The vertical white bands are the rubber door cushions

It is to be expected, of course, that there may be a reaction against excessive centralization of business. But this will not reduce the demand for rapid transit, because the new centers which must necessarily be developed will need rapid transportation connections.

Rapid transit is one phase of the solution of



Type of steel elevated car which has replaced a large number of wooden cars in Boston. It is equipped with one motor truck and has a running speed of 36 m.p.h.

the mass transportation problem about which it is impossible to generalize very much. Only the fundamental principles are applicable in all communities where rapid transit is feasible. Every large city has its individual characteristics which affect its rapid transit requirements and possibilities. In metropolitan Boston, for example, where the streets are narrow, crooked and hilly in the downtown section, the topography of the main business district is such that the effects of street congestion were early felt. Traffic flows, as it has for 300 years, from all directions into and out of the small peninsula which is historic and commercial Boston. Two-thirds of all the people entering this section use the "L." As I have stated before, Elevated transportation is the very life-blood upon which the industries and retail business of Boston depend.

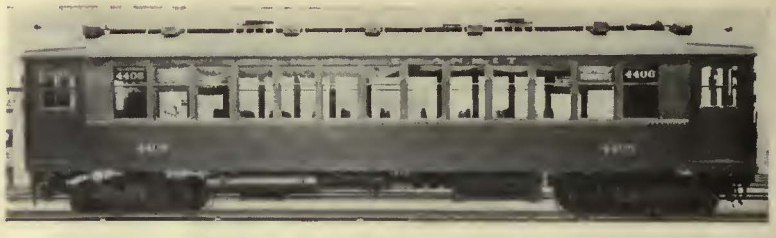
Rapid transit in general, as illustrated in Boston, is undertaken primarily to save time for patrons. It is safe to say that the saving over even favorable surface line transportation is 50 per cent. Time saving in rapid transit results from obvious advantages, principally freedom from traffic interference, reasonably economical spacing of stops, and ability to use the types of rolling stock best adapted for speed.

On the rapid transit lines of the Boston Elevated System the demand for speed is met to this extent: over the 8.5 miles of main-line elevated route the running time is 30 minutes; the 4.1 miles route between Dudley Street and North Station (via Atlantic Avenue) is covered in 15 minutes; between Harvard Square and Ashmont (9 miles) the time is 25 minutes. The rush-hour headway on the main-line elevated and between Cambridge and Ashmont is two minutes, with a normal-hour headway of four minutes on the former line and 2½ minutes on the latter.

How the Running Time Is Kept Down

Speed of operation, aside from duration of stops, depends on running speed, rate of acceleration and rate of braking. Efforts of engineers are constantly being directed to increasing these quantities without exceeding cost limitations (first cost and maintenance) and without making riding uncomfortable for passengers.

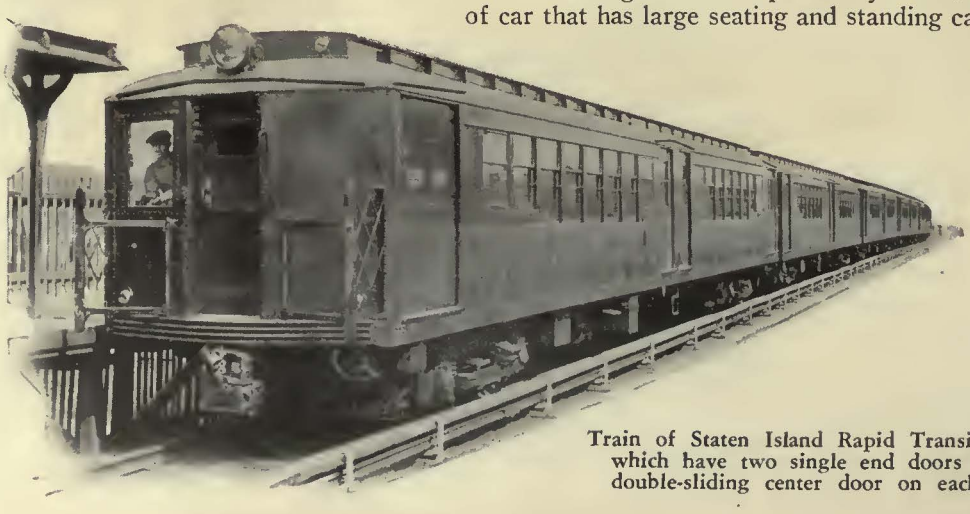
In Boston we are using an accelerating rate of 1.75 m.p.h.p.s. in the Cambridge subway and East Boston tunnel with unloaded cars, and 1.5 with cars carrying seated load. The braking rate is 1.75 m.p.h.p.s. The elevated cars accelerate at 1.5 m.p.h.p.s., light, and at 1.3 m.p.h.p.s. with seated load. The braking rate is from 1.5 to 1.75 m.p.h.p.s. The free-running speed is 36 m.p.h. in the Cambridge subway and 40 m.p.h. on the same route in the open. The speed in the East Boston tunnel is 30.5 m.p.h. and that on the elevated is 36 m.p.h. These rates have proved adequate, but research is constantly in progress looking to possible improvement. We feel that quick pick-up and stopping are just as good sales points for mass transportation as they are for the automobile.



Recent type of Chicago Rapid Transit elevated car, using cross seats, an unusual practice for heavy service

The Rapid Transit Car Is the Crux of the Problem

While rapid transit has many other valuable features, an outstanding one is the possibility of designing a type of car that has large seating and standing capacity, high-



Train of Staten Island Rapid Transit cars which have two single end doors and a double-sliding center door on each side

speed characteristics, quick pick-up and braking, etc. It will be of interest to consider some of the elements of modern rapid transit car design.

Of course, cars should be designed to present as pleasing an appearance as possible, although this feature may be complicated by some limiting condition in connection with window openings, letter boards or other governing considerations. During the past few years, street cars have been greatly improved in appearance. With rapid transit cars, however, there is not the same opportunity to vary the design aside, possibly, from the arrangement of doors, windows and roofs. Limiting conditions of tunnels usually definitely fix the car dimensions.

Steel cars for the Frankford Elevated in Philadelphia, using three doors on a side, each centered in its respective third of the car

The most practical arrangement of rapid transit car doors is one wherein the distance a passenger must walk, lengthwise of the car from the door opening to a point midway between the doors is the shortest possible and is equal throughout the length of car. This is accomplished by providing three doors in the side of the car. one at the center and two at points two-thirds the distance from the transverse center to the end of the car. With this arrangement a more uniformly distributed standing-passenger load is obtained. This, in turn, means a larger capacity than will result if the doors are arranged one at the center and one at each end of the car.

In the latter case the load is localized about the doors, with considerable available space in the area midway between them. This is true particularly in cars having longitudinal seats with a large standing area the full length of the car. Where a combination of cross and longitudinal seats is used, the condition is, perhaps, somewhat different. But even in this case, if the longitudinal seats are placed adjacent to the doors and the doors are located as in the first instance, the maximum standing load is obtained.

From the standpoint of handling the greatest number of passengers per unit, the longitudinal seating arrangement is superior to others. In the time required for loading and unloading of passengers, there also is a decided advantage in longitudinal seats in combination with the first door arrangement mentioned. The distance which it is necessary to travel to reach the door is shorter and there is freer movement of passengers due to the wide space between seats.

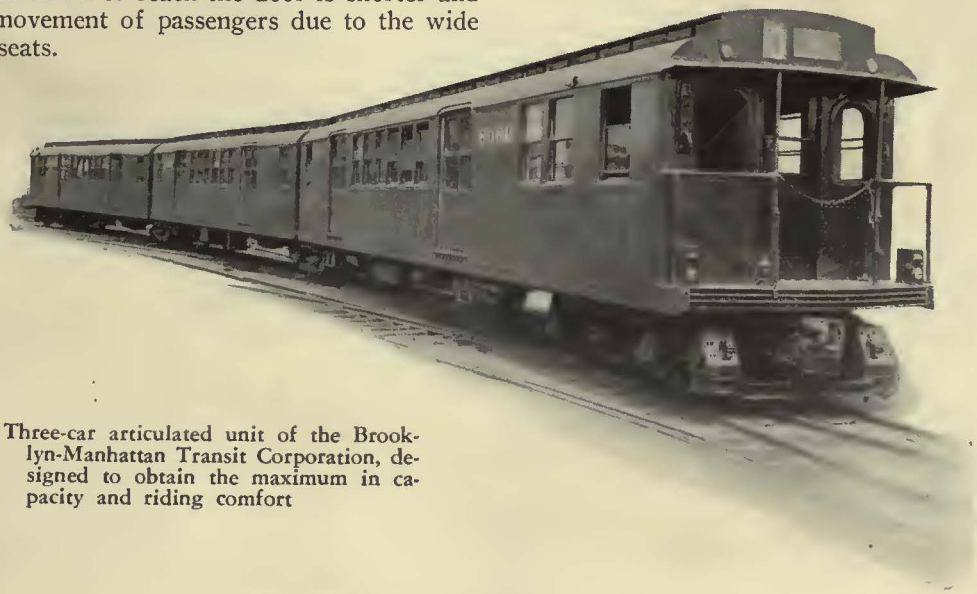
In rapid transit cars, floors of non-slip material should be provided, and door thresholds or other metal parts should be of such a design as to reduce to a minimum the possibility of passengers tripping or slipping. Sufficient stanchions, hand holds or grab handles should be provided to permit a passenger to support himself properly while the car is in motion.

On the question of seats, experts differ as to whether there is an advantage in providing soft upholstered seat cushions and backs, or whether some other seating material is better. In this matter I believe that for city rapid transit service, where the length of ride is comparatively short, leather upholstery is not desirable. Cushions and backs of wood slats, if of the proper contour, are perfectly comfortable and are preferable to leather from the standpoints of sanitation, durability and maintenance.

Provisions For Passenger Safety

It is the duty of everyone connected with car design to take all possible precautions against accidents to passengers and to operating men, including the shop men who maintain the equipment in first-class operating condition. To this end, doors should be provided with collapsible or rubber door bumpers which will permit a person to withdraw his arm or foot, in case he is caught in a closing door. Electric switches or apparatus of any kind which are involved in the operation of the car should be so located that passengers will not have access to them.

The question of weight of equipment is one which should receive careful consideration in the construction



Three-car articulated unit of the Brooklyn-Manhattan Transit Corporation, designed to obtain the maximum in capacity and riding comfort

of rapid transit cars. On the basis of a given operating cost per pound per year, it is obvious that the light car is more economical in operation than the heavy car. In addition to the saving in operating cost, there is a saving in first cost in body, trucks and motors. Weight, however, should not be reduced to the point of sacrificing the necessary strength for proper protection against collisions or other accidents. A substantial saving in weight can be effected in the design of any car without sacrificing strength by paying strict attention to the detail and design of small parts where the question of strength is not of great importance.

Boston's Latest Subway Car

In determining details of the present standard car for the Cambridge subway, of which 60 were recently commissioned, the considerations mentioned above governed the selection. The specifications have been published so that I need mention only the doors, which are in number three on a side and located as recommended above.

The doors on these cars are of wood, aluminum-covered, arranged to slide on the exterior of body and actuated by electric door operators. The result is light weight, and low original and maintenance cost. Moreover there are no door pockets, and no accumulation of snow experienced in the older type with pockets. The inside width of the car is greater than with inside-hung doors, and the unavoidable waste of compressed air with air-actuated door engines is eliminated, as well as the trouble experienced from freezing and slow door movement in cold weather. As compared with steel doors, these doors are approximately 640 lb. lighter per car.

The electric door operators are located under the seats, with a shaft extending through the side of car. To this is attached a lever for actuating the door. Operators are controlled from push-button groups at the end of the car, as on the earlier cars equipped with air operators. The end doors slide in pockets, but they are outside the gates, and weather stripping is provided to prevent snow from driving into pockets.

A Necessary Form of Mass Transportation

From my outline of the rapid transit problem, there is no doubt as to my belief in and enthusiasm for this form of mass transportation where feasible. Transportation patrons and prospective patrons want to save time. If convinced that they can do this they will limit the use of their automobiles to non-competitive service. Unnecessary time spent in going to and from business is just so much added to the day's work. It is particularly of the worker that I am thinking in this connection. He is usually compelled to travel in the rush hour when travel is at its worst as far as comfort is concerned. The less the duration of his homeward or workward ride, the less it fatigues him. Travel time saved for the patron is leisure time increased. Thus there is a sociological as well as an economic aspect to rapid transit.

The effect of rapid transit upon general living conditions has often been stressed. It cannot be over-emphasized. Rapid transit enables the worker to live at a reasonable distance from his work and under conditions of his own choosing. From the operating standpoint the high speed and the ability to use car and train units of large capacity offsets, under proper conditions, a large part of the increased capital investment involved in rapid transit. Thus densely settled urban communities of large population can have, and should have, rapid transit.

Above, aerial view of Fresno, agricultural and industrial city of the San Joaquin Valley, served by the Fresno Traction Company. At left, a waterfall in Kings River Canyon, a scenic spot near Fresno. At right, Fin Dome, a beautiful white granite mountain, on Rae Lake in the King River country

Portland, with majestic Mount Hood in the distance, an important trading center for a large area

Fifth Street, in the heart of Portland's retail district

IN order of their importance, successful commutation service must include (1) trains on time, and (2) adequate lighting and heating. The maintenance of train schedules is extremely important to the commuter who must be at his place of employment or business at a definite time each day. Because he uses his time on the train for reading his newspaper or magazine, the commuter must be provided with adequate illumination. Similarly, because he spends time on trains when otherwise he would be in his home, good heating and ventilation, comparable to that in his home, must be provided.

EDWARD H. MAGGARD

President and General Manager
Northwestern Pacific Railroad
San Francisco, Cal

Shelters at Kentfield, along the route of the Northwestern Pacific Railroad

Attractive architecture adopted for the passenger stations of the Northwestern Pacific Railroad

The "Wally Briggs' Swimming Hole" at Electric Park, where the main power plant of the Grays Harbor Railway & Light Company is located. The pool was established by the company's late general manager.

Pine automatic substation of the Northwestern Pacific

Seattle, metropolis of the Pacific Northwest and a seaport with an immense volume of commerce

Typical stretch of Oregon Electric Railway track through the Willamette Valley between Portland and Eugene

Train of the Oregon Electric Railway, carrying an observation parlor car

Underwood & Underwood Photo

In the business center of Tacoma where the leading industry is the manufacture of lumber

An extensive bus system is operated by the North Coast Transportation Company, subsidiary of the Puget Sound Power & Light Company

A bit of old Vancouver—Cordova Street

Vancouver Hotel, in the commercial center of British Columbia

Modern cars of the British Columbia Electric Railway on Hastings Street, East, Vancouver

Below — Empress Hotel and part of Inner Harbor in Victoria, also served by the British Columbia Electric Railway. Olympic Mountains in the background

Below—The Provincial Parliament buildings at Victoria are among the most stately governmental edifices in North America

Fig. 1—Locomotive of the Pacific Electric Railway, designed to handle heavy trains of steam road cars

Recent Freight Equipment Trend

MORE PROFITABL

By

DAVID R. THOMAS

President Electric Railways Freight Company
Cleveland, Ohio

ELECTRIC railways engaged in the transportation of freight have changed their concept of this business and their methods of handling shipments very fundamentally in the past few years. A steady decline of passenger revenue and a new but powerful competitor, the motor truck, have caused them to take every progressive step possible to attract an increasing amount of profitable freight revenue. Definite policies, adopted for this purpose, are clearly indicated by the types of equipment placed in the freight service of the interurban railways during the past year. They show pronounced trends, on the part of these common carriers, toward:

1. Maintaining faster freight train schedules and using cars of greater capacity.
2. Providing facilities for handling steam road cars on electric railway lines and for moving electric railway freight cars over terminal tracks of steam roads.
3. Rendering pick-up and delivery, door-to-door service.
4. Affording container service.
5. Operating truck lines as feeders to rail lines.
6. Paralleling rail lines with truck lines to meet the competition of competing truck lines.
7. Using mechanical equipment for handling freight at terminals and instituting more efficient warehouse and loading methods.
8. Providing automatic accounting machines with which to reduce accounting expense and provide more comprehensive statistical information.

The accompanying illustrations indicate clearly the complete and comprehensive freight service that is the ultimate goal of the electric railways. Fig. 2, for example, shows the trend in equipment toward faster, better-appearing freight motor cars. Greater capacity, too, is being attained in both motor cars and trailers.

The effort on the part of interurban lines, as distinguished from electrified steam lines, to develop connections with steam roads is also evident. Interurban lines cannot handle steam road cars through city streets but they are endeavoring to utilize sections of their systems located on private rights-of-way for this purpose. Several roads have tentative plans to build around a number of the smaller cities to permit a more extensive use of M.C.B. equipment. During the past year, too, arrangements have been worked out whereby steam lines may

handle interurban freight motor and box cars through steam road terminal yards. Only slight modifications in the construction of interurban cars were required to permit this operation.

In Figs. 4-8 are shown the different types of truck and trailer units used in electric railway pick-up and delivery service. The 1-ton tractor and 14-ft. semi-trailer, Fig. 4, is an extremely flexible unit and, with the second trailer to be left at the customer's premises while unloading the first at the freight terminal, is capable of picking up and delivering a surprisingly large amount of freight. The units shown, under favorable conditions, handle from 40,000 to 50,000 lb. of freight per day. The 2½-ton tractor and 20-ft. semi-trailer, Fig. 6, is the type of equipment used for large shipments by the Elway Transit Company, a forwarding company in Cleveland.

The truck carrying a Fitch container, Fig. 7, illustrates the flexibility of this container system. Note the similarity between this unit and any closed-body truck. The container may be carried on a highway trailer as well as upon a truck and is transferable to a railway flat car.

For the most efficient pick-up and delivery service in the larger cities the equipment required may be roughly grouped into three classes:

1. One-ton tractors, each with two 14-ft. semi-trailers for light work.

2. Two-ton trucks for serving customers so located as to necessitate driving through narrow alleys and for using congested dock facilities. Half of the trucks should be equipped with closed bodies, the other half with stake bodies.

3. Two-ton tractors, each with two 18-ft. semi-trailers; one with stake body, the other with closed body. It will be found that the manufacturers of certain commodities insist upon their merchandise being handled in waterproof vehicles. It is difficult to maneuver trailers that are longer than 18 ft. in many localities.

Fig. 2—Latest design of freight car, with a capacity of 80,000 lb., placed in service by the Cincinnati & Lake Erie Railroad. It is equipped with four 100-hp. motors and is capable of hauling twelve electric railway box car trailers at a speed of 45 m.p.h.

For service in outlying districts the use of two trailers in train drawn by one tractor is found to be most efficient; the second trailer is converted into a four-wheel trailer by means of a dolly. This same equipment is used in handling tonnage between off-line substations and the rail head.

It is becoming more and more evident that freight service from the door of the shipper to the door of the consignee is to become the general policy of the electric railways. This policy is manifested in varying degrees throughout the country. In Western Ohio and Indiana the railways have gone only so far as to absorb from 3 to 5 cents of the shipper's or consignee's cartage cost on shipments conforming to certain specified minimum weights, and commodity classifications. The shippers and consignees provide the cartage equipment.

In Southern California the Pacific Electric Railway has provided for a complete pick-up and delivery service through the incorporation of the Pacific Electric Motor Transport Company. This company was organized for the purpose of carrying on the business of transporting freight, express and other commodities and of conducting a general receiving, forwarding and warehouse business. The rates of the transport company will cover the complete door-to-door service, or service from the shipper's door to destination rail terminal, or from originating rail terminal to door of the consignee. In the Pacific Electric Railway territory, shipments will be

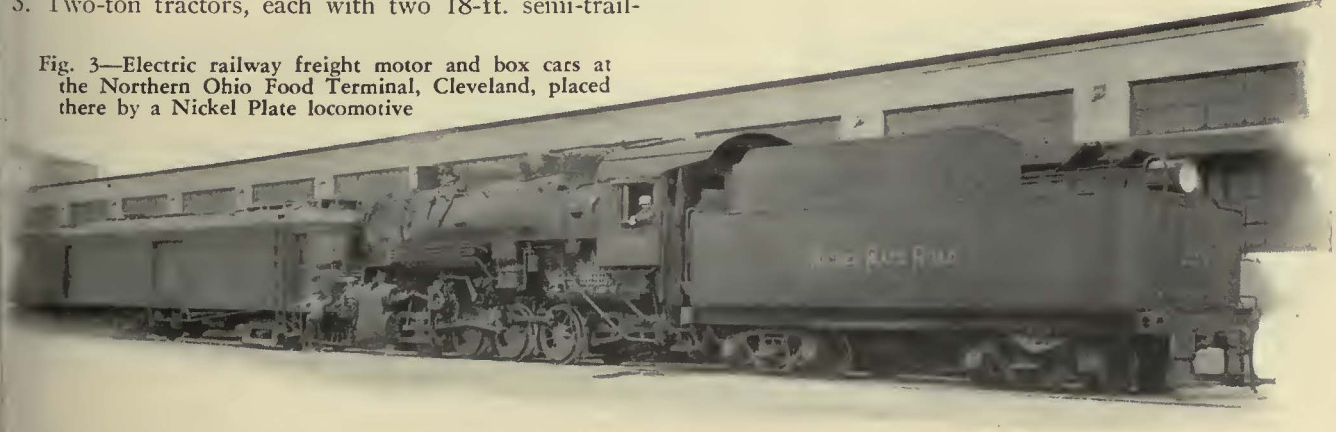


Fig. 3—Electric railway freight motor and box cars at the Northern Ohio Food Terminal, Cleveland, placed there by a Nickel Plate locomotive

Fig. 4 (at right)—One-ton tractor and 14-ft. semi-trailer of the Electric Railways Freight Company for pick-up and delivery service

Fig. 5 (below)—Tractor, semi-trailer and four-wheel trailer equipment of the Northern Ohio Power & Light Company. The truck with container body is used for both highway and pick-up and delivery service

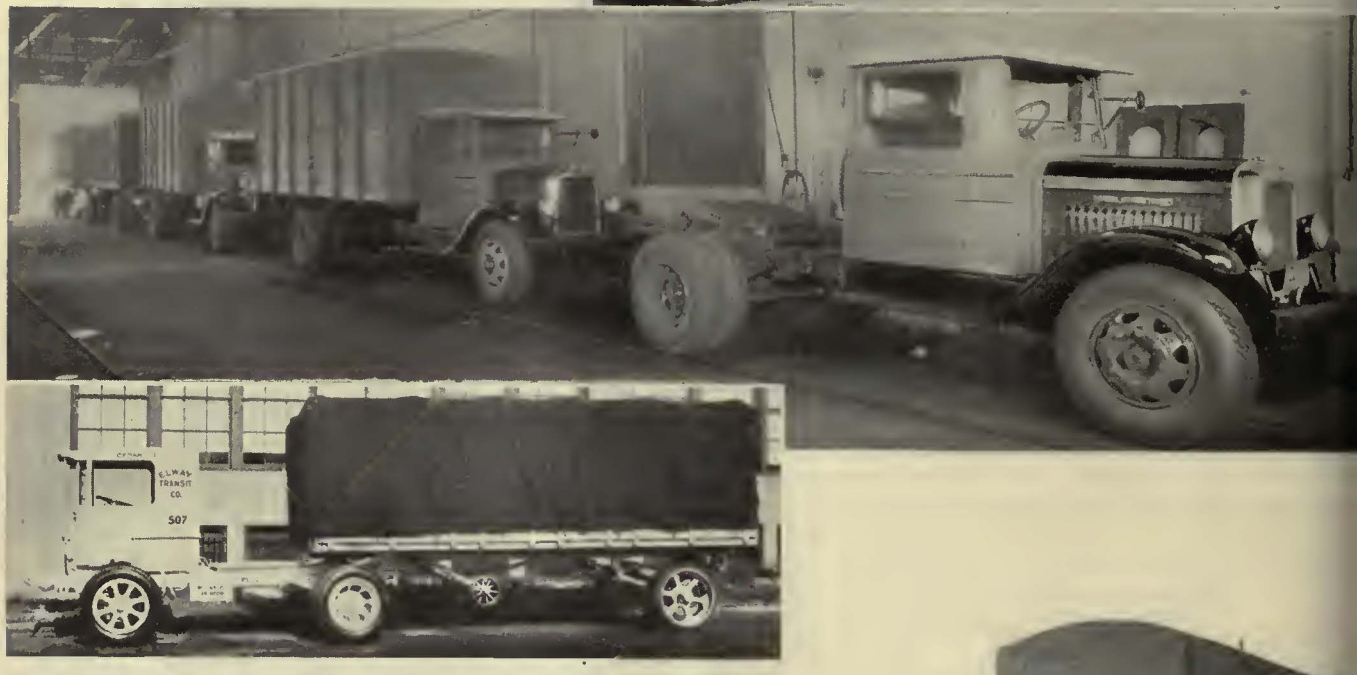


Fig. 6—Two and one-half ton tractor and 20-ft. semi-trailer used in pick-up and delivery service of the Elway Transit Company, a forwarding company in Cleveland

handled over the rail lines, the trucks performing the terminal cartage service only. The transport company's door-to-door rate, in general, exceeds the terminal-to-terminal rail rate but no fixed charge is specifically added to the rail rate to defray pick-up and delivery costs.

In the Detroit district, the Eastern Michigan Railways controls and operates a local cartage company, but does not perform a free pick-up and delivery service. For points in eastern, northern and central Ohio, the Electric Railways Freight Company provides free pick-up and delivery service for single shipments of first, second and third-class commodities weighing 6,000 lb. or more, and on fourth-class commodities weighing 10,000 lb. or more. The carload forwarding companies utilizing the electric lines in Ohio and eastern Michigan afford a form of pick-up and delivery service with lower mini-

Fig. 7—Fitch container mounted on truck for pick-up and delivery. It also may be carried on a railway flat car

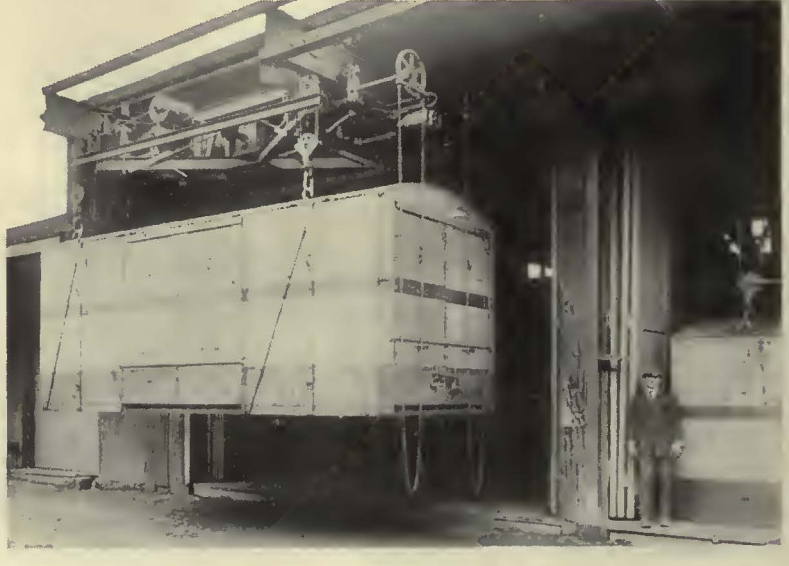


Fig. 8—Method of handling a Fitch container with an overhead crane

mums than those just described.

Pick-up and delivery service introduces a new element of expense to the railway that must be offset by increased revenue derived from additional business, by more efficient handling methods, or by making a charge for the additional service rendered. Comparatively

Fig. 9—Using an electric - lift truck to handle L.C.L. Corporation containers

Fig. 10—Trailer of Bonner Railwagon system mounted on railway flat car

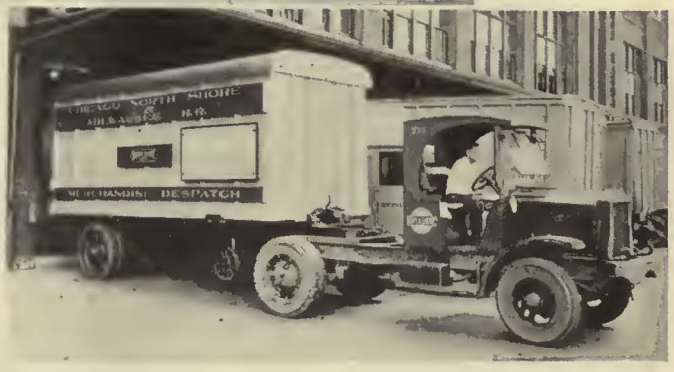


Fig. 11—Type of semi-trailer used by the Chicago, North Shore & Milwaukee Railroad

large shipments moving from one consignor to one consignee, or to several consignees at one destination, and shipments that, if not rehandled at terminals, can be shipped uncrated or unwrapped, are particularly adapted to motor-truck-trailer transportation. The use of containers eliminates 90 per cent of the terminal cost and from 50 to 60 per cent of the pick-up and delivery expense. The container also is, in a measure, a substitute for the steam road side-track, and makes available to the electric railways certain classes of steam road carload business that is not now obtainable because of the handling cost at electric railway terminals.

Figs. 8-11 show the trend of container design. It will be noted that the containers may be divided into two general groups: first, the demountable box type, illustrated in Figs. 8 and 9; and second, the highway trailer type, Figs. 10 and 11.

The box or container of the highway trailer type is in fact a highway semi-trailer that is carried, with wheels intact, upon the railway flat cars. In the Bonner type, Fig. 10, the floor of the container rests upon the platform of the flat car with the wheels suspended on either side of the flat car, below the level of the car platform. The journals of the flat car are placed inside of the car wheels instead of outside, the wheels of the trailer-container occupying the space customarily occupied by the rail car journal boxes, thus maintaining the over-all width of the standard interurban cars. In the case of the units used by the Chicago, North Shore & Milwaukee Railroad, Fig. 11, the trailer-container rides on top of the railway flat car, the wheels of the container resting on the car platform.

In both types described, three trailer-containers, each approximately 18 ft. long, may be carried on one railway flat car. The carrying capacity of each container is 20,000 lb. which permits a pay carload of 60,000 lb.

Several types of demountable containers are now available to the electric railways. The several methods of transferring them from truck to railway car and vice versa include the hoist, electric-lift truck and roll-off. It will be noted that the Fitch container, Fig. 8, is approximately twice the length of the other types of box containers shown. It is 18 ft. long and corresponds to the closed body of a highway truck, the bodies of the containers used by the North Shore, and those of the Bonner system. Three of these containers can be carried on a railway flat car, returning a very favorable per car-mile revenue at a comparatively low container rate. The

Fig. 12—Thirty-five foot semi-trailer unit of the Southern Michigan Transportation Company, used for hauling light and bulky freight

Fig. 13—Railway truck line transfer station of the Lake Shore Electric Railway, Toledo, with a "spot" capacity of four cars

18-ft. container is particularly adapted to meet the competition of the motor freight companies and is an excellent unit to use in connection with feeder truck lines. As a pick-up and delivery unit, the 18-ft. demountable container offers the means of meeting the competition of the side-track facilities of the steam roads.

Several types of highway equipment are now used by the electric railway freight truck lines. Power units usually consist of $2\frac{1}{2}$ to $3\frac{1}{2}$-ton tractors weighing approximately 7,000 lb. and capable of handling two trailers in train. The trailers are 20 ft. long and either of the stake or closed-body type; the second trailer in the train is either a four-wheel unit or a semi-trailer converted into a four-wheeler by means of a dolly. The trailers weigh from 7,000 to 7,800 lb. and have a rated carrying capacity of 7 tons but are capable of carrying from 10 to 12 tons. Fig. 12 illustrates a 35-ft. semi-trailer designed to handle bulky freight such as furniture. Several of these units are in the service of the Southern Michigan Transportation Company, Jackson, Mich.

Fig. 13 shows the Glendale rail-truck transfer terminal of the Lake Shore Electric Railway, located at the eastern city limits of Toledo, Ohio. This transfer has a "spot" capacity of four railway cars and has done much to eliminate congestion at the Toledo freight terminal. Cars loaded and unloaded at this terminal do not pass over the streets of the city.

Fig. 14 — Elwell-Parker electric lift truck depositing skid in freight car

During the past twelve months, a number of electric railways have either acquired truck lines or have entered into traffic arrangements with separately owned motor freight companies. In several instances, too, electric railways have abandoned rail operations and are serving the territory with motor trucks. The Eastern Michigan System, with truck lines radiating out of Detroit, is an example of an organization that is operating motor trucks as feeders to their rail lines, as developers of new territory not served by electric railways, as substitutes for rail lines that have been discontinued and as supplements to existing rail service. The Southern Michigan Transportation Company is giving freight service by motor truck, having abandoned all of its interurban lines.

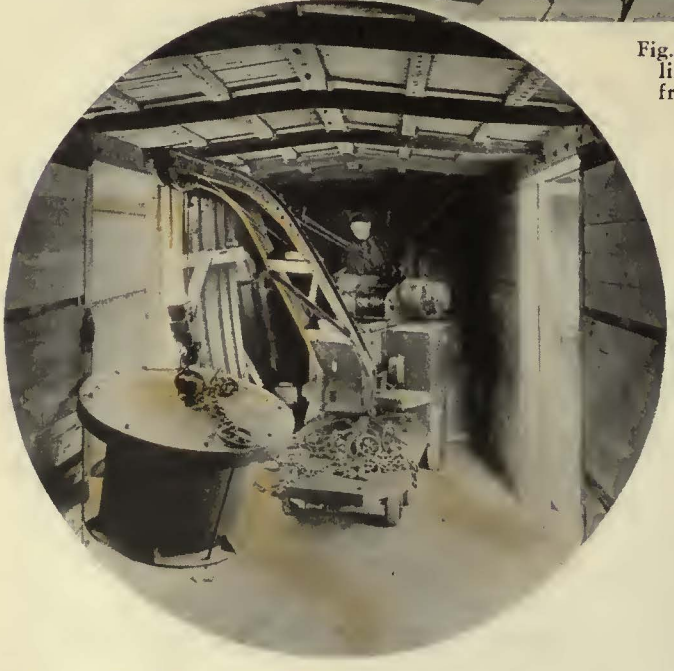


Fig. 15—Placing a heavy shipment in a car with an Elwell-Parker warehouse crane

In eastern, central and northern Ohio the Electric Railways Freight Company is directing operations of several truck lines that were recently acquired by the Northern Ohio Power & Light Company. These lines are being operated as feeders to the railways and for the purpose of meeting the competition of other truck lines serving the railway territory. The opinion is held by a number of operators that the railway which renders container service with the truck-body type of container will not find it necessary to parallel its rail lines with trucks.

In Figs. 14 and 15 are shown mechanical aids for reducing terminal costs and improving service. The advantages of these are self-evident.

Building BETTER *Track*

By
W. W. WYSOR
Chief Engineer
United Railways & Electric Company
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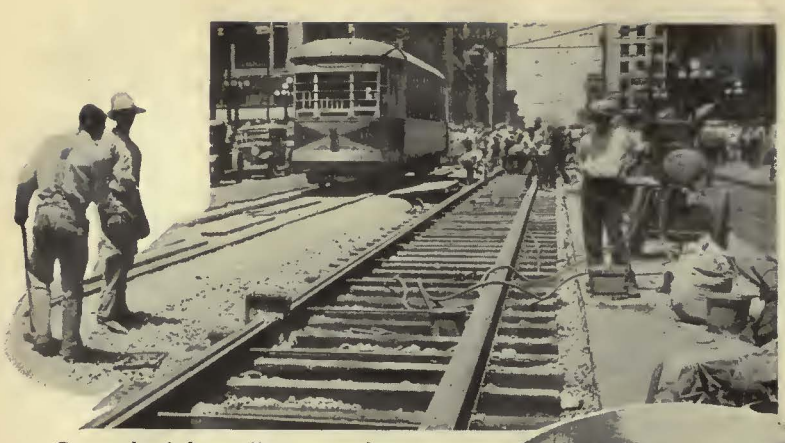
President
American Electric Railway Engineering Association

Tee rail has recently regained a considerable amount of its former popularity for use in street railway track with concrete paving

IT IS a far cry from the days of the rumbling stage coach bumping over cobblestone streets to the comfortable and speedy electric railway service of the present day. While the improvements which have been made in the design of the vehicle have attracted the largest amount of public attention, the advances made in the design and construction of roadway have been equally important in improving the quality of service. Today all forms of transportation are judged by the standards set up by the rubber-tired automobile and its attendant comfort. It is of the utmost importance, therefore, that the electric street car be provided with the smoothest and best type of roadbed that engineering skill can produce. To meet this need, numerous changes have been made in design and construction during recent years.

Development of improved rails has been one of the primary factors in the improvement of track construction. Very early in the growth of our cities it became apparent that some more adequate form of public transportation was needed than could be supplied by free-wheeled vehicles. The first street railway was built in New York in 1832 and others the following decade. Boston began the construction of horse car lines in 1856, Philadelphia in 1857 and New Orleans in 1861 and other cities soon after. These were followed by cable lines, the first being built in San Francisco in 1873. Electricity began to be adopted as a source of motive power about 1888. By the time street railways came into general use, the tee rail had been developed as the type most suitable for



Grooved girder rail on wood ties is widely used in track construction

Combination steel and wood ties are used by numerous railways

A recent development in track construction is the use of bent steel ties

Experimental track built on rail seats without ties

steam railroads. At that period, however, the rails were all of light section, probably not over 4 in. high. This was found unsuitable for paved streets where deep block pavements were generally used, and the so-called tram rail was developed with a greater height and a horizontal lip to accommodate wagon wheels.

With the coming of the cable car and the electric car, speeds were increased as well as the frequency of service. This made it undesirable for free-wheeled vehicles to use the car tracks. At the same time smoother pavements were coming into extensive use so that there was not the same necessity for vehicles to follow the car tracks that had existed in the early days. The next development after the tram girder rail was a grooved type of rail known as the "Trilby" because the head portion of the rail when inverted resembled somewhat the Trilby type of lady's shoe then in vogue. The Trilby type of groove has since been modified to a groove which gives a better clearance for wheel flanges.

While there are a number of different grooved girder sections being rolled today, the one most commonly used is that adopted several years ago by the American Electric Railway Engineering Association as standard. This is made in sections either 7 in. or 9 in. deep. With the increasing use of concrete paving, however, the use of a tee section has regained a considerable measure of popularity. Several types of plain girder or tee rails have been adopted as standard by the A.E.R.E.A. There is also available a rail, first rolled for the Cleveland Railway, which is non-symmetrical in gage, the backside of the head being sloped in a manner similar to the head of the girder grooved rails so as to make a better job in paved streets.

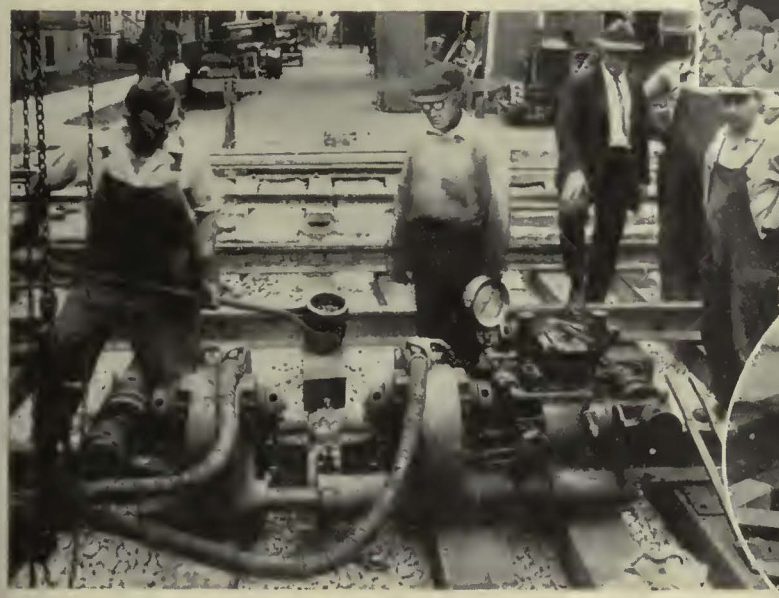
In general there has been a trend toward the use of heavier rail. Heavy rail gives track a longer life not only because there is more metal to resist wear but because it spreads out the loads and due to its anvil-like action absorbs the shocks, thus protecting the balance of the track structure as well as the surrounding pavement.

The increasing of wheel loads, car speeds, volume of traffic and also heavy motor trucks has resulted in the building of more substantial track foundations. While wood ties continue to be used more extensively than any other type, steel ties and combination designs have many adherents. Many companies have also adopted concrete in the track foundation, especially where steel or combination ties are used. To obtain greater density and closer union between the concrete, ties and rails, a number of railways have adopted the practice of vibrating the concrete thoroughly before it sets. This is not a new idea but new machinery for doing the vibrating has recently been developed.

One feature of track construction that has probably caused more concern than any other is the method of joining rails together. In the old days the street railways followed the steam railroad practice of using fish plates,

and the various modifications including base plates and so-called continuous plates. However, on account of the difficulty in getting at joints buried in street paving, the troubles of the street maintenance-of-way man were intensified over that of his steam railroad brother when it came to maintaining joints. While the paving around street railway tracks is the source of a great deal of annoyance and expense, it does make feasible the practice of welding of rail joints. Thus we now have indefinite lengths of track, welded solidly so that it is, in effect, one continuous rail. The paving not only tends

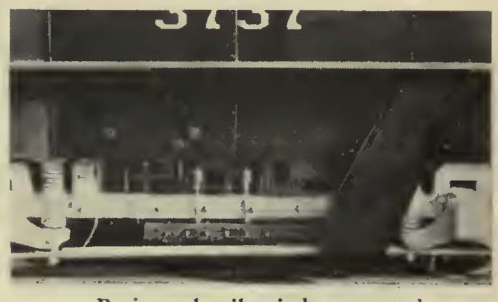
Typical electric seam welded rail joint



Making an electric butt weld

Thermit welded joints are widely used

Vibrating track concrete to give added strength



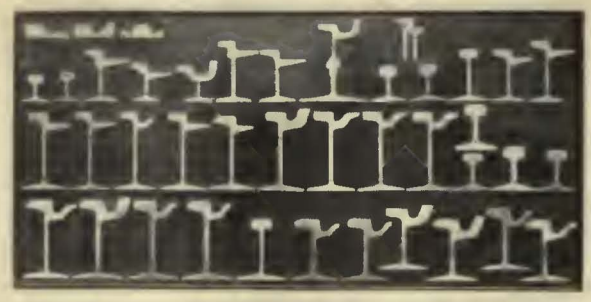
Reciprocal rail grinder mounted on car

Automatic ballast tamping is a recent development

Plastic rail filler helps to prevent transmission of vibration between rail and pavement

to keep down the extreme changes in temperature but confines the rail in such a way that it cannot buckle out of line and the stresses set up in the rails due to temperature changes are under the elastic limit of the rail steel.

The first method of welding rails together was by means of cast iron binding. There was, however, little actual weld in this case, the iron binding acting more through its gripping effect than through any actual fusion with the rail. Nevertheless, these cast-iron welds were remarkably successful. These gave way to the electric bar weld, the Thermit weld, the electric butt weld and the electric seam weld. Practically all the street railway track that is laid today is welded by one or the other of these processes, all of them being efficient but each having its own advocates and special applications. The welding of joints has prolonged the life of rails so that they can be used until worn down throughout their length instead of being scrapped when worn out at the joints.



Development of rail as used in Baltimore from the earliest horse car days up to the present

In addition to joint welding, extensive use has been made of arc welding for building up worn spots in track. This welding can be done at a nominal cost and it has resulted in the saving of large sums of money.

Many improvements have been made in recent years in the design of special trackwork. When street railways first came into use, it was soon found that the switches used by steam railroads were not suitable for paved streets and what is known as the tongue switch was developed. This was a more or less crude affair at the start, as was also the other special trackwork. Frogs were either made by bolting together plain rails and cutting notches for the wheel flanges, or were made of cast iron. The sharp curves necessary in negotiating street corners were guarded with strap steel or specially rolled light guard sections secured to the running rails by bolts. These answered the purpose for a time but much difficulty was had in keeping these guards securely fastened and so there was developed a form of girder rail having a solid guard. This is a tremendous improvement over rail with a bolted-on type of guard. Great improvement has also been made in the method of making frogs. These are either made of high-grade alloy steel or of what is known as the iron-bound type with hard center inserts.

We must bestir ourselves to hold our patronage by giving to our passengers the closest approximation we can to the comfort they enjoy in "riding on rubber." If we do not, we may expect to see them drifting away in greater numbers. All the time and efforts of the way engineer have been directed toward developing a type of track that will accomplish this and at the same time will give maximum length of service at minimum cost.

Spokane Falls at night, a picturesque scene in the center of the city

Suburban station on the newly-electrified Lackawanna system, showing the attractive type of suburban territory served

Serving the SUBURBAN COMMUTER

By

MORRIS BUCK
Engineering Editor
Electric Railway Journal

PROMINENT among the transportation facilities which have contributed to the development of many of our modern American cities is the suburban service offered by the main line railroads. Begun within a comparatively few years after the steam locomotive had been invented and the railroad had become a reality as a means of travel, suburban service has been developed more and more intensively, until today it stands in a distinctive class as one of the essential transportation facilities of the large community.

At the outset, the use of the available facilities of the steam railroads for commuter traffic seemed logical, both to the residents of the cities and to the managements of the roads themselves. Nearly every system entering a city of any size, particularly where a terminal was located, had obtained a choice site for a passenger station. In the days of railroad expansion it was considered essential to locate such a station as near as practicable to the center of business activities. At a time when freight traffic was comparatively light, little difficulty was experienced in scheduling passenger trains at convenient hours to serve the needs of executives and office and factory workers who desired to live along the line of the road. Since it was considered that the tracks and other facilities would have to be provided anyhow in order to handle through passengers and freight, it was only natural that reduced rates were offered to induce regular riders to use the suburban service which could be given with relatively small additional investment. Monthly, quarterly and annual tickets have been sold at rates far lower than the regular one-way fares, sometimes as little as one cent a mile if all the rides on the tickets are used.

As a consequence of this policy, in many cities a large business has been built up that has become an essential part not only of the railroad system, but of the community. In some instances it has brought a profit to the railroads and in others it is questionable today whether the service is operated at a profit or at a loss. But in any event, the growth of the communities has been fostered by this activity of the railroads.

Generally speaking, suburban railroad service antedated the street railway, and was operated for many years before there was a thought of the use of electricity as a motive power. At first, the ordinary passenger coaches and locomotives were employed, but later some of the railroads developed locomotives which were able to produce higher acceleration rates and coaches which were particularly fitted to the needs of commutation service.

Under conditions of a generation ago, with no other

form of rapid transit available, the suburban service of the steam railroads furnished the only means through which the worker in a large community could live very far away from his business. With convenient terminals, it was quite possible for workers to spend a comparatively small amount of time in travel and reach points offering the advantages of country or suburban life. While the cost of transportation to the individual was not negligible it was not so high but that a considerable class of people found it possible to build homes at distances of 5 to 20 miles from the congested area. Naturally it was the more substantial element of a city that did this. As a result, the steam railroad has always had a high class clientele for its suburban business.

While the advent of electricity opened up many new possibilities for railroad suburban service, comparatively few systems adopted the new motive power at once. Those that did so were forced to it by public opinion or by legislative enactment. Even today a number of railroads are continuing steam service for this class of traffic with a considerable measure of success. The most progressive ones, however, have electrified in order to cope with the demands for rapid, clean and frequent service.

Woodside, one of the principal junction points on the Long Island Railroad, uses flush platforms

It is well to look into the possibilities of railroad suburban service as compared with those of rapid transit lines of the ordinary type. Naturally, speed is one of the prime essentials of suburban roads of either type. As to convenience, in some respects the rapid transit line probably has the better of it, since it does not need a single terminal in the heart of the city, but can operate through the entire length of the business district with stations at many convenient points. Against this, the main line railroad offers the advantages of comfort and a time-table which may be adhered to rigidly. As a rule, seats are provided for all passengers and many facilities are offered for the comfort of passengers. such as wider cars with cross seats, better upholstering, better lighting and ventilation, and smoking compartments, which are lacking in the more intensive rapid transit service. The fares being materially higher, undoubtedly the best class of travel is attracted to the suburban railroad, and this makes it necessary to do many things to keep the good will of the riding public.

Granted that railroad rights-of-way and facilities are available, it is much more logical to develop them for suburban service than to build competitive rapid transit lines, particularly subways. Accordingly, if a railroad already serves the territory it would appear much better and decidedly cheaper to electrify it and if necessary to construct short sections of subway in the business districts to provide for the distribution of passengers. This plan has been adopted in the electrification of the Pennsylvania Railroad in and about Philadelphia. Suburban trains will be diverted to a subway reaching the central district.

Suburban service has been of much benefit to Philadelphia. When the Pennsylvania electrified its main line a number of years ago, it opened up a territory for some 20 miles to the west of Philadelphia for commuters working in the city. This section has grown remarkably. Following closely on the conversion of this route, the Chestnut Hill branch was electrified, with a quite similar development of the territory served. The line to Wilmington was equipped about two years ago and is at present undergoing an increase of business. With the complete electrification of the Pennsylvania system between New York and Washington, suburban service will be given electrically as far as Trenton, and further growth of the communities along the line is anticipated. Electrification of the suburban lines of the Reading Railroad, which is now taking place, will put this system on a par with the Pennsylvania as a means of serving suburban residents in and about Philadelphia. In all these installations the exclusive suburban character of travel has been retained, so that there is no direct competition with the city-owned subways and elevated lines.

Suburban trains are operated successfully in several places on the Pacific coast by the Southern Pacific System and its affiliated lines. Views of the Alameda-Oakland lines appear on page 370.

Another possibility for the utilization of existing facilities for intensive service is to connect them with existing rapid transit lines for distribution of passengers in the business district. This has been urged many times. There are, however, comparatively few instances where the plan has been worked out. The most notable of them is the Ashmont extension of the Boston Elevated Railway's Cambridge-Dorchester subway. This route, with the surface trolley line extension to Mattapan, is nearly all on the right-of-way of the New York, New Haven & Hartford Railroad. The route has been equipped for rapid transit service at a cost much less than would have been necessary to build a competing subway. The capacity has been increased far beyond anything possible with steam traction, or even electrification of this one line as a part of the railroad service. It must be remembered, however, that in developing the line in this manner its character has been changed completely, and true rapid transit service is now being furnished instead of suburban commuter service. Steam railroad facilities are also to be used for rapid transit purposes in Cleveland. There several railroad lines are being electrified to form a rapid transit system entirely apart from the surface car system.

As a community builds up, naturally it becomes impossible to continue giving the same class of suburban service as was possible with low concentration of population and small amounts of traffic. As the demand grows, the congestion increases. Trains must be made longer and headways shortened until the service automatically approaches that given by rapid transit lines. This is what has occurred on the Long Island Railroad, serving principally the Borough of Queens in New York City. The Long Island Railroad has been faced with the necessity of providing what is virtually rapid transit service to the detriment of the riders who desire to travel to suburban points outside the city.

Under present-day conditions successful suburban service demands electric operation. The traffic densities are almost invariably too great to permit of satisfactory service with steam locomotives. Use of multiple-unit trains will increase the capacity of a stub terminal from 20 to 30 per cent, while with a through terminal or a loop station the increase in capacity may be even greater. With multiple-unit trains many of the problems involved in locomotive operation are entirely absent. Maximum acceleration can be obtained along with reasonably high speeds so that running times can be shortened materially. With electric heating and lighting of the cars, there is no necessity for frequent trips to a terminal or roundhouse, and the cars can be operated with little or no attention, save for periodic cleaning and inspection. Absence of smoke and dirt also have been popular.

As to the best type of equipment for suburban service, there is comparatively little diversity of opinion. Most of the roads use coaches of the ordinary steam railroad type, all or a portion being equipped with electric motors and control, the others being used as trailers. In a few instances, notably the Illinois Central Railroad, cars of a distinctive type have been developed for suburban service. All the cars have been designed for use with flush station platforms. These are desirable, as they save several seconds at each stop and make it easier for passengers to board and alight. On nearly all of the other railroads giving suburban service there are low station platforms, only a few inches above the rail level. On the Long Island Railroad a considerable number of the stations have flush platforms, while others have low platforms. This necessitates the use of trap doors which must be raised by hand at stations with low platforms.

A distinctive feature of railroad suburban service that has contributed much to its popularity as compared with rapid transit is the adoption of time-tables of the steam railroad type which make use of individual combinations of station stops for each trip. Trains may be run local for the entire distance, express for the entire distance, or there may be a combination of the two types of service on any train. A careful traffic analysis is made and the schedule is adapted to the requirements for that particular trip. If the headways are greater than the minimum it is thus possible to give a superior service, even though only a single track is available in each direction. This is distinctly contrary to the principles of rapid transit, where all trains of one class stop at certain designated stations, locals stopping at all local stations and expresses stopping at express stations only. As traffic density increases, however, it becomes more and more difficult for a suburban railroad to give more than a single class of service on one track and, as stated elsewhere, standard rapid transit operation is approached.

Intensive suburban service with electric trains is given on the main lines of the Pennsylvania Railroad with a terminus in the heart of Philadelphia

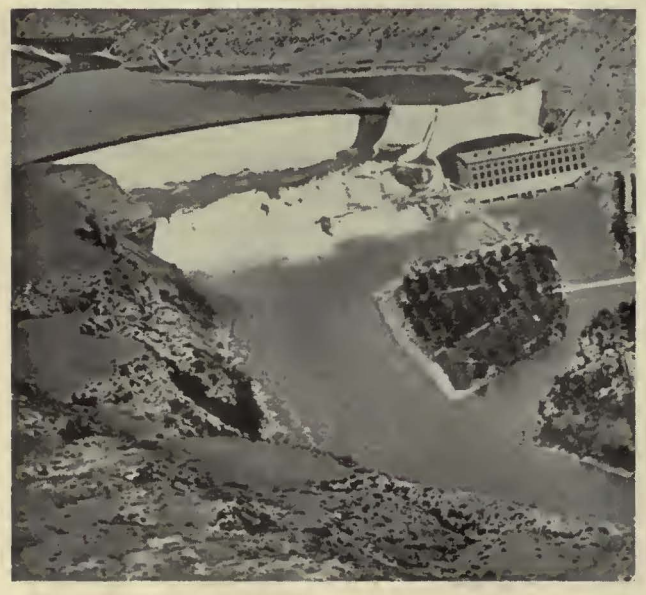
One element of cost that has a great deal to do with the difference in operation between trunk line railroad suburban service and rapid transit is the method of payment for labor. Rapid transit trainmen are almost always employed on an hourly basis, while trainmen in railroad service are paid on a mileage basis. This makes it possible for the railroads to schedule trains with much more flexibility. Coupled with greater lengths of route, favorable time-tables can be made up with minimum labor cost and with little waste service during the non-rush hours.

The length of the commuting zone varies with the type of community and the service furnished. Some roads have catered to this class of service in one or more communities and accordingly have built up larger or smaller districts, suburban in character and tributary to the central district. Striking differences have existed on this account in comparable territories. For instance, the writer knows of one example where two parallel trunk line railroads pass through quite similar territories. One of them gave an intensified local passenger service and as a result developed suburban towns on an average of one to two miles apart for a distance of 40 miles, while the other one had practically no suburban development along its line.

The "richest hill on earth," at Butte

East Park Street, in the business section of Butte, where local transportation is furnished by the Butte Electric Railway

One of the four hydro-electric plants with a total capacity of 240,000 hp., developed by the Montana Power Company on the Missouri River in the vicinity of Great Falls, is shown below



Utah Agricultural College at Logan is in the territory served by the Utah-Idaho Central Railroad

City Common of Anaconda, maintained by the Anaconda Copper Mining Company, which operates the street railway system

"NET" can come from two sources—increased earnings or decreased expenses. Improvements in design can bring about both. For some time past we have been attempting to attract riders through improved appearance, riding comfort and speed.

The electric coach attracts riding not alone because of its appearance and comfort, but largely because the rider is impressed with a sense of speed. A modern street car on a good track furnishes a comfortable ride, but a rubber-tired vehicle with its flexibility, quietness and light weight, permitting rapid acceleration, very nearly approaches the ideal mass transportation unit for the average city.

E. A. WEST.

General Manager
Utah Light & Traction Company
Salt Lake City, Utah

One of the electric coaches in Utah's capital city. The famous Mormon Temple is in the background and the statue of Brigham Young is at the right

Main Street, Salt Lake City, looking north toward the Capitol

Modern interurban terminal at Salt Lake City, used by the Bamberger Electric Railroad, which runs north to Ogden, and the Salt Lake & Utah Railroad, which extends south to Payson

Twenty-six electric coaches are operated by the Utah Light & Traction Company. In the business district they use the street car safety zones

The co-operative installation or use of ornamental poles for the support of overhead structures occasions a favorable public reaction

Increased Power Department Responsibility Demands PROPER EQUIPMENT

TODAY the activities of the power department of the average modern street railway extend far beyond the responsibility of supplying, through a system of distribution and contact structures, a continuous and economical source of propulsion energy for the movement of cars. The leaders in the industry acknowledge this and, therefore, no longer feel that the scope of power development responsibility ends with the production and distribution of electrical energy, but that it has a real place and constitutes an important part in the general scheme of building up and maintaining friendly relations with patrons of the company and the public at large.

The question is then asked: What are the conditions or qualifications necessary to enable the power department to fulfill best its place according to the modern conception, wherein the sphere of departmental responsibility has been increased?

Primarily these may be classed as follows: continuity of power supply; modern equipment and practices properly maintained; a company policy regarding the public in general, wherein the department, as a unit of the entire company, recognizes and fulfills its responsibility to the public as well as to the company through a more or less definitely prescribed company channel.

In perusing the three major qualifications and realizing that the one incentive behind the whole structure is to build up a business by demonstrating the ability and desire to serve, one cannot but realize that accomplishment of the desired end is at least impracticable, if not impossible, should any one of the three qualifications be absent.

Dependable service cannot be rendered if the source of power frequently fails. Continuity of power supply cannot be maintained utilizing antiquated equipment or antiquated operating and maintenance methods. Harmonious public relations cannot be maintained if the foregoing qualifications are not fulfilled. On the other hand, the most modern methods and equipment rendering 100 per cent service cannot discount the ill effects of poor public relations or an antagonistic local governmental body. Therefore, one or even two of the qualifications without the third will be of no avail. The triad must exist. In this article it is the intention of the author to discuss briefly only one of these qualifications; namely, modern equipment and practices.

The electric railway industry has witnessed no development quite so revolutionary and far-reaching as the perfection and adoption of the automatic substation. During the sixteen years since the first station of this type was placed into operation, the cost of power delivered to the car has been decreased, accompanied by increased reliability of service and greater freedom from labor

troubles on systems where the automatic plant has been installed to any extent. In interurban service this type of plant, even in its simplest form, has demonstrated its ability to render satisfactory performance at a material decrease in operating costs when compared with operating costs of the former manually operated plants. In metropolitan service a full complement of automatic equipment, operated in conjunction with remote and supervisory control and a properly designed distribution system, establishes a power system which, because of its many power supply points located advantageously about the entire system and its extreme flexibility, guarantees a continuity of power supply to the

Remote and supervisory control, utilizing various colored lamps for indicated condition of conversion and distribution system control equipment

complicated and less costly to install than rotating equipment installed for automatic operation. The cost of maintenance should likewise be lower. However, when considering major sources of power in metropolitan service, additional features which must be considered in many instances invalidate the advantages of the rectifier and cause rotating equipment to be selected. Paramount among these features is the fact that conversion equipment in this class of service is generally operated at or near capacity as long as it remains in service, particularly if automatic control is employed and the stations and distribution system are under remote and supervisory control. Furthermore, to protect fully the operation of the rectifier in major plants, duplication of the water cooling system, employing some form of recirculating system in addition to the normal supply of water from the city mains, would be necessary. Likewise, serious telephone interference is very apt to be encountered when rectifier equipment is operated in metropolitan areas. Prevention of such a condition would necessitate the installation of additional apparatus not required with rotating equipment.

With the advent of the automatic substation has come not only an entirely new type of housing structure, but

nd PRACTICES

By

L. D. BALE
Superintendent of Power, Cleveland Railway
First Vice-President
American Electric Railway Engineering Association

system that can be accomplished in no other way and at a lower cost of power at the car than was possible with former methods of distribution.

The mercury arc rectifier has advanced to a position where, in certain types of service, definite advantages may be gained by its use. The efficiency characteristic of this device at fractional loads causes it to be particularly well adapted when, for a greater percentage of the time, the nature of the load is such that the equipment is but partially loaded. The rectifier, in its simplest form, is less

Mercury arc rectifier substation equipment for 600-volt d.c. service. Above—Installation of the Long Island Railroad at Hempstead. At left—Equipment of the Connecticut Company at Bridgeport

likewise new ideas, aesthetic in their nature, regarding the surroundings of the building. The substation building no longer takes the form of conventional factory structure for in some instances where stations have been located in suburban residential areas it would be difficult for the uninformed to distinguish the substation building from neighboring residences. By these means, the engineer has been able to realize upon the advantages offered by the automatic plant and obtain a source of power supply in territories where heretofore it was necessary to absorb the heavy power losses and annual charges due to long distribution cable or suffer low operating voltage with its adverse effect upon car schedules.

In applying the automatic substation, particularly to the metropolitan field, the necessary feeder calculations are considerably more extensive and exacting than was generally the case with the larger capacity manually operated plants. The smaller capacity of the automatic plant and the relatively confined area which it is intended to feed makes it necessary to work within closer limits than formerly. The problem of reserve capacity is no longer solved by installing spare equipment in each substation.

Removing old and stringing of new trolley wire in one operation

The close proximity of the power sources permits of a more economical method and insures greater continuity of power supply to the system as a whole. Due to this new arrangement, the distribution system is utilized to make available the capacity of the entire system which may not be in use at any particular moment. To accomplish this result a close adjustment of the ohmic resistance of the feeder system between stations is necessary so as not to unbalance the load between stations.

The supervision of a number of automatic plants in metropolitan service, particularly where they constitute major sources of power, is an essential factor in obtaining the maximum economy and the highest guarantee for continuity of service. Superimposing some form of remote and supervisory control upon the automatic features of the conversion equipment and the outgoing direct current distribution control system, by means of which a dispatcher may at all times be fully acquainted with conditions on the system and in which he has at his disposal means to change conditions instantly whether due to routine operation or emergencies, constitutes without question the greatest insurance for efficient operation and a continuous supply of energy to the cars.

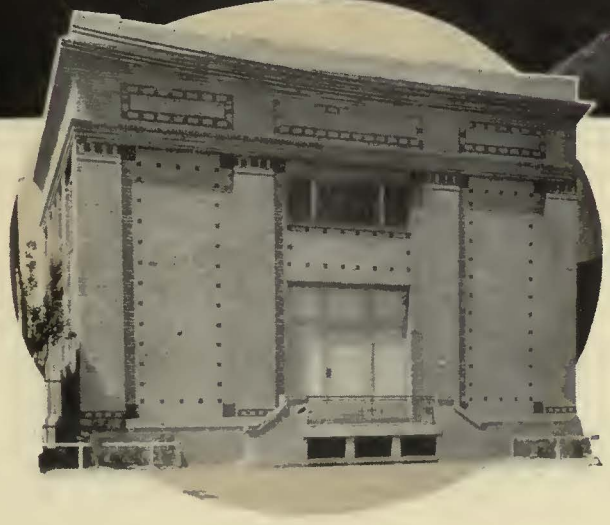
Simultaneously with the development of the automatic substation, the remote and supervisory control system and the new conception of the distribution system, which constitutes one of the greatest contributions the engineer has made to the industry, great strides have been made elsewhere within his jurisdiction. The great improvement in performance of overhead contact and distribution systems, in many instances at a reduced cost per mile, is certainly worthy of comment. Year by year due to intensive study and the research work of the railways and the manufacturers new low records are being established for trolley wire breaks. The stringing of trolley using the dynamometer method, rigid inspection on a car mileage basis rather than at definite periods regardless of car passages, dependable reports and the schooling of employees are chiefly responsible for this marked improvement. The industry is indebted to the several A.E.R.E.A. Power Committees which have made studies and prepared reports upon this and allied subjects. These reports have not only created influence toward standardization, making possible the procuring of better materials, but they also have been the means of placing before the individual engineer a cross section of what the industry as a whole is accomplishing. As a result they have given him new insight and an incentive for additional work.

Since one of the prime factors in the delivery of a continuous supply of power to the car is the contact system, it behooves the engineer to eliminate every trolley break possible from whatever cause. In this connection it has been noted, in perusing the reports of various railways, that there is more or less of a universal increase in the number of trolley breaks under the so-called uncontrollable classifications. These are due to pull-downs or burn-downs by railway equipment, in most instances improperly operated, or by objects of unusual dimensions being transported through the city streets.

Much favorable public reaction may be occasioned by the co-operative installation or use of some form of ornamental pole for the support of overhead structures, particularly if the channels are available whereby the public can be made to realize that the railway, by such acts, is interested in contributing to the civic improvement of the community. There have been several installations within the past two years where railway poles, street lighting standards and traffic signal standards or poles have been replaced by the use of one structure resulting in a greatly improved appearance of the thoroughfares.

Profitable results may be obtained by instigating a survey of the distribution system to ascertain its efficiency. This investigation, which involves the distribution plant from the power sources to the cars and includes both positive and negative sides of the circuit, is, of course, considerably simplified if the cars are equipped with power measuring devices. Quite aside from the possibility of advantageous readjustment of parts of the distribution system, based upon the results of such a survey, it will indicate the difference between the total amount of power drawn from the bus bars of the system power sources and that actually used in the production of revenue car-miles. It is safe to say that the engineer who has not taken the occasion to make such a survey will be astonished at the amount of energy used on his system for miscellaneous purposes.

One important item of electric railway maintenance, which is too often neglected, is rail joint



Examples of modern substation buildings, designed to harmonize with the particular territory in which they are located. From top to bottom—substations in Los Angeles, Baltimore, Atlanta and Cleveland

nductivity and the method f determining electrical re- stance of rail joints. The ectrical conductivity of the ack joints not only has an portant bearing upon the ficiency of the distribution stem but also involves the lationship of the railway ith other public utility com- nies utilizing the city reets as well as the individ- l property owners and pa- ns of the company.

The foregoing includes t a few of the important factors by which an economical and continuous supply of energy may be assured and where other functions of the power department may be conducted in such a manner that the railway and the public are best served. These factors, in the majority of cases, constitute two of the three conditions or requirements mentioned previously.

The third factor must be accomplished through the cooperative effort of the entire personnel. Employees in contact with the public must be schooled in order that proper conduct will be assured. Proper means also must be established, maintained and controlled, whereby the public is kept constantly advised of the company's steps to insure safe, speedy and dependable transportation at lowest possible cost.

Colorado Springs & Interurban cars at the city's busiest corner. Pike's Peak may be seen in the distance

BY IMPROVING our track, speeding up schedules and insisting on courtesy, we are providing the most satisfactory service possible with existng vehicles. More modern equipment, along the lines being developed, is necessary to raise our standards higher. Such equipment should be of standard design, along automotive lines, with prices reduced to a minimum.

W. N. CLARK
Vice-President and General Manager Southern Colorado Power Company
Pueblo, Col.

Car of the Southern Colorado Power Company in Pueblo

Downtown Denver, as seen from the State Capitol

Sixteenth Street—the main thoroughfare of Denver's business section

IMPROVED design in street car and bus equipment is an important factor from the standpoint of civic pride, as well as in consideration of improved service. Though we haven't reached the point where it is necessary to bring out new models every year, as the automobile makers do, attractiveness and comfort play a tremendous part today in service effectiveness.

H. S. ROBERTSON
President Denver Tramway
Denver, Col.

State Capitol of Colorado and a part of the Denver civic center

San Antonio St., a heavily-traveled artery in the business district of El Paso

One of the bridges over which the El Paso Electric Company operates cars to Juarez, Mexico

The "heart" of El Paso—San Jacinto Plaza

San Xavier Mission, Tucson, the oldest mission in this country

Buses of the Phoenix Street Railway Department in front of the City and County Building

WITH the great number of automobiles in use now the electric railways must make their track, equipment and service approach that of the private vehicles if they expect the public to ride the cars. Our experience indicates that neat, comfortable and speedy cars, operated on a smooth roadbed, offer a real inducement to prospective patrons. Following the rehabilitation of our system, involving the reconstruction of our worn-out track and the replacement of our antiquated cars with new vehicles, revenues increased from 25 to 60 per cent.

C. E. NEWCOMER

Superintendent Phoenix Street Railway Dept. Phoenix, Ariz.

The mill room, located directly behind the body repair tracks. This arrangement was adopted for all the departments

MODERN MACHINERY

A Sound Investment for

Better Maintenance

By

E. J. JONAS

Superintendent of Equipment
Cincinnati Street Railway
Cincinnati, Ohio

EXPERIENCE has proved that most car equipment of the conventional design can be made reliable and reasonably quiet in operation by efficient inspection and maintenance standards, the price of which is good tools plus eternal vigilance. With these two allies many electric railway properties have made real progress in keeping their cars in better condition at a lower cost. Great reductions in number of pull-ins and increases in mileage without mechanical difficulties serve as the tangible proofs for many systems of this program.

Well-arranged shops and carhouses, furnished with modern machinery and equipment, have played an extremely important part in improving the quality of work and, more particularly, in reducing costs. Adequate maintenance facilities and the provision of the proper machines for doing the many types of work are being considered essential by more and more companies. They realize the opportunities for savings in labor and equipment and that the resulting economy makes the additional or improved facilities a good investment.

A little more than two years ago the Cincinnati Street Railway completed its Winton Shop and transferred its operations from the old Chester Park Shops. Much thought was given to obtaining the best possible design and location of the building proper. In line with an efficient building layout, the company provided all the

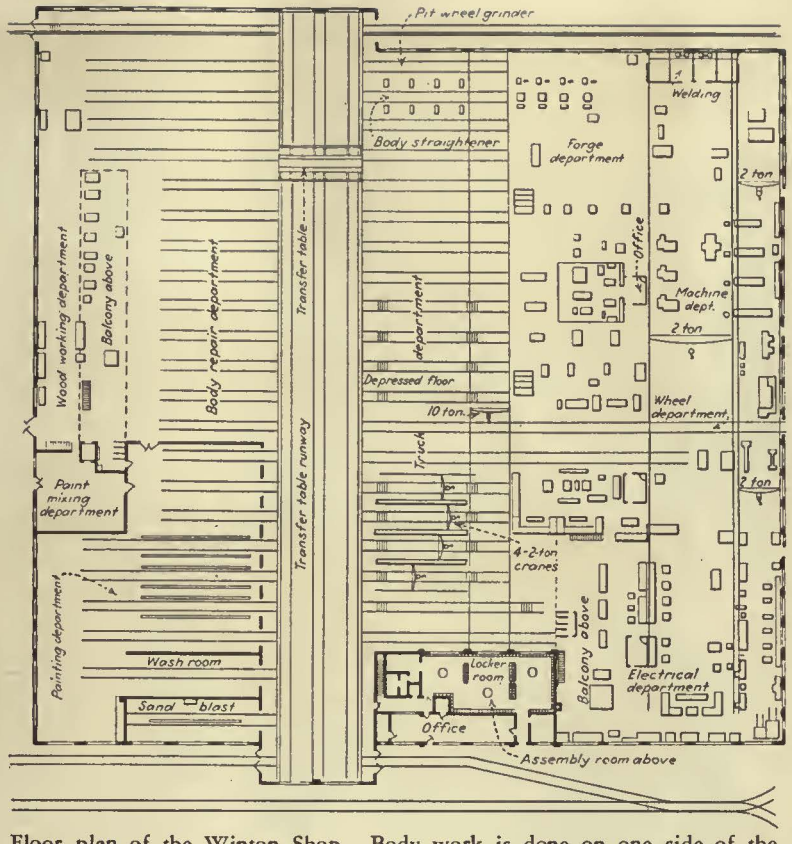
necessary modern machines and equipment for the efficient overhauling and maintenance of its rolling stock.

The steady increase in car-miles per disabled car from an average of 4,500 in December, 1927, to 20,000 in September, 1929, and the gradual decline in maintenance cost per car-mile, show a justification for the investment made in these modern facilities for street car upkeep. Many of the practices in maintenance work made possible by the new shop and its equipment are relatively insignificant in themselves as compared to the whole; many of these accomplishments are more the result of providing workmen with facilities and surroundings that encourage initiative and individual effort rather than the installation of labor-saving machinery.

Idle Workmen or Idle Machines?

In selecting new shop equipment it is advisable to obtain the best possible machine for the work to be performed, bearing in mind that an idle tool is unprofitable. In cases when such a tool will only be used occasionally, it is best to purchase the least expensive. On the other hand, an idle workman is more expensive than an idle machine; therefore, adequate equipment must be available in order that man-hours will not be lost on this account.

In the electrical department of the new Winton Shop the equipment includes five welding sets, two automatic wheel welding heads, two armature baking ovens, an electrically heated cleaning tank, a waste-treating plant and nine grinders of various types. Metal-working machines include ten lathes, a 400-ton car-wheel press, numerous grinders and drills, and other useful equipment. A very complete array of machines is provided in the woodworking department. Other equipment of special interest includes two cleaning ovens, a car-body straightener, an air-valve test bench, a special sand blast, a car spray hood, a combination transfer table and car hoist and a telescoping air jack. In an accompanying table all of the important machines and tools are listed.



Floor plan of the Winton Shop. Body work is done on one side of the transfer table runway and all truck and electrical work on the other side

A slight modification of the principle of designing a shop so that each track will hold but one car was made to bring about a more harmonious floor plan. In the erecting department four of the tracks are long enough to accommodate two cars. This does not interfere with the general scheme, however, as cars that must remain in the shop for a longer period are placed at the far ends.

The principle of keeping all body work on one side and all truck and electrical work on the other side was recognized in the floor plan. To facilitate the placing of the car body in one department and the trucks in another at the start of the overhaul it was decided to place a car hoist directly on the transfer table, doing away with the necessity of equipping each erecting shop track with an individual hoist. This arrangement has since proved to be ideal for this shop, no confusion or congestion resulting from movement off or on the transfer table. It is provided with a power cable reel for moving cars and trucks with motors and a motor-driven winch for moving equipment not having motive power. The car hoist consists of two 15,000-lb. overhead hoists, each having two drums on one shaft with hooks at the lower ends of cables that permit raising car bodies to a height of 6 ft. This height permits a thorough and final inspection of the body, brake rigging, side and center bearings, and other parts.

No live trolley wires are suspended over repair tracks, since the move-

Section of the wheel department with its array of modern machinery for maintaining and reclaiming wheels

ments are very short and can be accomplished by means of cable leads or the power winch and rope.

In locating the various tools and machinery, care was taken to place them so that the parts being overhauled would be moved a minimum distance. The present output of eight overhauled cars per week of 45 working hours is not an adequate indication of the capacity of this shop, since much of the work being done at present consists of rebuilding rather than overhauling.

Provisions for Handling Materials and Parts

Physical exertion is reduced to a minimum in the handling of parts and supplies by means of numerous jib cranes and an electric industrial truck with elevating platform of the high lift type. The shop also is equipped with one 10-ton and nine 2-ton floor-operated traveling cranes.

When motors are removed from trucks they are placed on platforms that permit the lift truck to pick them up without further handling, and are delivered to the motor repair section. Mounted wheels are transported in like manner. Air compressors, controllers and resistors as well as all supplies from the storeroom, are also handled by this truck.

Incoming motors are placed near the cleaning tank where housings and armatures are removed. Housings are placed in the cleaning tank, while armatures are passed down to the winding section for dipping and baking. They are then taken to the bending lathe, and finally are removed to the armature bench near the vertical boring mill and bearing press. By this time cleaned housings have also arrived at this point. The bearings are then checked and new bearings bored to the correct fit if new ones are needed. All armatures and axle bearing housings are kept with their respective motor frames when being reassembled. After motors

Equipment Installed in the Winton Shop of the Cincinnati Street Railway

Electric Equipment

3	Wldg. mtr.-gen. sets—300 amp	Westinghouse Electric & Mfg. Co.
1	Wldg. mtr.-gen. set—175 amp.	Westinghouse Electric & Mfg. Co.
1	Wldg. mtr.-gen. set—400 amp.	General Electric Co.
1	Welding transformer—150 amp.	Gibb Instrument Co.
1	Automatic wheel welding head.	Westinghouse Electric & Mfg. Co.
1	Automatic wheel welding head.	General Electric Co.
1	Armature baking oven—28 kw.	Westinghouse Electric & Mfg. Co.
1	Armature baking oven—21 kw.	Westinghouse Electric & Mfg. Co.
2	Babbitt pots—300 lb.	General Electric Co.
1	H. L. control test set	Westinghouse Electric & Mfg. Co.
1	Battery charger—50 amp.	Electric Products Co.
1	Electric high-lift truck	Elwell-Parker Electric Co.
1	Elec'cally-heated cleaning tank.	*
1	Waste-treating plant	*
1	Lumber-heating oven	*
1	Snagging grinder	Cincinnati Electric Tool Co.
4	Dry grinders—12 in.	Cincinnati Electric Tool Co.
1	Dry grinder— 8 in.	United States Electrical Tool Co.
1	Tool grinder—12 in.	Cincinnati Electric Tool Co.
2	Dry grinders— 6 in.	Cincinnati Electric Tool Co.
1	Buffing lathe	Hisey-Wolf Manufacturing Co.
1	Band saw brazer	Oliver Machinery Co.

Forge Shop Equipment

1	Air hammer—800 lb.	Nazel Engineering & Machine Works
1	Blacksmith's helper	Blacker Engineering Co.
1	Forging furnace	Strong, Carlisle & Hammond Co.
1	Shoe bolt forging machine	*
1	Shoe bolt forging furnace	*
4	Down draft forges with blowers	Buffalo Forge Co.
3	Surface plates	*
4	Iron storage racks	*

Metal Working Machine Tools

1	Engine lathe—16 in. x 8 ft.	American Tool Works
1	Engine lathe—20 in. x 8 ft.	American Tool Works
1	Engine lathe—24 in. x 10 ft.	American Tool Works
1	Engine lathe—25 in. x 12 ft.	R. K. LeBlond Machine Tool Co.
2	Engine lathes—24 in. x 10 ft.	R. K. LeBlond Machine Tool Co.
1	Toolroom lathe—12 in. x 8 ft.	Lodge & Shipley Machine Tool Co.
1	Turret lathe, flat turret	Acme Machine Tool Co.
1	Turret lathe, semi-automatic	Acme Machine Tool Co.
1	Car wheel lathe	Niles Tool Works
1	Car wheel press—400 tons	Niles Tool Works
1	Car wheel grinder	Springfield Manufacturing Co.
1	Axle grinder—18 in. x 8 ft.	Norton Co.
1	Car wheel borer—48 in.	Niles Tool Works
1	Vertical boring mill—34 in.	King Machine Tool Co.
1	Horizontal boring mill—32 in.	Lucas Machine Tool Co.
1	Milling machine—No. 4	Cincinnati Milling Machine Co.
1	Shaper—32 in.	Smith & Mills Co.
1	Shaper—16 in.	Smith & Mills Co.
1	Radial drill—5 ft.	Cincinnati Bickford Tool Co.
1	Radial drill—4 ft.	Dreses Machine Tool Co.
1	Planer—42 in. x 42 in. x 16 ft.	Cincinnati Planer Co.
1	2-Spindle drill	Fosdick Machine Tool Co.
2	Sensitive drills	United States Machine Tool Co.
1	Sensitive drill	Canedy-Otto Mfg. Co.
1	Punch press—No. 21	E. W. Bliss Co.
2	Upright drills—24 in.	Cincinnati Bickford Tool Co.
1	Upright drill—21 in.	Cincinnati Bickford Tool Co.
1	Squaring shear—5 ft.	Bertsch & Co.
1	Bolt cutter—2 in.	Acme Machinery Co.
1	Bolt cutter—2 in.	Landis Machine Co.
1	Universal shaping saw	Peerless Machine Co.
1	Hack saw	Peerless Machine Co.
1	Cutter grinder	Oesterlein Machine Co.
1	Drill pointer	Oliver Instrument Co.
1	Toolroom upright drill	Fosdick Machine Tool Co.
1	Straightening roll	Bertsch & Co.
1	Portable pipe threading machine	Robbins & Campbell Co.
1	Centering machine	E. W. Whiton Machine Co.
1	Nibbler shear	W. J. Savage Co.

Woodworking Machine Tools

2	Band saws—42 in.	J. A. Fay & Egan Co.
1	Swing saw	J. A. Fay & Egan Co.
1	Planer—No. 2	J. A. Fay & Egan Co.
1	Mortiser	J. A. Fay & Egan Co.
1	Shaper	J. A. Fay & Egan Co.
1	Universal wood worker	J. A. Fay & Egan Co.
1	Rip and cut-off saw	J. A. Fay & Egan Co.
1	Roll sander	J. A. Fay & Egan Co.
1	Tenoner	J. A. Fay & Egan Co.
1	Knife grinder	J. A. Fay & Egan Co.
1	Band saw filer	Black Diamond Saw & Machine Co.
1	Post drill	Champion Blower & Forge Co.

Hand-Operated Tools

1	Hand punch	*
1	Slitting shear	Excelsior Tool & Machine Co.
1	Punch press	Standard Machinery Co.
1	Folder	Peck, Stow & Wilcox Co.
1	Slip roll former	Peck, Stow & Wilcox Co.
1	Pipe bender—2 in.	American Pipe Bending Machine Co.
1	Arbor press—No. 4	Atlas Press Co.
1	Arbor press—No. 0	Atlas Press Co.
1	Brake—10 ft.	Dreis & Krump Mfg. Co.
1	Hydraulic axle straightener	*
1	Hydraulic armature press	*
1	Axle test stand	*
1	Paper shear	Excelsior Tool & Machine Co.
1	Shear	*
2	Hand lift trucks	Stenbing-Cowan Co.

General Equipment

1	Gear pan cleaning oven	*
1	Axle bearing cleaning oven	*
1	Car body straightener	*
1	Toolroom furnace	Bellevue Industrial Furnace Co.
1	Air valve test bench	*
2	Banding lathes	Columbia Mach. Wks. & Mall. Iron Co.
1	Armature dipping plant	*
1	Field winder	*
1	Air compressor—350 cu.ft.	Worthington Pump & Machine Co.
1	Sand blast equipment	W. M. Sly Mfg. Co.
1	Sand blast ventilating equipm't	Young & Bertke Co.
1	Sash washing tank	*
1	Car spray hood	DeVilbiss Co.
1	Sign spray hood	DeVilbiss Co.
1	Waste wringer	American Laundry Machine Co.
1	Mill exhaust blower	American Blower Corp.
1	Mill exhaust system	Young & Bertke Co.
1	Sewing machine	Singer Sewing Machine Co.
2	Car body turners	*
1	Electric drill stand	Cincinnati Electrical Tool Co.
1	Forcing press—30 ton	Lucas Machine Tool Co.
1	Transfer table and car hoist	*
2	Electric elevators	Warner Elevator Co.
1	Hydraulic elevator	Warner Elevator Co.
1	Traveling crane—10 ton	Niles Tool Works
8	Traveling cranes—2 ton	Chisholm-Moore Mfg. Co.
1	Chain hoist traveling crane	Chisholm-Moore Mfg. Co.
1	Telescoping air jack	*
1	Water heater	Bryant Heater & Mfg. Co.
46	Unit heaters for shop heating	American Blower Co.
1	Blue print machine	Wickes Bros.
1	Sand drying plant	C. O. Bartlett & Snow Co.
2	Boilers—250 hp.	Tudor Boiler Mfg. Co.
2	Stokers	Riley Stoker Corp.
5	Wash basins	Bradley Wash Fountain Co.
186	Lockers	All-Steel Equipment Co.
20	Jib cranes, with Ford chain hoists and trolleys	*
	Office furniture	Globe Wernicke Service Co.
	Fire extinguishers	Knight & Thomas, Inc.
	Pwr. transf'rs and switch b'rd.	General Electric Co.
	Shop motors and control	Westinghouse Electric & Mfg. Co.

*Designed and built by the Cincinnati Street Railway.

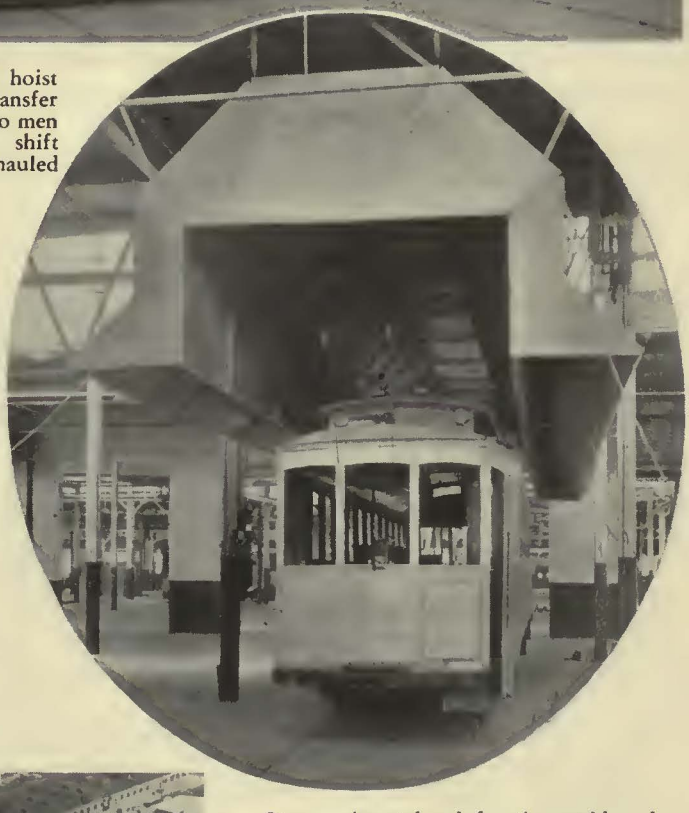
are tested they are placed on the motor storage floor on platforms, ready for delivery to the truck department when needed.

In like manner bad order wheels are delivered to the wheel department for reclaiming or replacement. They are then placed on another track and fitted with axle bearings which are bored on a turret lathe. The bearings are held to the axle by means of spring clips, so that when they are received by the truck department the correct axle bearing is immediately at hand. The practice of boring axle and armature bearings to fit their respective journals has reduced bearing costs approximately 50 per cent.

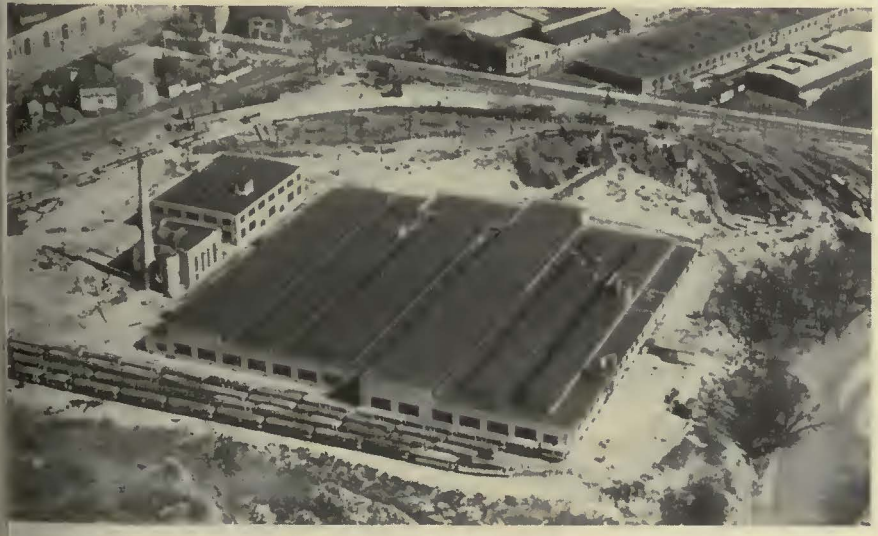
The vertical boring mill is fitted with jigs which center the motor bearing housings, after the bearings have been pressed in place. They can thus be accurately and quickly bored to the correct diameter to fit the armature journal. This method is just as fast as the step method and greatly increases the useful life of bearings.

Welding equipment, consisting of four a.c.-d.c. motor-generator sets, one d.c.-d.c. motor-generator set and one welding transformer, is used extensively for reclaiming worn and broken parts. Correct gear centers are being restored on all the older type motors by building up the axle and housing fits and reboring on a horizontal boring mill. Reclaiming of steel wheels with an automatic welding machine has resulted in a large saving in wheel costs and the development of automatic heads for other classes of welding will similarly effect other savings. After much speculation as to the actual percentage of time that a manually-operated arc was kept in operation, a check was made with a recording instrument. It revealed that an average of four and one-half hours out of nine were obtained in motor frame welding, and two and one-half hours on brake parts. This information is being used as a basis for paying premium rates.

With the overhead hoist built into the transfer table structure two men can exchange shift trucks for overhauled motor trucks



Spray exhaust hood for the rapid and economical painting of cars



All departments of the Winton Shop are under one roof with the exception of a boiler house and a storehouse. The main building has a floor area of 177,605 sq.ft., more than 4 acres

Standardization on body repair work is almost impossible since a great number of things may happen to a car body while in service. Seldom are two body jobs alike. However, something has been accomplished by building up vestibule fronts on a jig for the wood post cars. The cost of preparing for painting also has been reduced.

The sand blast room has an air cleaner that will handle 10,000 cu.ft. of air per minute. The equipment is installed in an inclosed room and permits a thorough cleaning of the car interior.

NEWS *of the Industry*

LATE NEWS

Alliance, Ohio—Approximately $40,000 is being expended by the Stark Electric Railroad this summer for rehabilitation. The company operates between Canton and Salem, a distance of 30 miles. Fifteen thousand new ties are being placed and several grade crossings are being rebuilt.

✦

Philadelphia, Pa.—The Philadelphia Rapid Transit Company has purchased the Hartel Cab Company, operators of about 25 cabs from the Sixty-ninth Street Terminal here and in Lansdowne. Yellow cabs will replace those formerly owned by the Hartel Company.

✦

Chicago, Ill.—Union employees of the Chicago Surface Lines have signed a new wage and working agreement with the company. The terms include renewal of the wage scale which has been in effect for the last three years. The renewal is for one year from May 31.

✦

Lawrence, Mass. — The Eastern Massachusetts Street Railway made its fourth installation of the weekly pass at Lawrence on May 18. The pass sells for $1.25 against a cash fare of 10 cents and ticket rates of fourteen for $1, and Belt Line rate of six for 50 cents. The Brockton division added a pass Nov. 3, 1929; Lowell, Dec. 29, 1929, and Haverhill, Jan. 24, 1930.

✦

Seattle, Wash. — Agitation for construction of a loop to replace the wye at the north end of the Phinney-Greenwood Municipal car line, North 85th Street and Greenwood Avenue, is being revived. Building of the loop would require the purchase of private property for right-of-way as Phinney Avenue is not cut through in this area. The purchase and the loop construction would cost about $30,000.

✦

St. Louis, Mo.—The General Taxicab Company ceased operations at 4:30 p.m. on June 9 because it was unable to meet the demands of the Chauffeurs Union for payment in full of wages due the 125 chauffeurs normally employed, or post a cash guarantee that the wages would be paid. The company has been holding back five days wages of employees in making up its payrolls. It has been named defendant in bankruptcy proceedings. Forty-four of the company's 66 cabs were in operation on June 9.

✦

Los Angeles, Cal.—The Pacific Electric Railway has applied to the Railroad Commission for authority to issue two notes of the face amount of $311,846 each, to Motor Transit Terminal Corporation, in part payment of the purchase of capital stock of Motor Transit Company, operating an extensive auto stage service in southern California. The notes are to be dated Jan. 1, 1930, and one is to be payable July 1, 1931, and the other on Dec. 31, 1931.

(Late News Continued on Page 424)

Auto Does Not Justify Its Use of St. Louis Streets

Merchants Misguided About the Value to Them of Customers Who Come to Stores in Their Own Cars—Five Times as Many Carried by Street Car as by Auto

TO DETERMINE accurately the character of traffic in the business district of St. Louis, Mo., the St. Louis Public Service Company on May 26 sent 170 checkers into the district bounded by Twelfth Boulevard, Market Street, Third Street and Washington Avenue, to note the kinds of traffic in that section and the volume of such traffic.

Among other things the company wanted to know what part private automobiles play in transportation and whether parked automobiles carry a sufficient number of persons to justify their private-garage use of much-needed street space on the badly congested downtown thoroughfares.

The checkers found that 45,961 automobiles entered the district during twelve hours and carried 72,342 persons, an average of only 1.58 persons per automobile, including the driver. It was found also that 14,693 of these automobiles parked at the curb during some time of the day. Thus it was found that the parking of these private automobiles in the 56 square blocks comprising the congested area accommodates only 23,222 persons. That number was only 10 per cent of the persons who entered the district during the twelve-hour period under observation. In short, 10 per cent of the persons entering the district monopolized about one-third of the downtown street space for the storage of their automobiles. The average parking time of automobiles ranged from 45 minutes on Sixth Street to 1 hour and 40 minutes on Market Street.

In the twelve-hour period, 216,350 persons entered the downtown district and of these the street cars and buses carried 129,819 or 60 per cent. During the rush hours 7 a.m. to 9 a.m., the street cars and buses carried 73.5 per cent of all and the street cars alone 65 per cent. The average street car load was 28.5 persons. The buses carried 15,277 persons into the district and with 693 buses entering the average was 22 persons per bus. Service cars, or jitneys carried 6,528 persons in 1,629 cars or only four persons per vehicle.

The 1,221 street cars and buses entering the district carried four times as many people as the 14,532 private automobiles. The elimination of all parking in the downtown district would save five minutes to street car riders in getting into and out of the congested district. Some downtown business men have been reluctant to advocate the abolition of parking, even on very narrow streets. The traffic check made by the railway dispels the theory that parked automobiles are an aid to retail business downtown.

Checkers, who studied the customers of the city's four large department stores during the day, found the total in excess of 120,000 or about five times the total number carried into the district by all the private automobiles. Few persons who use the downtown streets for private garages are potential customers of the stores in the districts. Most of them are employees of various establishments.

Illumination a Feature

AS an added entertainment feature of the American Electric Railway Association Convention at San Francisco, the local committee of the National Electric Light Association will hold over from the convention of that association the special illumination features in the Civic Center so it will be available for display on Monday evening, June 23, following the A.E.R.A. banquet.

Engineers Report on Transit in Philadelphia

J. A. Emery, chairman, Milo R. Maltbie, W. K. Myers and S. M. Swaab, constituting the transit advisory committee to the general conference on the transit situation in Philadelphia, filed their report on May 24. The document covers 151 pages of typewritten text together with 71 tables. The report deals with the principal facts of the transit situation. The members of the committee do not recommend any specific plans for improvements, nor do they attempt to determine what is preferable, believing their action in this respect to follow the purport of the instructions under which they proceeded.

In the discussion of the various plans they illustrated the financial results under certain assumed conditions. They say that no one can predict what terms might be agreed upon between the city and other parties at interest under any one of these plans without knowing specifically the terms and conditions.

In their discussion they used the financial data reported by the Philadelphia Rapid Transit Company for the year 1929, but did not attempt to analyze, audit, or review the data as such criticism would involve among other things the determination of questions at issue in a judicial proceeding and were considered beyond the scope of the inquiry which the members were instructed to conduct. The members of the committee say that it is impossible at this time to make a satisfactory forecast of earnings of the property largely because of changing economic conditions.

Conway Interests Take Philadelphia & Western Railway

Thomas Conway, Jr., and his associates have assumed control of the Philadelphia & Western Railway and will actively direct the management. The company operates a high-speed suburban system running from the 69th Street Terminal, Philadelphia, to Strafford and Norristown, respectively, passing en route through Ardmore, Haverford, Bryn Mawr, Villa Nova, Radnor, and other communities.

For the purpose of insuring continuity of management and policies, the holders of a majority of the total number of outstanding shares of capital stock of Philadelphia & Western are depositing them under a voting trust agreement extending over a period of years under which Thomas Conway, Jr., William L. Butler, Alba B. Johnson, Edgar C. Felton and C. Jared Ingersoll are named as voting trustees. Mr. Conway has been elected chairman and Mr. Butler vice-chairman of the board. They will be the senior executive officers of the company. No changes in the operating personnel are contemplated. John L. Adams will remain as president, reporting to the chairman and the vice-chairman of the board. Mr. Johnson has been associated with the Conway interests in other electric railway properties.

The plan also contemplates that a large block of stock in the Philadelphia & Western will be acquired by the Conway interests.

In 1922, Mr. Conway and his associates took over the management of the Chicago, Aurora & Elgin Railroad, a high-speed suburban system serving the western suburbs of Chicago. During a period of approximately four years of operation of this property by the Conway interests, gross revenues from railway operation were increased 66 per cent, and net earnings, after operating expenses, maintenance and taxes, more than 150 per cent. In 1926, the control of this company was sold to the Insull interests.

Early in 1926 the Conway interests acquired control of the Cincinnati, Hamilton & Dayton Railway and since that time total operating revenues have been increased 22 per cent and net earnings more than 230 per cent. On Jan. 1, 1930, four other electric railway properties were acquired and the name of the company changed to Cincinnati & Lake Erie Railroad, now one of the largest interurban railway systems in the United States.

The Conway interests, through the Thomas Conway, Jr., Corporation, are the developers of Drexel Park, one of Philadelphia's most beautiful suburbs.

Segregation of Ohio Light and Railway Properties

Stockholders of the Pennsylvania-Ohio Power & Light Company, Northern Ohio Power & Light Company, the Ohio Edison Company, the Akron Steam Heating Company, and the London Light & Power Company, all operating in Ohio and owned by the Commonwealth & Southern Corporation, have been informed that the directors of these companies are of the opinion that to consolidate them, thus uniting the electric light, power and steam heating business into one company and to separate the transportation portion of their properties into subsidiary units, will result in increased efficiency and economy of operation and create an electric company with a greater diversity of consumer use than is now possessed by any one of the individual companies. Accordingly a new company will be formed to be known as the Ohio Edison Company, which will also acquire the physical assets of Ohio River Edison Company and the Ohio River Transmission Company, which companies own the power plant and transmission lines now leased to the Pennsylvania-Ohio Power & Light Company. It is also proposed to convey the transportation portion of the the property of these companies to three separate companies, retaining the consolidated company's equity in them through stock ownership.

Milwaukee Rate Case Under Way

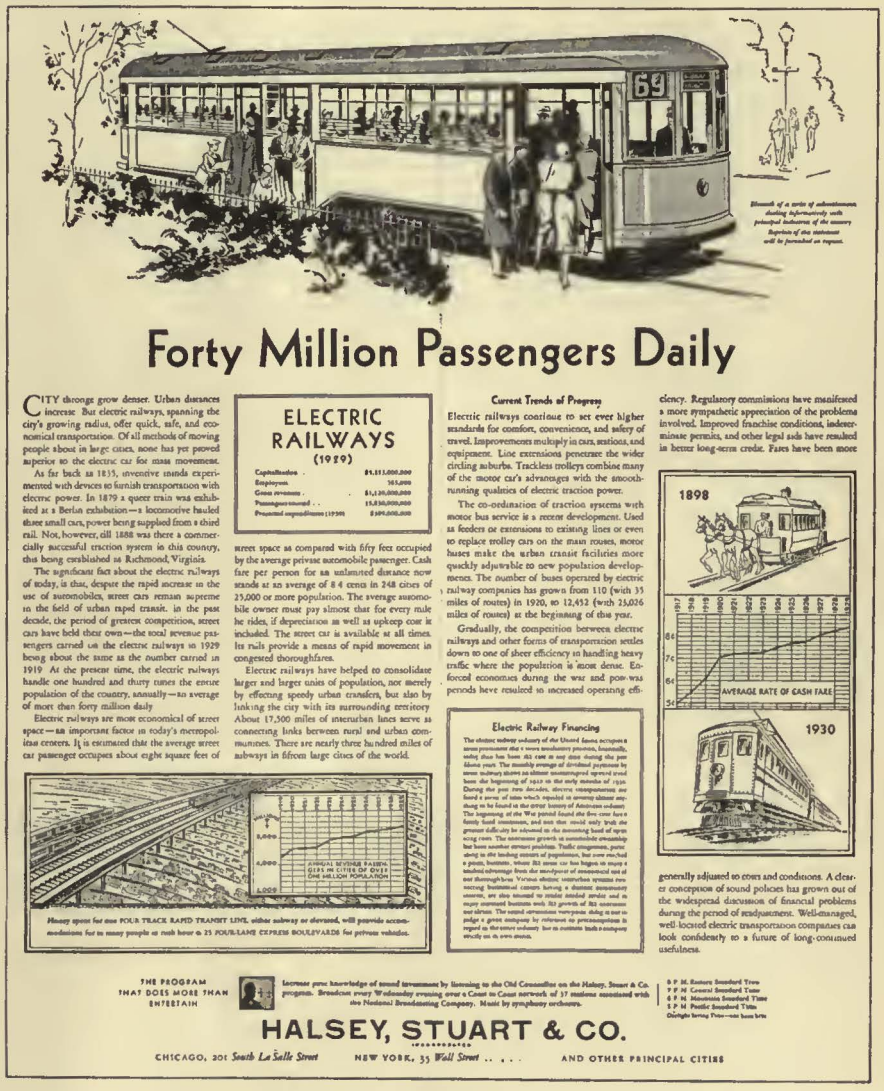
The suburbs of Milwaukee were authorized to intervene in the appeals of the city and the Milwaukee Electric Railway & Light Company from the Railroad Commission's recent street car rate order by Circuit Judge Zimmerman on June 9, at a hearing for preliminary motions in the case at Madison. Trial of the appeals was set for June 18.

Judge Zimmerman also granted the company's plea that its appeal and that of the city be consolidated for purposes of trial. City Attorney Niven said he would not oppose consolidation of the cases if it was understood that the cases were to be presented separately at the same trial.

Nine suburban communities were represented at the trial. The city and the company are appealing from the commission's order as inequitable. The commission, which will be defendant at the trial, was represented by the assistant attorney general at the first trial. The suburbs and other outlying districts, which stand to gain from the commission's order, are intervening to defend the order.

Effective Banker Co-operation

Co-operation from an unusual source in the campaign of the electric railway industry to impress the public with the importance and value of the electric railways is reflected in the accompanying advertisement which appeared over the signature of Halsey, Stuart & Company in the *United States Daily* on May 28, 1930. This advertisement is one of a series dealing informatively with the principal industries of the country. The purpose back of the advertisement was to have it serve as an effective reminder of the important place which the electric railways play in the present transportation system.



Display Ad Emphasizing Importance of the Electric Railways

LATE NEWS

(*Continued from Page 422*)

Cleveland, Ohio — The department store for which the Van Sweringen interests made provision in their Cleveland Union Terminal group will be occupied by the Higbee Company, in business 70 years. The store will be built at the intersection of Ontario Street and the south roadway of the Public Square, above the rapid transit tracks and terminal. Construction contracts are to be let immediately.

✦

Utica, N. Y.—Segregation of earnings of the various units of the New York State Railways as urged by holders of mortgage bonds covering the Syracuse and Rochester units and opposed by holders of bonds on the Utica lines, is under consideration by Judge Bryant of the United States Court.

✦

Tacoma, Wash. — Representatives of Titlow Beach and the far west end of the city have thus far failed to convince Tacoma Railway & Power Company officials that there is enough business out Sixth Avenue beyond Proctor Street to warrant the company putting in a bus service at regular city fares. Commissioner Davisson suggested that the company institute a 90-day trial of the bus line.

✦

Davenport, Iowa—Dissolution of the Tri-City Railway & Light Company of Davenport, Iowa; Rock Island and Moline, Ill., to simplify the financial structure of the United Light & Power Company will be voted upon June 19 at a special meeting of stockholders. Direct control will be placed with the United Light & Power Company by the elimination.

✦

San Francisco, Cal.—Officials of the Southern Pacific Company have announced that hereafter special permits will be issued to blind persons accompanied by "seeing eye" dogs giving them the right to use any of its trains carrying coaches, in club cars of Pullman trains, on the upper deck of ferry steamers and on electric trains.

✦

Concord, N. H. — Robert J. Dunn, who operates a bus company under the name of the Yellow Cab Company here, has been authorized to operate a line between Concord and London, N. H., via the Concord airport. At the Public Service Commission hearing on the matter, the petition was opposed by the Boston & Maine Transportation Company and the Concord Street Railway. The latter's rights are protected in the decision of the commission by a clause that forbids the Yellow Cab Company to take on passengers on any streets where the railway holds franchise rights.

✦

Nashville, Tenn. — Hiram A. Davis, superintendent of the railway department of the Nashville Railway & Light Company, is dead.

✦

New York, N. Y.—In a letter to President Hedley of the Interborough Rapid Transit Company, the Transit Commission has declined to hold a hearing on its proposal to issue $40,000,000 additional first and refunding bonds to finance purchase of additional cars ordered by the commission on April 30. The commission holds the company should amend the petition to conform with the commission's wishes.

✦

New York, N. Y.—More than 85 per cent of the replies received by the Interborough Rapid Transit Company in its poll of passengers on the Sixth Avenue "L" favor retaining this line until it is replaced by a subway on Sixth Avenue, according to a summary made public by the company. In answer to the question, "Do you want the Sixth Avenue 'L' kept in operation until the proposed city subway under Sixth Avenue is in operation?" the following replies have been tabulated: Yes, 12,136; no, 2,085.

✦

St. Louis, Mo.—The Missouri Public Service Commission has approved the plan for the St. Louis Public Service Company and the Peoples' Motor Bus Company to interchange transfers for the convenience of patrons of the St. Louis Municipal Opera, which opened a twelve-week season at the Open Air Theatre in Forest Park on May 30.

✦

New York, N. Y.—Supreme Court Justice Levy has granted the city's application for removal of Interborough Rapid Transit Company's elevated spur in East 34th Street. At present, one-car shuttle train, carrying an average of 140 passengers a day is operated over line.

✦

East St. Louis, Ill.—The City Council has adopted a resolution opposing the application of the East St. Louis Railway for a straight 10-cent fare for adults. Cash fares now are 10 cents but five tokens are sold for 40 cents.

✦

Louisville, Ky.—Director of Works Will has approved the application of the Louisville Railway to abandon the Brook and West Main line, the Bank Street line and the Jefferson Street line west of Seventh Street. Mr. Will has also approved the rerouting of the Portland Street line, the inauguration of a bus route in Portland and a rerouting of the Preston and Main Street line. The changes will be put into effect within 60 days.

✦

St. Augustine, Fla.—Authority has been granted the city of St. Augustine and the St. Augustine Company, controlled by the Florida Power & Light Company, for abandonment of the railway here in an order issued by the Railroad Commission. The line runs from just east on the Matanzas River bridge across Anastasia Island for a distance of 4.8 miles. The commission said its right was not "exclusive and complete," but that it would be for the best interest of the applicants and the public.

✦

St. Louis, Mo.—The St. Louis Public Service Company has been requested to substitute iron for wooden trolley poles from Olive Street between Twelfth Boulevard and Channing Avenue. A recent experiment of suspending trolley wires from the concrete light standards on Olive Street just west of Twelfth Boulevard indicated that these poles were not sufficiently strong to sustain the additional weight.

Brooklyn, N. Y.—The valuation basis to be used in fixing the price to be paid by New York City for elevated lines of the Brooklyn-Manhattan Transit Corporation continues to be one of the main stumbling blocks in the way of unifying the company's rapid transit lines with the city's new subway system, it developed at a conference of city and state transit officials.

✦

Milwaukee, Wis. — Latest appraisals of the estate of John I. Beggs, long president of the Milwaukee Electric Railway & Light Company, place its value at $54,800,000.

✦

Anderson, Ind.—Receivership proceedings of the Union Traction Company were advanced in Madison County Circuit Court on June 6 when Judge Carl F. Morrow entered a decree with an order to the receiver to sell all property of the company at auction here on July 2. Through deals made direct with bondholders, the Insull interests in the last year have a contract to buy more than 60 per cent of the outstanding bonds of the Union Traction system, and with these in their possession will be in an advantageous position as prospective purchasers.

✦

Chicago, Ill.—First prize in the electric railway posters and cards division competition of the Public Utilities Advertising Association was won by the Chicago Rapid Transit Company.

✦

Manchester, N. H.—The Manchester Street Railway, now being operated by the Public Service Company of New Hampshire, celebrated the 35th anniversary of the electrification of the road on June 8. Officials of the company and city government leaders rode on a new 44-passenger trolley over the route followed by the first car 35 years ago.

✦

New Haven, Conn.—Employees of the Connecticut Company have agreed to a renewal of the present wage scale for one year from June 1. Operators of cars and buses, shop workers and power house men are included. Recently the men, through their executive committee, asked for an increase and changed working conditions. Following conferences it was decided to vote again with the result that the former scale has been renewed.

✦

New York, N. Y. — Additional testimony has been furnished the Mayor's Taxicab Commission favoring a limit on the number of cabs and an increased fare, by Ernest H. Miller, president of the Parmelee Transportation Company, who urged the adoption of a uniform rate of 25 cents for the first quarter mile and 5 cents for each succeeding quarter. He also urged the number of cabs be limited to 15,000.

✦

Alexandria, Va.—The two Alexandria transportation companies, after succeeding on May 13 in a plea for increased fares to become effective on June 10, withdrew their application for the increase before the State Corporation Commission on June 5. The fare was to have been 8 cents. The communication from the companies stated that a decision had been reached "to give the intrastate rates heretofore existing a further trial, hoping that the operation may be continued without the necessity for any increase."

(*Late News Continued on Page 426*)

More Convenient Service by Bus in Schenectady

The Public Service Commission has authorized the Schenectady Railway to operate buses in place of cars on the Rosa Road-Nott Street-Erie Boulevard line and the Crane Street line. The city authorities have consented.

Buses on the Crane Street line will be used on practically the same route over which cars now operate and they will also pass through certain streets not now served by the trolley line. The Rosa Road line will supplement existing trolley lines and serve a section of the city not now conveniently reached by the trolley cars. Transfers are to be exchanged between the trolley cars and the buses.

The bus service on the Crane Street line will provide through service from the Mount Pleasant section to the General Electric Works and an alternate route is provided over the Crane Street line so that special shop trips can be made over a more direct line, thereby saving about twelve minutes over present operation. There will be a ten-minute headway and four buses will be used.

The Rosa Road line will furnish service to residents of that section now required to travel at least two blocks to the Grand Boulevard line. This will afford a more direct and time saving trip between that section and the American Locomotive and the General Electric plants.

City and Railway Differ About Madison Fares

Officers of the Madison Railways and city officials have clashed over the proposal by the city that the company try a $1 weekly pass in the hope of increasing its revenue. The company wants a straight 10-cent cash fare and a fare of 5 cents for school children. The present schedule is 10 cents cash, 16 tokens for $1, three for 25 cents and a 5-cent fare for school children.

At the hearing before the Railroad Commission on June 9 Dudley Montgomery, vice-president and general manager of the company, declared that if a weekly pass were substituted for the sale of tokens the passenger revenues would still further decrease. City Attorney Lewis insisted that the company should at least try the pass. City officials contend that a further increase in fares will tend to drive patronage away. The hearing may not be resumed until July.

Separation of Suburban from Through Traffic

In its great Philadelphia station project, the Pennsylvania Railroad is planning to separate to a very large extent the suburban from the through traffic. The through traffic trains will all be handled at the main station, so constructed as to allow trains to go to or from the East, West, South or North, without reversing direction, as is now required. Suburban trains, serving territory within 30 miles of Philadelphia west of the Delaware River, will all stop at the main station, but they will then continue on about a mile further to a new underground suburban station which is being specially constructed at Sixteenth Street and the Parkway, close to the long-established downtown business center. An overwhelming proportion of the commuters and frequent riders on these trains will use the underground station, while only a few will get on or off at the main station. Thus, the principle of separation or segregation, as between short distance and long distance travel, will be applied on a larger scale to a great railroad terminal project.

N.E.L.A. Delegates Leave New York

Headed by Matthew S. Sloan, president of the National Electric Light Association, who is also president of the New York Edison and affiliated electric companies, 210 members of the National Electric Light Association left the Pennsylvania station in New York on June 12 on a special train known as the "Blue Special" for the Pacific Coast, where they are scheduled to arrive June 15, the day before the 53rd annual convention of the association will begin.

Buses to Replace Rochester-Buffalo Railway Service

The Public Service Commission has granted the application of the Rochester, Niagara Falls & Buffalo Coach Lines, Inc., for certificates for operation of bus lines between Rochester and Buffalo and between Rochester and Niagara Falls.

The new company was organized in the interests of the Rochester, Lockport & Buffalo Railroad. The trolley operates 54 miles between Rochester and Lockport, running thence over the International tracks to Buffalo, carrying freight and passengers. The coach company is to be financed by the railroad and it will operate four buses at the outset, two between Rochester and Buffalo and two between Rochester and Niagara Falls. This number will be increased as service demands. It was stated at the hearing that due to competition with private automobiles, expense of grade crossing eliminations, signal installations, which it anticipates, together with possible paving costs in villages the railroad can not continue operation, and for that reason it organized the coach company. The company's petition amounts to a gradual substitution of bus service for trolley service between Rochester and Lockport and extension of the bus route from Lockport into Buffalo.

The company's petition to operate between Lockport and Buffalo was opposed by the Western New York Motor Lines, the Buffalo Transit Company and the International Railway. The Western New York line claimed the operation would be in direct competition with its buses between Rochester and Buffalo, but this contention, the commission holds, is not sustained by the facts. The Buffalo Transit Company claimed that there was adequate service between Lockport and Buffalo. The commission finds that the two lines would parallel for about 13 miles between Lockport and Sheridan Drive, but the new company is to be restricted and no passengers are to be carried boarding cars in either city for transportation to or from Lockport or Buffalo. The International Railway said that transportation facilities between Buffalo and Lockport are entirely adequate.

New Diesel Bus Tested

Some 40 bus operators and press representatives including one from ELECTRIC RAILWAY JOURNAL were guests of the Mercedes-Benz Company on June 11 at a demonstration and test of a Diesel-engine powered bus just received from the German factory of the company. The bus was operated on a run of about 30 miles at varying speeds in traffic. Its performance appears to be approximately equal to that of a gasoline bus of equal size and motor rating. Control of the vehicle is through a standard gear set and accelerator pedal. Low-grade fuel oil was used. The exhaust appeared practically clear and odorless.

The power plant consists of a six-cylinder Diesel engine with bore of $3\frac{1}{8}$ in. and stroke of $5\frac{7}{8}$ in. The weight is 1,400 lb. At the maximum speed of 1,650 engine r.p.m., the rating is 72 hp. The fuel is supplied to the cylinders by the usual fuel pump and through injection nozzles, and is fired by the heat generated during compression of the engine. To start, a storage battery operated starting motor of conventional type is used with an electric preheater warming "glow plugs" in the ignition chamber to create the necessary temperature for the initial explosions.

The engine has two blocks of three cylinders each, and the crankshaft is of the seven-bearing type and carries a vibration damper. The rods are of steel of double T section, while the pistons are of aluminum alloy. In the cylinder heads are an inlet and an exhaust valve of the overhead type for each cylinder, the fuel injector nozzle and the pre-combustion chamber. The valve mechanism is driven by push rods and rocker arms from the camshaft through helical gears. The water circulation system in similar to that in general use with gasoline engines for bus service.

It is stated that the engine and vehicle are now in production for sale in the American market. The National Railway Appliance Company of New York is the sales agent for the United States.

Detroit's Trackless Trolley To Be Fittingly Installed

Ceremonies befitting the occasion are planned for the opening by the Department of Street Railways, Detroit, Mich., on June 16 of service by trolley bus over a route of more than 5 miles on Plymouth Road between Grand River Avenue and the city limits. It is expected that Henry Ford will be among the prominent citizens who will attend. The city recently ordered six trackless trolleys from the Twin Coach Corporation.

H. L. Miller in New Post

H. L. Miller, has accepted a position with the Pettibone Mulliken Company as manager of electric railway division. Mr. Miller studied civil engineering at Bucknell University and joined the Engineering Corps of the Pennsylvania Steel Company, Steeton, Pa., on construction and plant maintenance in 1905, entering the frog and switch department of the company in 1907, resigning this latter position in 1910 to accept a position as draftsmen with The Buda Company at Harvey, Ill., with which he served continuously until March of this year. At the time of his resignation he held the position as chief engineer.

Trolley Buses for Queens

The Brooklyn & Queens Transit Corporation will ask the Board of Estimate for authority to replace some of its trolleys in the Borough of Queens with trolley buses. Officials of the company, promising closer co-operation with the Queens Highway Bureau, have agreed to aid in the shifting of the tracks on Corona and Way Avenues, Woodhull Street, Flushing Avenue and Metropolitan Avenue.

President Menden said he believed the most feasible plan is to substitute trolley buses for trolleys, so as to permit the removal of tracks from main thoroughfares. This would expedite traffic and would result in lower operating expenses for the company. The company plans to try out the trolley buses on the Junction Avenue route in Corona.

Accident Record Bettered in Kansas City

Four classes of accidents were reduced by the Kansas City Public Service Company, Kansas City, Mo., during 1929. Fell-in-car accidents were lower than they have been for four years. Collision-with-person accidents were reduced to the lowest point in seven years. Car collisions have been lowered more than 50 per cent in the last four years. The blind accident record showed an improvement. Vehicle collisions showed no improvement. Boarding and leaving accidents, and those involving injury by gates and doors, all increased. Two hundred and seventy-seven car and coach operators went through the entire year without an accident that was avoidable. Prizes given by the company are considered largely responsible for improvements in the accident record.

Yellow Coach Reports Best Month in History

General Motors Truck reports Yellow Coach deliveries for May as the largest in the history of the company, deliveries for the month amounting to more than $3,500,000. This sum represents sale of 403 buses, mostly of the large capacity type. The total compares with deliveries valued at $1,535,000 for the corresponding month of last year. Increased sales as reported are due to large orders recently secured from Public Service Co-ordinated Transport, the Greyhound System, Fifth Avenue Coach and other prominent motor coach operators. Coaches ordered and scheduled for delivery in June compare favorably with totals for May.

LATE NEWS

(*Continued from Page* 424)

Chicago, Ill. — The popularity of the service on Diversey Avenue has necessitated an increase in the number of buses originally planned by the Chicago Surface Lines on streets in the northwest section. More buses have been ordered and the installation of service on other streets covered by the order of the Commerce Commission will begin at once. Trolley bus service on Central Avenue, from Lexington Street to Milwaukee Avenue, was started on June 8. The streets, in addition to Diversey and Central Avenues, on which trolley bus service is to be installed are as follows: Narragansett Avenue, North Avenue, Elston Avenue. Belmont Avenue is being supplied with service by means of gasoline buses. Gasoline bus service also will be established on Irving Park Boulevard from Neenah to Harlem Avenue.

✦

New York, N. Y. — The *Financial World* for June 11 is the eighteenth annual public utility review. In addition to an analysis of more than 150 utilities, the issue contains articles entitled: "Forecasting Electrical Growth"; "The Growing Natural Gas Industry"; "Valuing Public Utility Securities"; "Ventures Into Foreign Fields"; "A Study of Utility Holding Companies," and "Analyses of More Than 150 Utilities."

✦

Detroit, Mich.—Recall petitions seeking to remove a mayor from office are being circulated for the first time in Detroit's history. Charles Bowles is the mayor. He was elected last fall to succeed Mayor Lodge on a platform calling for the quick and thorough cleaning up of the city. Now he faces removal on charges that he has permitted Detroit's underworld to ply its illicit trade openly. Another factor in the recall movement was Mayor Bowles' recent dismissal of Frank Couzens, son of Senator Couzens, from the street railway commission in charge of Detroit's municipal railway. The commission, composed of three men, recently voted to increase fares. Mr. Couzens protested vigorously.

✦

Portland, Ore.—Proposal of the Pacific Northwest Public Service Company to extend its 10-cent car zone to nearby points on its three main interurban electric lines and extend full transfer privileges has been discussed by company officials with members of the public service commission. Members of the commission pointed out that Milwaukie residents now riding on the fixed terminals plan will have to pay 10 cents from Milwaukie to First and Alder Streets instead of 7 cents as at present, but the company officials said that under the 10-cent zone plan a Milwaukie resident could ride to any point in Portland for the dime, whereas now, because of the fact that no transfers are granted at this fare, he would have to pay 17 cents.

✦

Greenville, S. C.—The Piedmont & Northern Railway has presented motions in Federal Court here asking that parts of the bill of complaint in the suit of the Interstate Commerce Commission and a group of steam railways against the electric line be stricken out. The commission and steam railways seek to secure an injunction against the $15,000,000 expansion program of the Piedmont & Northern. The case will be tried on its merits in Federal Court during the summer. The Piedmont & Northern is planning immediate resumption of work on the Spartanburg-Gastonia link.

Rockaway, N. Y. — Twenty-two municipally owned buses have been put in operation by the Department of Plant and Structures between Far Rockaway and Neponset, Queens. Soon after municipal operation started the police ordered off the streets all buses of eight non-licensed lines. The present arrangement will continue until satisfactory plans can be outlined for a permanent system. Mayor Walker has indicated that the general report on the bus situation soon to be submitted by the Board of Transportation would clarify the Rockaways problem.

✦

Boston, Mass.—The trustees of Eastern Massachusetts Street Railway took no action on June 10 on the quarterly dividend of $1.25 on adjustment stock due at this time.

✦

New York, N. Y.—The Transit Commission's suit to compel the Interborough Rapid Transit Company to live up to the 5-cent fare requirements of its contract with the city on subway and elevated lines and the company's litigation for a 10-cent fare on its elevated routes will make no further progress until fall. Both suits have yet to reach the Appellate Division calendar and that court is about to adjourn.

✦

Toronto, Ont.—Their names referred back twice without discussion and rejected entirely by the City Council at a special meeting, W. C. McBrien, former Comptroller Albert Hacker and S. J. McMaster, have been renominated by the Board of Control as Toronto Transportation Commissioners. The feeling prevails that some members of Council who voted against the recommended Commission will now change their votes. When the Board of Control met it decided not to name the commissioners, but later reconsidered its decision, and after several fruitless attempts to select other commissioners from names already suggested to it, renominated its rejected selections.

✦

Laconia, N. H. — The Laconia Car Company has voted to pay a liquidating dividend of $10 to preferred stockholders.

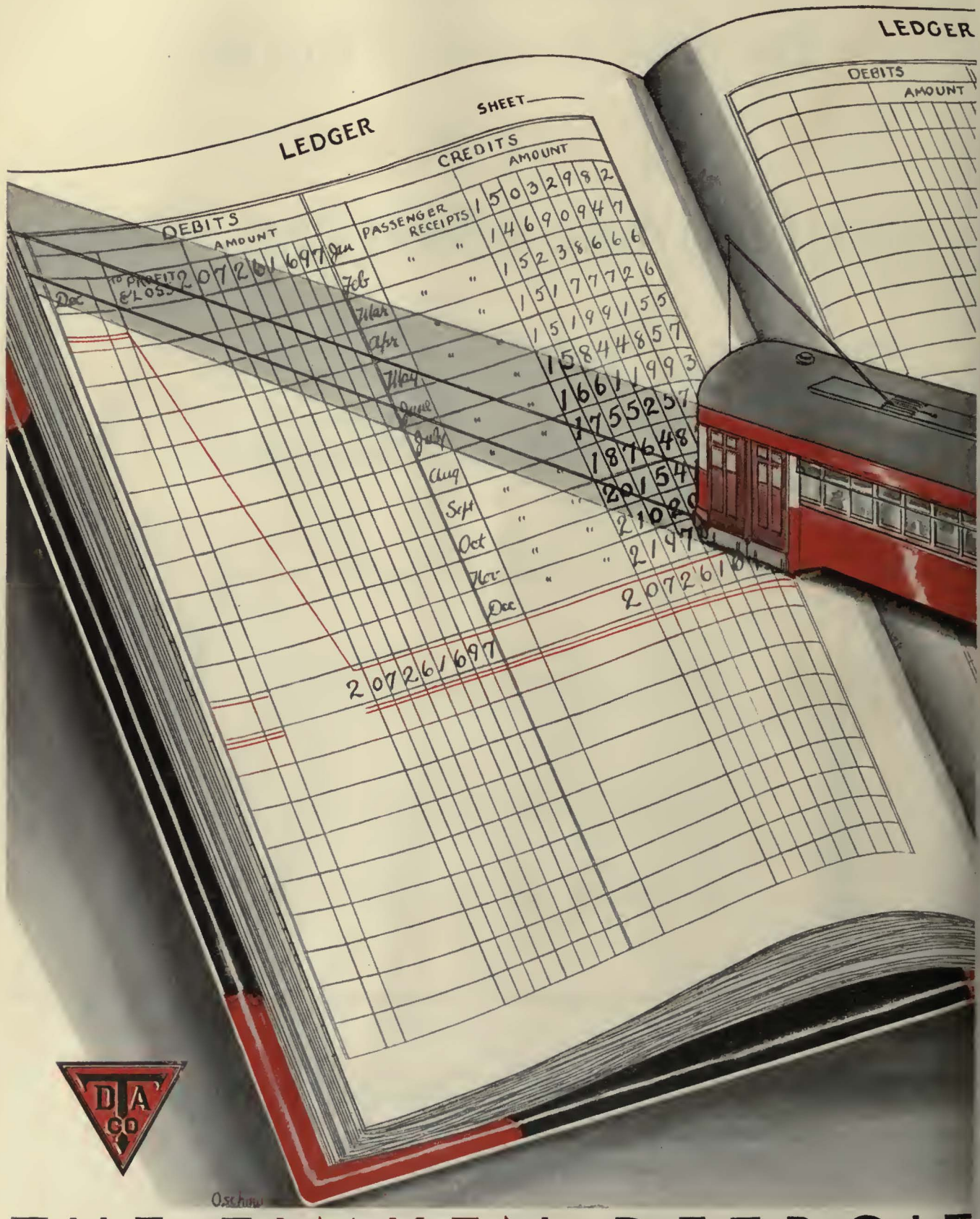
✦

Huntington, W. Va.—No further opposition by the city or business interests to rate increases sought by the Ohio Valley Electric Railway is planned upon the showing of the statistician's report civic and business leaders voted favorably on a resolution favoring relief for the railway and voiced their accord with any decision of the Public Service Commission.

✦

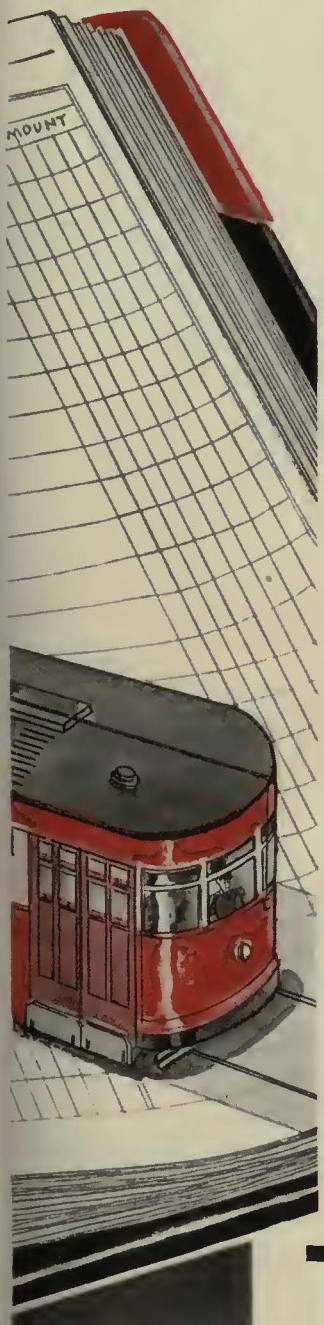
Winnipeg, Man.—An early decision regarding the application of the Winnipeg Electric Company for an increase in fares and relief from certain tax imposts, is indicated in the report of the auditors appointed by the City Council to examine the company's books. This report has been presented to the special committee of the City Council. Representatives of the company were present when the report was read to the committee, but a copy was not then available to the company. Despite this, company officials feel that the findings establish the fact that the company is entitled to relief much greater than it asked, and that the report confirms the facts set out in the company's application.

Make those



THE TIMKEN DETROIT

black figures bigger and blacker



You improve the quality of the product you sell, and cut your cost of doing business by putting Timken Worm Drive Trucks under your cars.

Timken Worm Drive brings street cars into the front rank of quiet, swift dependable transportation.

Timken Worm Drive reduces weight; lowers maintenance costs; cuts power consumption; speeds up schedules.

Timken Worm Drive is logical.

American Electric Railway Association
San Francisco, June 23rd to 26th
Headquarters—Hotel St. Francis

TIMKEN worm drive TRUCKS

for electric railway cars

AXLE CO., DETROIT MICH.

No. 327-M Special seats are in use by the Virginia Electric and Power Company, which was awarded the Charles A. Coffin medal for 1928.

DESIGNED FOR INTERURBAN USE

THE 327-M Special is a popular Heywood-Wakefield electric railway seat. The deep, double spring construction of the cushion and the restful pitch of the spring-filled backs make this attractive style one of the most comfortable interurban seats ever offered.

The 8M5 Special is a de luxe interurban type with spring-filled seats and backs. It has been purposely designed and built to withstand the most severe use and abuse, while delivering trouble-proof service year after year.

Our car seating experts will be glad to assist in solving your equipment problems. This service is yours without cost or obligation. Just write to the nearest Heywood-Wakefield sales office.

HEYWOOD-WAKEFIELD COMPANY

Boston, Massachusetts

516 West 34th St., New York City
439 Railway Exchange Bldg., Chicago, Ill.
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
H. G. Cook, Hobart Bldg., San Francisco, Calif.
The G. F. Cotter Supply Co., Houston, Texas
The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada

the problem of

ion

Topic 1. Improving Design to improve transportation Service.

2. Increasing Speed of Operation.

3. Reducing Vibration and Noise.

4. Improving the Riding Qualities of Trucks.

5. Progress in Trolley Bus Design.

6. Meeting the Power Demand.

7. Improving the Bus to increase its Usefulness.

8. Advancement in Structural Design of Vehicles.

9. Increasing the Efficiency of Rapid Transit.

When a company is equipped with "Tool Steel" gears and pinions, gear maintenance costs practically disappear

This is what one line is doing to reduce future maintenance.

1913 – "Tool Steel" gears specified on 240 new motors

1914 – " " " " 340 " "

1916 – " " " " 400 " "

use of the latter suggested.

United Railways & Electric Company, Baltimore, Md., noted in the ELECTRIC RAILWAY JOURNAL of Dec. 9 as purchasing one hundred double-truck, semi-convertible, four-motor pay-within cars, announces that contracts have been awarded for the following equipment:

Car bodies and trucks	J. G. Brill Company
Motors	General Electric Company
Air brakes	Westinghouse Traction Brake Company
Seats	J. G. Brill Company
Signs	Hunter Illuminating Car Sign Company
Registers	International Register Company
Fare boxes	Johnson Fare Box Company
Gears and pinions	Tool Steel Gear & Pinion Company
Electric heaters	Consolidated Car Heating Company
Wheelguards	Wendell & MacDuffie Company
Car wheels	National Car Wheel Company
Ackley brakes	National Brake Company
Inspection	R. W. Hunt & Company

TRADE NOTES

Ohio Brass Company, Mansfield, Ohio, has received an ord... Boston Elevated Railway for 5000 trolley

And they have carefully tested other grades!!

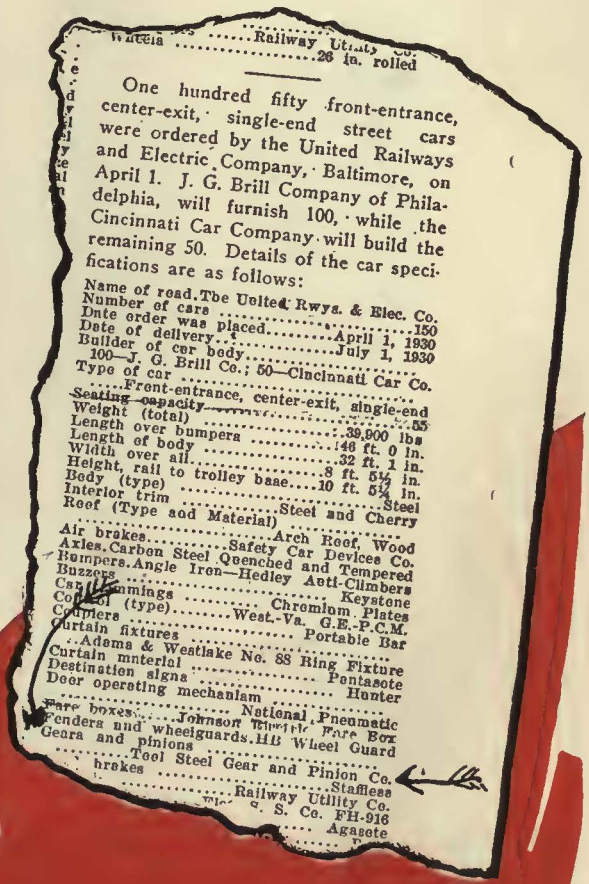
QUALITY.

and now

1930 "Tool Steel" gears
specified on 560 new motors.

NOTE: The Pinions bought in 1913-1914, 1916 are still only about ⅓ worn out.

The Tool Steel Gear & Pinion Co.
CINCINNATI—OHIO



Railway Utilities Co.
26 in. rolled

One hundred fifty front-entrance, center-exit, single-end street cars were ordered by the United Railways and Electric Company, Baltimore, on April 1. J. G. Brill Company of Philadelphia, will furnish 100, while the Cincinnati Car Company will build the remaining 50. Details of the car specifications are as follows:

Name of road.The United Rwys. & Elec. Co.
Number of cars 150
Date order was placed.....April 1, 1930
Date of delivery.....July 1, 1930
Builder of car body.....
100—J. G. Brill Co.; 50—Cincinnati Car Co.
Type of car .....
Front-entrance, center-exit, single-end
Seating capacity.....55
Weight (total) .....39,900 lbs
Length over bumpers .....46 ft. 0 in.
Length of body .....32 ft. 1 in.
Width over all.....8 ft. 5½ in.
Height, rail to trolley base.....10 ft. 5¼ in.
Body (type) .....Steel
Interior trim .....Steel and Cherry
Roof (Type and Material) .....
Arch Roof, Wood
Air brakes.....Safety Car Devices Co.
Axles.Carbon Steel Quenched and Tempered
Bumpers.Angle Iron—Hedley Anti-Climbers
Buzzers .....Keystone
Castings .....Chromium Plates
Control (type).....West.-Va. G.E.-P.C.M.
Couplers .....Portable Bar
Curtain fixtures .....
Adams & Westlake No. 88 Ring Fixture
Curtain material .....Pantasote
Destination signs .....Hunter
Door operating mechanism .....
National Pneumatic
Fare boxes.....Johnson Automatic Fare Box
Fenders and wheelguards.HB Wheel Guard
Gears and pinions .....
Tool Steel Gear and Pinion Co.
Heaters .....Stafflese
Railway Utility Co.
G. E. & S. Co. FH-916
Agasote

40 New Cars for Des Moines

One of the 40 New Type, Light Weight, One-Man Cars recently built for the Des Moines Railway Company.

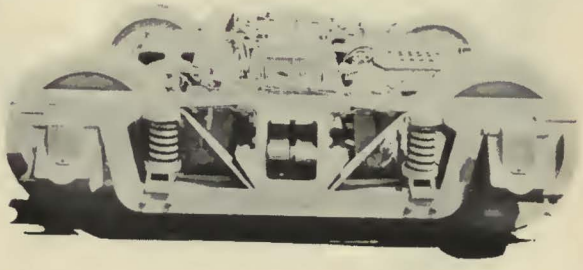
NOTE the well-proportioned design of these cars—the low, streamline effect obtained by the balanced relation of roof height, letter board, windows, and side sheets—the wide single sash windows that give maximum unobstructed vision.

With a 42′ 0″ overall length, these cars seat 51 passengers comfortably with a 31 inch spacing between seats. Low step heights are provided—15 and 13 inches respectively—with step wells and folding doors.

Every feature from the exterior design to the interior finish and equipment has been chosen with regard to pleasing appearance and passenger comfort.

The color scheme adds an unusually pleasing tone to the interior of these cars. An enamel finish has been used with a light cream headlining shading to dark brown wainscoting that matches the brown leather, semi-bucket seats.

Dome lights over the center line of seats provide excellent and attractive lighting.



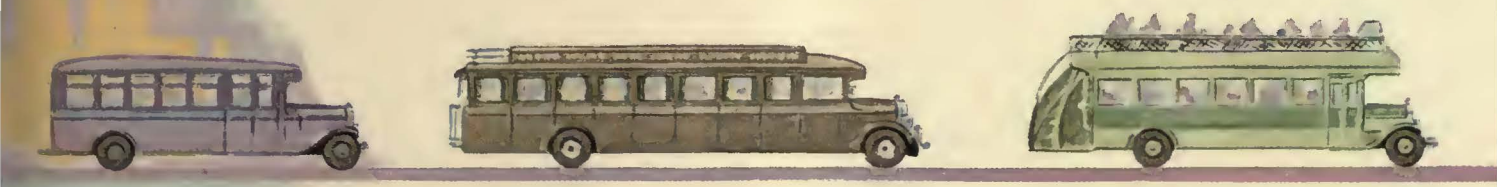
Cummings No. 64 Equalizer type Trucks contribute to the lightweight, quiet, smooth riding qualities of these cars.

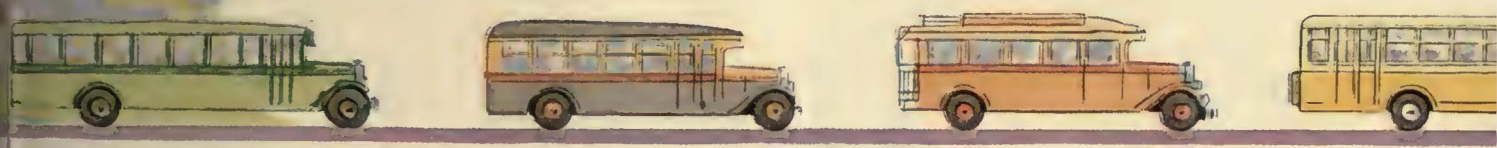
built by

CUMMINGS CAR AND COACH CO.

111 W. Monroe St. Chicago, Ill.

A Coach for every class of service





Yellow Coaches

YELLOW COACH

A COACH FOR EVERY

type U

For Light Traffic
For Frequent
Headways

City Service Coach
21-23 passengers

Parlor Coach
16 passengers

Standard Observation
Parlor Coach
21 passengers

Brief Specifications

WHEELBASE: Standard 185"; Special 215"
ENGINE: 6 cylinder. Overhead valve 90 hp.
FRAME: Pressed steel. Rigid type. 7 cross members
AXLE: Underslung worm and wheel
BRAKES: 4 wheel duplex hydraulic with vacuum booster
TRANSMISSION: Unit power plant type, 4 speed
GENERATOR: 12 volt, 600 watt
TIRES: Standard. 34 x 7.5 balloon; Dual rear
Special. 36 x 8.25 balloon; Dual rear
CASCLINE TANK: 46 gal. capacity

Complete body and chassis specifications on request

Special Observation

CLASS OF SERVICE

type W

For
De Luxe Express Service
Feeder Line Service
Small City Service
Intercity Service

Parlor Coach
17 passengers

City Service Coach
21-23 passengers

Special Observation
Parlor Coach
215″ wheelbase
25 passengers

Standard Observation
Parlor Coach
21 passengers

City Service De Luxe

Brief Specifications

WHEELBASE: Standard 185″; Special 215″
ENGINE: 8 cylinder. V type; 95 h.p.
FRAME: Pressed steel. Rigid type. 7 cross members
AXLE: Underslung worm and wheel
BRAKES: 4 wheel duplex hydraulic with vacuum booster
Emergency brake on double drums on propellor shaft
TRANSMISSION: Unit power plant type, 4 speed
GENERATOR: 12 volt, 600 watt
TIRES: Standard 34 x 7.5 balloon; Dual rear
Special 36 x 8.25 balloon; Dual rear
GASOLINE TANK: 46 gal. capacity

A COACH FOR EVERY

type Z 29

A Nationally Famous Model—
Now Available With Many
New And Noteworthy
Improvements

City Service Coach

Provides a maximum of comfort for 29 seated passengers with unusually liberal seat spacing (31 inches). An alternative arrangement provides seats for 31 passengers or for 29 passengers with air operated rear door. Air operated front door standard.

Chassis

WHEELBASE: 225″
ENGINE: 6 cylinder. Sleeve valve; 100 h.p.
AXLES: Front—Heavy reverse Elliott type
Rear—Underslung worm and wheel
BRAKES: 4 wheel Westinghouse air. Gun iron drums with easily removable brake liners
TRANSMISSION: 4 speed midship mounting, 3 point suspension
GENERATOR: 12 volt; 600 watt
TIRES: 40 x 9 balloon; Dual rear
Also available Type 616—150 h.p. overhead valve engine at

Body

Rigid all-metal construction. (Chiefly duralumin and other aluminum alloys.) A great achievement in body building. Remarkably strong and enduring. Maintenance greatly simplified and upkeep costs greatly reduced. Built throughout of standardized parts and sections which fit as accurately as the chassis parts. Sections easy to renew with unskilled labor. Many parts interchangeable.

Complete chassis and body specifications

CLASS OF SERVICE

type Z 38

A Powerful Fast Accelerating
Mass Transportation Vehicle
With Capacity To Handle
Maximum Peak Loads

Double Deck Coach

Seats for 62 to 70 passengers. Available with open or covered upper deck.

City Service Coach

with comfortable seats for 38 passengers and ample room for standees. Front and rear doors air operated.

Chassis

WHEELBASE: 240"

ENGINE: 6 cylinder. Overhead valve. Type 616 150 h.p. Silenced with Zero-lash adjuster. Counter-weighted crank-shaft with harmonic balancer. Dual ignition, dual down draft carburetors, dual fuel pumps, dual coils and condensers.

AXLE: Full floating worm drive

BRAKES: 4 wheel Westinghouse air. Gun iron drums with easily removable brake liners

TRANSMISSION: 4 speed midship mounting

GENERATOR: 12 volt, 750 watt

Body

Same design and construction as Z-29. Advantages of this type all-metal body include big reduction in excess dead weight, great structural strength, increased safety and protection against fire. Being all metal it has longer life and greater endurance and greater resistance against disintegration from the elements. It has thinner wall sections and more body and revenue area, greater window area and improved vision for passengers, with greatly simplified maintenance.

A COACH FOR EVERY

type 250

For De Luxe Mass Transportation in Cross Country Service. Intercity, Interstate and *Transcontinental.*

Observation Parlor C

33 passengers. Reclining chairs auxiliary folding seats for seve ditional passengers.

A 29 passenger parlor coach o type also available on the 225" w base standard chassis with 616 150 h.p. engine.

Chassis

WHEELBASE: 250"

ENGINE: 6 cylinder. Overhead valve. Type 616 150 h.p. Silenced with Zero-lash adjuster. Counterweighted crank-shaft with harmonic balancer. Dual ignition, dual down draft carburetors, dual fuel pumps, dual coils and condensers.

AXLE: Bevel gear, full floating

BRAKES: 4 wheel Westinghouse air. Gun iron drums with easily removable brake liners

TRANSMISSION: 4 speed, unit power plant type

GENERATOR: 12 volt, 750 watt

TIRES: 40 x 9.75 balloon; Dual rear

Gasoline capacity: 140 gal. Dual tanks

Body

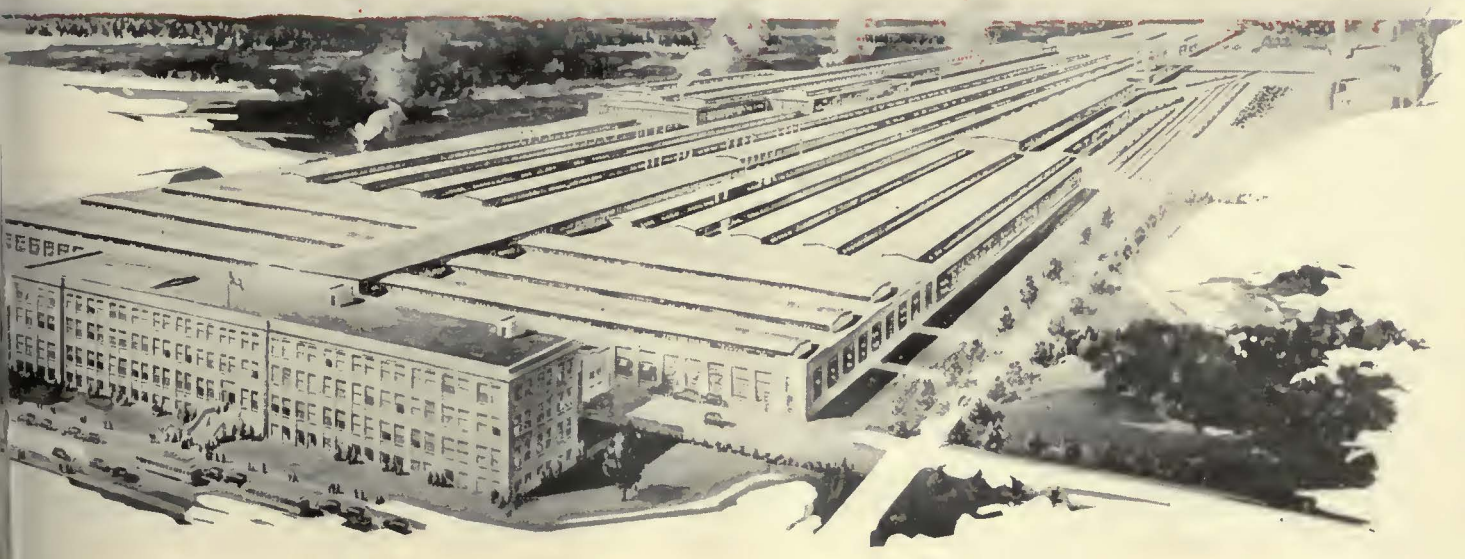
Fully de luxe. Overall coach length 32'; width 96"; headroom 79"; 40" reclining chairs with individual backs and head rests. Interior luggage rack. Dual Tropic-Aire Heaters

Complete body and chassis specifications on request

CLASS OF SERVICE

The Greatest Name in Commercial Highway Transportation is back of

YELLOW COACHES



THE reason for Yellow Coach performance is easy to understand when you are familiar with the unexcelled engineering, research, testing and manufacturing facilities that play an essential part in the production of Yellow equipment.

Yellow Coaches are built in a great new $8,000,000 plant at Pontiac where there is every modern facility for efficient, economical production. Among production men, the General Motors Truck Company plant is rated as one of the most modern and efficient, as well as the largest plant in the world devoted exclusively to the production of commercial transportation vehicles.

To really appreciate its size, its capacity and its flexibility of operation and the modern methods employed to reduce labor waste and improve efficiency of production one must visit and inspect this great plant in person.

Only by coming to Pontiac, as many Coach operators do, can these economic advantages be properly demonstrated and visualized and their relation to the progress of highway transportation be correctly valued and understood.

YELLOW COACH FLEETS
Of 40 Or More Coaches

(April 30, 1930)

Public Service Co-ordinated Transport	1,705
Chicago Motor Coach	549
Greyhound System	466
Philadelphia Rapid Transit	465
Fifth Avenue Coach, New York	254
Peoples Motorbus, St. Louis	196
Toronto Transportation Commission	120
Illinois Power & Light	114
Eastern Mich. Motorbuses, Detroit	113
Department of St. Rwys., Detroit	106
Washington Railway & Electric Co.	86
Connecticut Co., New Haven	82
International Railway Corp., Buffalo	81
New England Transportation Co., Boston	81
Montreal Tramways	70
Milwaukee Electric Rwy. & Light	66
Pittsburgh Motor Coach Co.	59
Camel City Coach, Winston-Salem, N. C.	56
Shore Line Motor Coach, Hammond, Ind	56
Northern Ohio Power & Light, Akron	55
Blue & Gray Transit, Charleston, W. Va	54
Provincial Transport, Montreal	45
Washington Rapid Transit	45
Worcester Consolidated Street Rwy	45
Community Traction Co., Toledo	44
Metropolitan Motor Coach, Chicago	43
Boston & Maine Transportation	42
Union Pacific System	42
Detroit Motorbus Company	40
Wisconsin Power & Light Co.	40

and over 400 other Yellow Coach fleets of less than 40 coaches

First Choice of America's Leading Operators

YEAR after year the electric railways have consistently bought far more Yellow Coaches than any other make.

Year after year, Yellow consistently leads among steam railway operators.

Far more Yellow Coaches are placed in operation every year, *in all classes of service*, than any other make of coach.

It is this combined judgment of so many successful and experienced operators that furnishes conclusive evidence of the superior operating value of Yellow equipment.

For the true *test* of leadership is *performance*.

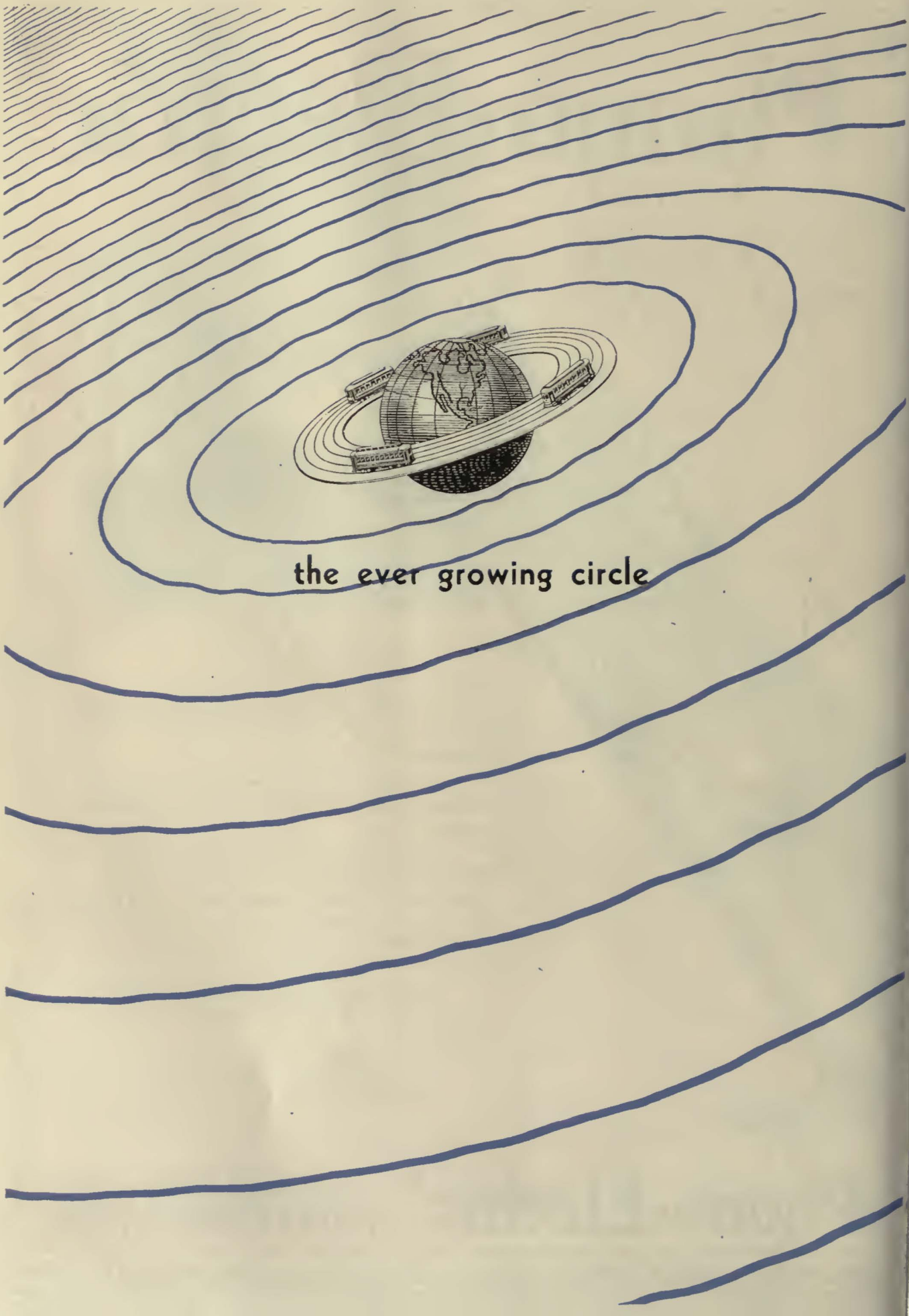
That Yellow operators know and appreciate the value of Yellow Coach dependability, endurance and low operating costs is proved conclusively by this significant fact—

80 per cent of Yellow Coach sales are repeat sales. Yellow Coach operators choose Yellow over and over and over again.

It is logical to select equipment that has back of it such convincing proof of leadership.

GENERAL MOTORS TRUCK COMPANY
Pontiac, Mich.
Subsidiary of Yellow Truck & Coach Manufacturing Co.

YELLOW COACHE


the ever growing circle

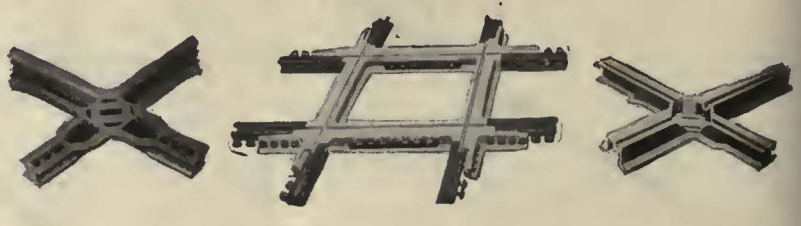
TRACK maintenance—drops a Heavy Burden

NO LONGER is track maintenance on the fifty leading roads that have installed the new Wharton crossing heavily burdened with excessive crossing costs.

For these roads are no longer dependent on crossings not scientifically designed and engineered to meet the severest tests of service.

The new Wharton crossing is the first and only crossing scientifically designed and built to withstand the ceaseless pounding of locomotives, cars and loadings. It will give far longer service, and appreciably lower crossing maintenance under any operating condition.

Learn more about the design of the new Wharton crossing and the service it is giving on leading roads. Ask for bulletin 1 C.

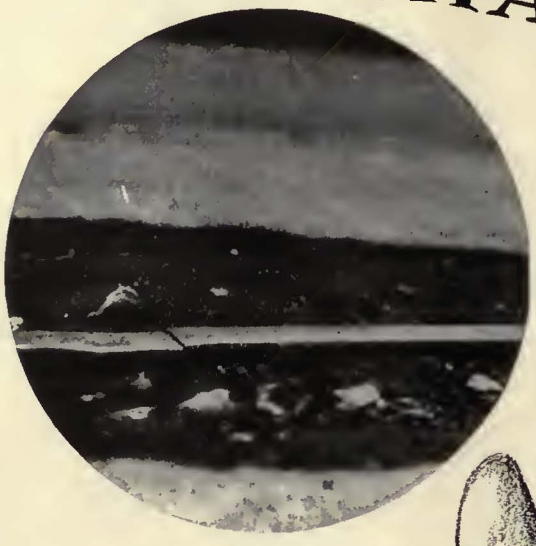


Wm. Wharton Jr. & Co.
INCORPORATED
EASTON, PENNSYLVANIA

SALES OFFICES: Pittsburgh Chicago Houston Montreal New York
Philadelphia Bostan San Francisco Scranton Las Angeles

USE YOUR OWN
COST FIGURES
FOR REPAIRS TO
RAIL JOINTS - -

DO THIS FIGURING YOURSELF AND COMPARE THE RESULTS



Use your own cost figures for repairs to rail joints - - -

HERE is a simple and convenient estimate form for comparing actual costs of joint repairs. Try it, using costs from your own actual experience. Your own labor costs! Your own "local conditions"! Tell us the rail section and we will furnish the cost of the Thermit material.

See for yourself what the difference is!

A careful analysis of the comparative costs will show that a permanent Thermit welding job costs but little more than the ordinary patch job. The difference of a few dollars, at most, affords a Thermit-welded joint which lasts as long as the rail itself. The patch job usually has to be done over again in a few years, and the life of the rail is actually shortened.

TIMATE *for* PATCHING bolted joint

t permit from city	x x x x x
opening street	.....
tify Transportation	x x x x x
partment of work	.....
BOR	
en Pavement	.....
move old plates d clean rail	.....
face Joint	.....
cksmith and replace plates..	.....
lding up and welding	.....
place Concrete	.....
place Pavement	.....
nding	.....
cking Material and Men...	.....
tchmen	.....
ays to Traffic	.....
ervision	.....
cl.	.....
al Labor	.....
TERIAL	
ing Material	.....
crete Material	.....
s and Plates	.....
ding Material	.....
l estimated Cost....	.....

ESTIMATE *for* THERMIT-WELDING old bolted joint

Get permit from city for opening street	x x x x x .....
Notify Transportation Department of work	x x x x x .....
LABOR	
Open Pavement	.....
Remove old plates and clean rail	.....
Surface Joint	.....
THERMIT (*) WELD	.....
Replace Concrete	.....
Replace Pavement	.....
Grinding	.....
Trucking Material and Men...	.....
Watchmen	.....
Delays to Traffic	.....
Supervision	.....
Miscl.	.....
Total Labor	.....
MATERIAL	
Paving Material	.....
Concrete Material	.....
THERMIT (**) MATERIAL	.....
Total estimated Cost....	.....

(*) 3 man-hours

(**) Thermit Material depends on rail section. Send for data.

You pay for Thermit whether you use it or not

TAKING your own figures from the estimates suggested on the preceding page isn't it far cheaper to Thermit weld once, than to patch the same joint two or three times in the next few years? The honest answer must be—*yes!* In this sense you more than pay for a Thermit weld, even if you don't use it.

Think of the saving of wear and tear on the track structure and on rolling stock, if a permanent smooth welded rail replaces a lot of troublesome joints.

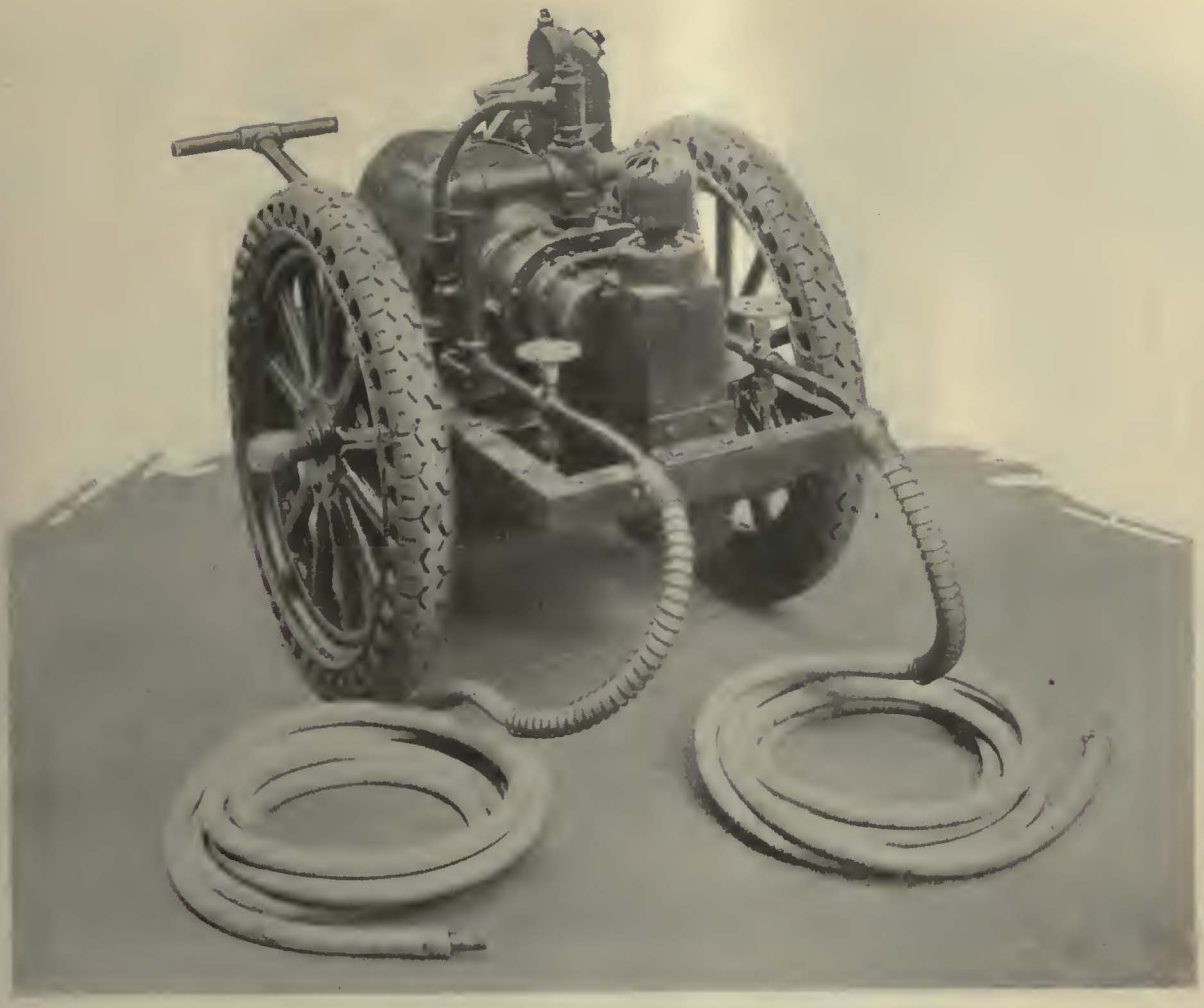
Think of the better public feeling when track is permanently fixed, instead of constantly being torn up for joint repairs.

And you may be surprised to learn how much wear can be secured from old rail that now appears to be near the end of its useful life. Thermit-welding has rejuvenated many an old piece of track that was thought to be ready for complete reconstruction.

We shall be glad to inspect old track, make recommendations, and furnish estimates for getting rid of the rail joints once and for all.

Send for estimate sheet which contains the items listed on the third page of this insert.

METAL & THERMIT CORPORATIO
120 BROADWAY, NEW YORK, N.Y.
PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO



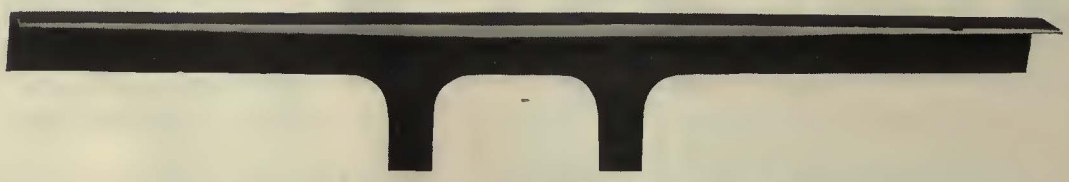
THERMIT ANNOUNCES
a New Rail-Welding Preheater

. . a new light weight equipment . . . . . .
. . especially designed for maintenance work
. . simple and efficient in operation . . . . .
. . *and at a new low price!* . . . . . .

[*There are no exhibits at this year's Convention. So we take this means of displaying our new equipment. Further details on request.*]

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK, N.Y.
PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

STARK ELECTRIC



The Remedy for Low Joints Caused by Wear

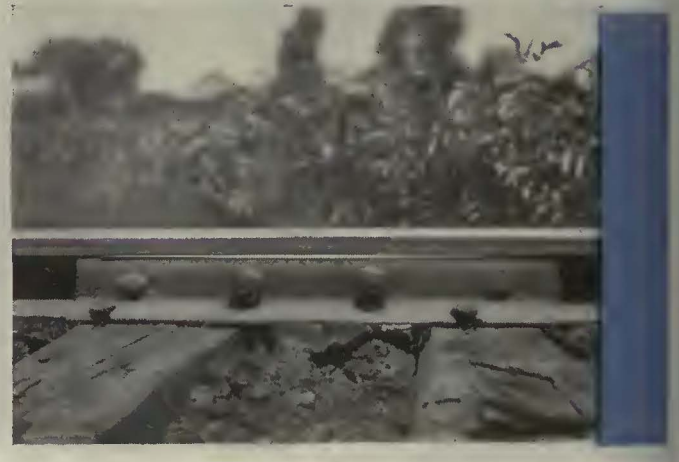
The Stark Electric Railroad Company of Alliance, Ohio, have completed the rehabilitation of 33 miles of open track by a 100% installation of True Temper Tapered Rail Joint Shims. The first shims were used in January, 1928, and proved to be such an economical and satisfactory method of restoring a worn track to first class condition that the entire line was put into shape using the same device.

This outstanding track rehabilitation job was accomplished at low cost for both material and labor. The cost of True Temper Tapered Rail Joint Shims was about ¼ that of any other acceptable method and this was the only material cost as the existing bars and rails were used. Labor cost for installation was low as the shims are applied by loosening the joint bolts and slipping them in place.

The application of True Temper Rail Joint Shims levels up worn rail joints and restores the track to first class condition. Riding qualities are thus greatly improved, passenger traffic encouraged, car maintenence costs are reduced,

Stark Electric Joint Shim installation. Note conformity to worn fishing angle and restoration of rail to original true surface.

This, and other pictures here, taken on double track. Note conformity of shim to unequal wear in leaving and receiving end of joint.



TRUE TEMPER TAPERED

RESTORES ENTIRE OPEN TRACK MILEAGE ...WITH TRUE TEMPER SHIMS

The above shows outside of joint illustrated on opposite page. Note insertion of shim without interference with rail bonding.

Picture below shows tapered rail joint shim in position after two years of service. Note perfect rail surface.

power consumption is kept on an economical basis and track maintenance cost is held down.

Mr. J. H. Weber, superintendent of ways and structures, The Stark Electric Railroad Company, says in effect, "I never could have done the job of properly rehabilitating our track mileage without the use of True Temper Tapered Rail Joint Shims."

What has been accomplished on this road can be accomplished on any other by the use of True Temper Tapered Rail Joint Shims. These shims are made in 4 length and thickness combinations. Full information gladly furnished on request.

The American Fork & Hoe Co.
General Offices: Cleveland, Ohio
Factory: North Girard, Pa.

District Offices
Whitehall Bldg., New York, N. Y.
Daily News Plaza, Chicago, Ill.

Representatives at
Boston, Denver, Detroit, Minneapolis, St. Louis and San Francisco

Foreign Representatives
Wonham, Inc., 44 Whitehall St., New York, N.Y. and 68-72 Windsor House, Victoria St., London, S.W.-1.

RAIL JOINT SHIM

You can win back the crowds with improved equipment . . .

ELECTRIC railway and bus line operators everywhere now realize that to get peak crowds—and to hold them—to bring back the days of the full fare box, requires the use of improved equipment that caters to the public's desire for greater comfort and faster transportation. It is here that Johns-Manville Service to Transportation plays its part by assisting you to modernize your equipment in a way that will, at the same time, keep down maintenance costs.

Johns-Manville Insulation brings quiet and comfort to the interiors of cars and buses. J-M Hair Felt for upholstery is comfortable to the rider, and sanitary . . . J-M Flooring provides safety underfoot and bears the onslaught of the heaviest passenger traffic.

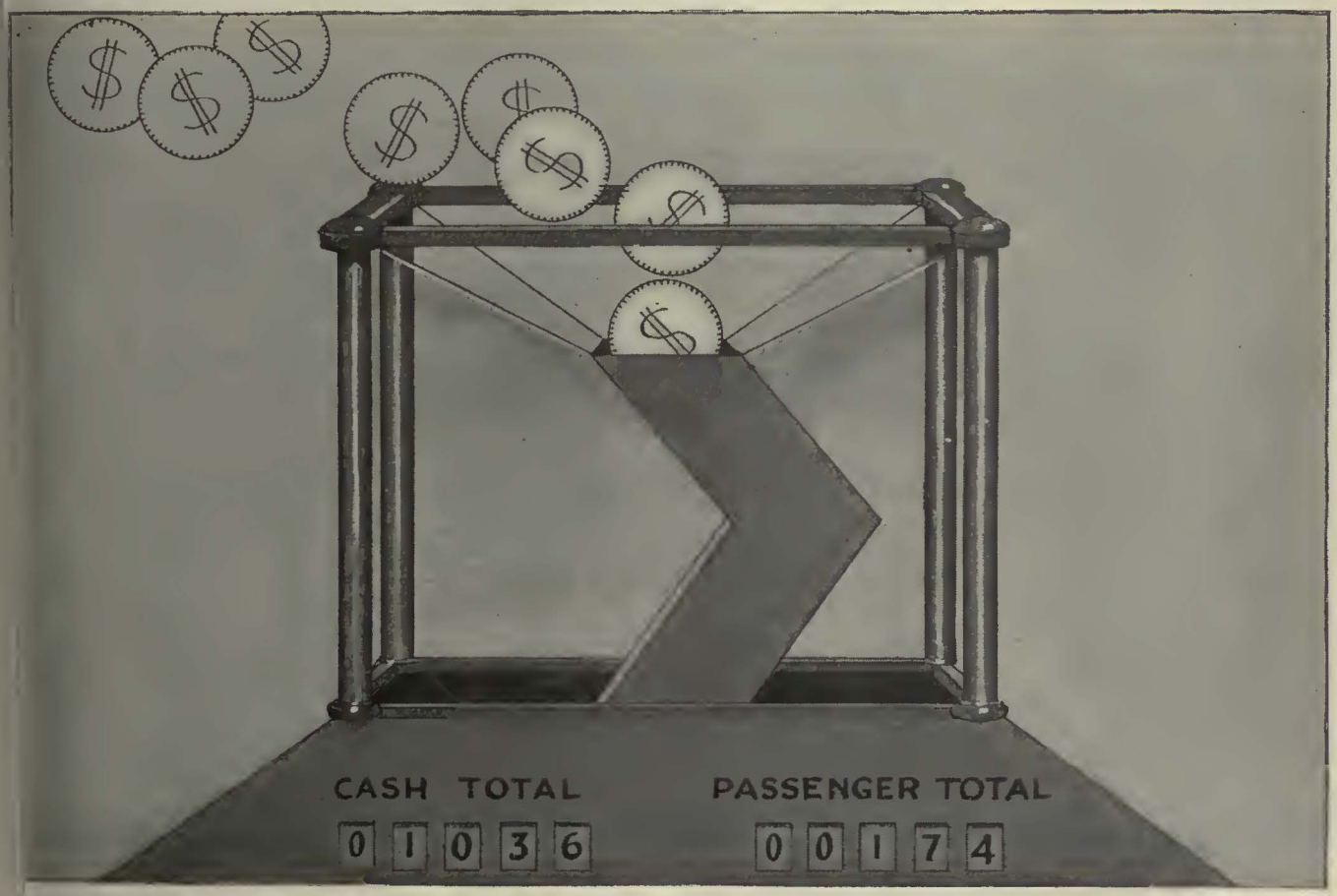
Listed below, to serve as a convenient reminder, are these and many other of the products around which Johns-Manville Service to Transportation is built.

Let J-M products contribute to the comfort your passengers demand. It may be an important step in selling the crowd whose regular fares push down operation costs. Install J-M materials as standard equipment, as many other lines throughout the country have done. Johns-Manville Service to Transportation has kept pace with the needs of this growing industry and is now prepared to supply an invaluable service to the development of the electric railway car and the bus. Address Johns-Manville, New York, Chicago, Cleveland, San Francisco, Montreal.

JOHNS-MANVILLE PRODUCTS

Johns-Manville

SERVICE TO TRANSPORTATION



JOHNS-MANVILLE SERVICE TO TRANSPORTATION

ACKINGS · REFRACTORY CEMENTS · FRICTION TAPE · INSULATING TAPE · CELITE FOR CONCRETE
AR AND BUS FLOORING · READY-TO-LAY ROOFING · FIREPROOF BRIDGE DECKING · WATERPROOFING
UILT-UP ROOFING · BUS AND AIRPLANE INSULATION · MASTICOKE FLOORING · ASBESTOS SHINGLES
MOKE JACKS · ELECTRICAL PARTS · TRANSITE PIPE · PASSENGER AND REFRIGERATOR CAR INSULATION
TRANSITE · INSULATIONS · BRAKE LINING AND BRAKE BLOCKS

IT WILL PAY YOU


. . . to buy
PARK AV
DODGE BROTHER

Dodge Coaches

Your Investment Will Be Smaller, Your Costs Lower, Your Schedules More Dependable, Your Patrons Highly Pleased

Operators, in large cities and smaller, have proved by performance tests and cost analysis the fitness of Dodge Brothers Motor Coaches for present-day service.

Powerful, smooth, flexible, six-cylinder engines and sturdy four-speed transmissions assure time-saving acceleration in traffic or on the open road. Internal-expanding, hydraulic four-wheel brakes provide deceleration that is safe and certain. Thus, operators are enabled to maintain higher scheduled speeds. Their investment in equipment need not be as large. Their operating and maintenance costs will be less.

And the comfort, the dependability and the appearances of these modern coaches attract patrons and insure more revenue.

MOTOR COACHES

. . AND YOUR MAINTENANCE COSTS WILL CONTINUE LOW BECAUSE A DODGE BROTHERS DEALER— ONE OF YOUR REPUTABLE LOCAL BUSINESS MEN— CARRIES AN AMPLE STOCK OF REASONABLY PRICED REPLACEMENT PARTS . . .

DODGE BROTHER
MOTOR COACHES

$9.55

See Electric Railway Journal June, 19[illegible] Page 665

Per Single Track Foot

No Maintenance In Ten Years

A Track Design
Selected by
An Engineering Commission in 1920
Approved by
The Detroit Engineering Society

Adopted As Standard By The Department of Street Railways and Installed as Follows:

8.5 Miles in 1920
34.0 Miles in 1921
4.0 Miles in 1922
11.0 Miles in 1923
5.0 Miles in 1924
4.0 Miles in 1925
4.7 Miles in 1926
1.0 Miles in 1927
9.0 Miles in 1928
15.0 Miles in 1929

AND NOW 18 MILES TO BE INSTALLED IN 1930—

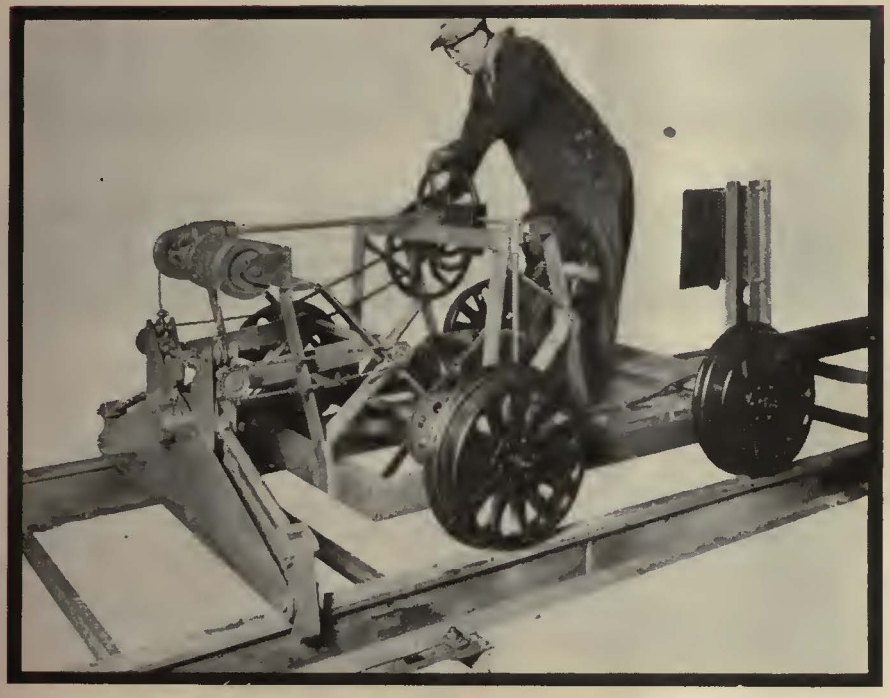
IN

IN DETROIT—

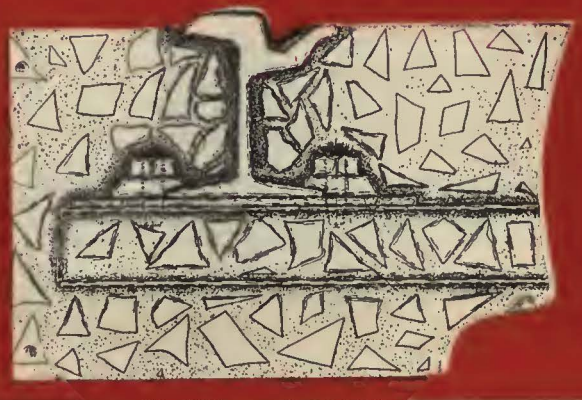
Uniform Paved Track Is Assured by the "MORTAR-FLOW" PRINCIPLE of Vibrating Concrete Around the Track Structure.

INTERNATIONAL STE

DETROIT



THE "MORTAR-FLOW" PULSATOR clamps to both rails. Vibrates whole track structure 5500 times a minute. Concrete is bonded to steel as the cement is forced iato every miuute crevice. All voids are filled. Entire structure is sealed into a uuified monolith.



IE COMPANY CLEVELAND OHIO

Y ogram of Standardization

IT LONG has been the custom of the Electric Railway Industry to specify in detail the type of rolling stock for their lines. Why? Simply custom.

Well known is the fact that to have any product specially built increases the cost. In an effort to reduce this expense standardization has become the order of the day.

From a background of practical operating experience, the builders of Cincinnati cars view the Electric Railway Industry as a whole. From our experience and study we are convinced that greater standardization of street cars is possible.

Standardization will enable manufacturers of street cars to put their shops on a production basis and build more economically. This, in turn, means that the Electric Railway Properties benefit from the economies effected; can procure rolling equipment at less cost and thus materially reduce the capital investment.

Because of a keen understanding of operating conditions and many years' experience as car builders the management of the Cincinnati Car Corporation is unusually well qualified to help the individual operator with a program of standardization.

Public Servic

Public Service
Coordinated Transport
System on the streets
of Newark, N. J.

Johnson Fare Systems
will *register*—

Nickels and Dimes
Dimes, Tokens, and Half Fare Tokens.
Nickels, Dimes, and Quarters.
Any of the above coins or tokens singly.
Zone Fares.

Johnson Electric Fare Systems
can now be

Leased or Purchased

TERMS UPON REQUEST

Over 7,000 Johnson Automatic Electric Fare Boxes have been placed in service in the last 3 years.

JFB

JOHNSON FAR

4619 Ravenswood Ave., CHICAG

Coordinated Transport of New Jersey fully equipped with 3,000 Johnson Electric Fare Boxes

Isn't it significant that this, the largest coordinated transportation company in the country, and undoubtedly one of the most progressive, has adopted Johnson Electric Fare Systems for both bus and street car operation.

Over 1600 buses and 1400 street cars on this vast system are equipped with Johnson Type J Fare Boxes.

The fact that the new type J Fare Box is available in two and three coin registers makes them adaptable to any fare collection system. You can have the advantages of Electric Fare collection no matter what system you use.

Electro-magnet type of fare box—NOT motor driven; no drain on battery.

will

Increase Revenue
Speed up Loading
Facilitate Inspection
Give rapid Accurate accounting
Reduce Accident Hazards

WRITE FOR further information, including a list of other prominent operators and the saving they have found possible.

BOX COMPANY
NEW YORK W. 61st Street

Over 60,000 Type D Boxes have been placed in service during the last 20 years.

YOU

OOD TIE USERS

HERE'S SOMETHING YOU'VE MISSED

IN SOLVING ONE OTHER VITAL ONE'S

IT is a recognized fact that electric railway track engineers are divided into two schools of thought. No. 1—those who adhere to wood ties. No. 2—those who prefer rigid steel and concrete construction.

The first class have under their jurisdiction more than 38,000 miles of the 43,400 miles of electric railway track in the United States and Canada.

These engineers believe that passage of a car over the rail produces a vibration in the rail, which must be absorbed by the track structure. Their choice of an absorbing medium is wood—in the crosstie—and flexibility in the ballast.

YOU BELIEVE 50% OF THE DAYTON STORY

In other words, wood tie users have already accepted 50% of the Dayton story—the need for absorbing this vibration.

With those who use wood ties in open track, we have no difference—cost considered, there is no better tie for that purpose.

PROBLEM...THREE
ARE LEFT UNSOLVED

THE UNSOLVED PROBLEM

But use of wood ties in paved track, while it solves one problem, leaves certain other very vital problems unsolved. These problems have haunted the railway industry since the beginning—have cost millions of dollars.

1. It is impossible to spike into wood, tight enough to prevent some loosening of the rail.
2. Ballast cannot be placed so it will not settle. This is corrected in open track by constant work on ballast. It cannot be corrected in paved track.
3. Wood will not bond with concrete to possess any holding power. Hence, a structure of wood ties and concrete grout is merely begging the question—it is only a little more effective than gravel ballast.
4. Compressible ballast accentuates wave motion of the rail. Locomotives—on this account are said to continually climb a one per cent grade when running over level track.

These four problems are of too much importance to remain unsolved. They are costing the industry too much for track and power.

How Dayton meets these problems

Dayton Ties give you first, that which you consider essential—a treated white oak block under the rail.

They add a further vibration absorbing feature in an asphaltum and fibre layer under the block—confined within a steel pan.

These two features take care of your desire to absorb harmlessly, the rail vibration.

Dayton Ties provide bolted rail clips, screw threaded, steel to steel. They cannot pull out or get loose. Takes care of problem No. 1.

Dayton Ties provide a perfect re-enforcing bond with concrete. With the concrete, they produce a strong homogeneous unified structure—there is no ballast to settle—no way for the tie to part company with the concrete—problems 2 and 3.

Dayton Tie Method with its perfectly controlled rail deflection reduces rail wave to a negligible degree. Problem 4.

RESULTS...SEE LAST PAGE.....

RESULTS

The results are read in first cost of construction, in years of life, in cost per mile per year. We invite your inspection of these results—there is a nearby property where you can. Let us tell you where it is.

Dayton Mechanical Tie Co.
Dayton, Ohio

Double Track Crossing—Fifth and Main Streets, Dayton, Ohio. Installed with Dayton Mechanical Tie foundation, 1922. Sustained heaviest city traffic. Photograph taken 1930—eight years and still perfect.

East and West, they

The Northwestern Pacific Railroad Company will have 19 St. Louis Cars operating over the electrified zone of its line, between Sausalito and San Rafael in Marin County, California. They are motor coaches seating 108 passengers equipped with St. Louis Cane Seats. Cars are all steel construction, railway standard design. Original order was for 10 cars and a repeat order for 9 more followed.

FROM every part of the country, where modern transportation is wanted to attract passengers and increase revenues, utilities come to St. Louis Car Company for the newest and most modern in car engineering.

The dominating position of the St. Louis Car Company today is due as much to engineering skill as to the high quality of workmanship that has characterized its products for many years.

For, regardless of type or style, St. Louis Car Company is equipped to build into its cars the elements of comfort, easy riding, speed, that attract passengers as well as durability and maintenance-free service.

In Chicag

they use St. ley Buses. came necessa transportatio some of the ing districts it was decid siderable sti trackless tr most econom cient type the partic Naturally, t Car Comp largely in this equip usually does and depends manded. St less Trolley build un re cago.

And Los Angeles

comes to St. Louis for its low level car. With a seating capacity of 46, this car is 48 feet long, over-all. Body is mounted on St. Louis Car Company E. I. B. trucks. DeLuxe leather upholstered seats are used in these cars. St. Louis Car Company is now building two model cars of same dimensions and capacity except end entrance and center exit.

St. Louis Car Co.

ST. LOUIS MISSOURI

Quality Cars

come to St. Louis for Quality Cars

ST. LOUIS CAR CO.
Birthplace of the Safety Car

In Lorain—

recognizing the need for modern equipment to attract passengers, they turn to the St. Louis Car Company for 10 cars of new and modern design. These are light weight, single end, double truck, one-man, two-man cars, equipped with brown leather upholstered bucket type St. Louis Car Company seats and mounted on St. Louis Car Co. E. I. B. type trucks.

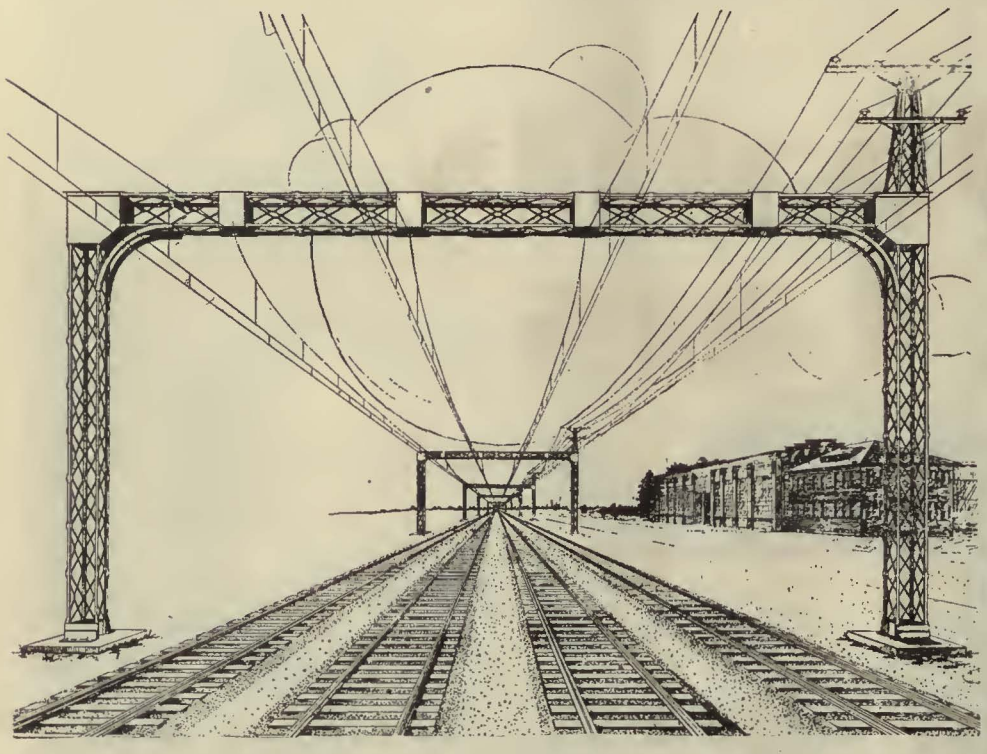
klahoma City—

s an equipment modernization pre- which includes the purchase of 10 . Louis Trolley Cars of the type uest satisfactory in the city. Here the economy and revenue-attracting of modern equipment has been zed as well as the capacity of the is Car Company for doing the best nd a repeat order for 20 additional e cars has been placed.

Oklahoma City recognizes the dom- position of the St. Louis Car Com- nd the quality of workmanship and ring it implies.

Walter Bates Steel

EXPANDED SQUARETRUS



SQUARETRUS Construction—

for Strength, Appearance, Economy, Efficiency

More lbs. of strength for lbs. of weight than any other design.

"SQUARETRUS" Poles are made from four main pieces. Each corner leg angle is intact with one set of expanded lacing.

Erection of structures is obviously a simple matter, easily kept at a minimum expense.

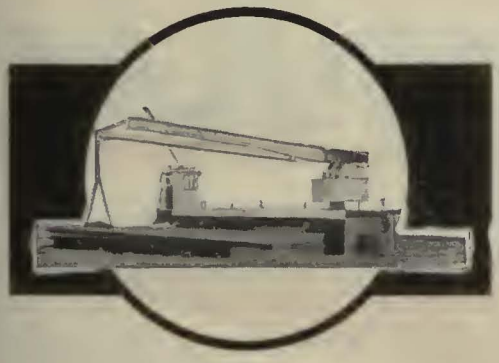
Very few bolts; examine the cut carefully for detail of construction. Tabulated data gladly furnished.

WALTER BATES STEEL
FLOOR GRATING
SUBSTATIONS
TOWERS
POLES

WALTER BATES STEEL CORPORATION

GARY INDIANA

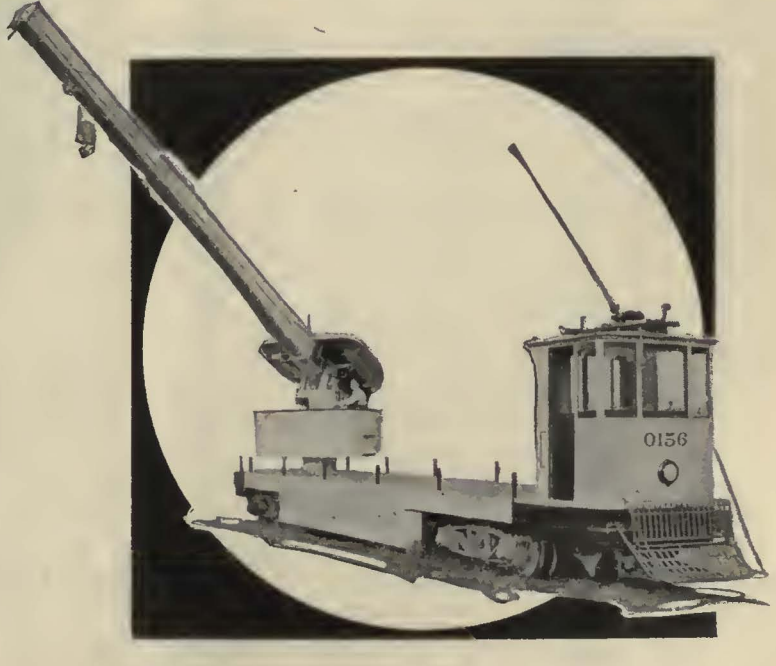
IT'S DIFFERENT WITH DIFFERENTIALS



FOR example, the Differential Crane Car. Fast and safe, it conforms to Electric Railway clearances, does not obstruct traffic on adjacent tracks. One man from a revolving turret controls every operation.

Teamed up with Differential Dump Cars, Differential 3-Way Truck Bodies and Clark Concrete Breakers, work goes with a snap. More is accomplished, costs are less.

We can prove Differentials are different by a few comparative figures. Write for details.



The
Differential Steel Car Co.
Findlay, Ohio

IAS PRODUCED THE

Vigne

Bimetallic Armature Bearing

THE Vigne Double Duty Bimetallic Armature Bearing now becomes another outstanding NATIONAL Product, and an asset to the Electric Railway Industry.

We have never ceased to be active in seeking ways and means to lower maintenance and increase the economy of electric railway operation.

The new "Bimetallic" is an example of the efforts we have made and are continually making to better serve you.

This latest improvement is a distinct departure from former types of Armature Bearings, and has been proven highly successful. It will last longer—requires less attention—is less expensive.

An ideal combination of Bronze- and Lead-Base Babbitt Metal Strips in contact with the shaft.

During test installations "Vigne Bimetallic Armature Bearings" have given 160,000 miles' service on the original applications, and are still in good condition and in active use.

New savings in shop costs, labor, elimination of expensive Babbitt Metal for linings, and tying up of motors can be yours. Investigate the "Bimetallic."

Write for explanatory booklet—"How to Reduce Operating Costs of Electric Railways."

NATIONAL BEARING METALS CORP.

ST. LOUIS, MO.

ew York, N. Y. Jersey City, N. J. Pittsburgh, Pa.
eadville, Pa. Portsmouth, Va. St. Paul, Minn.

List of Commodities we manufacture

Brass, Bronze, Copper, Lead, and Aluminum Castings of all kinds.

Axle, Armature and Journal Bearings for Electric Railways.

Locomotive Wearing Parts.

Bushings and Solid Bars.

Standard A. R. A. Car Journal Bearings.

Special Size Car Journal Bearings.

Solders: Bar, Wire, Drop Cake, and Ribbon.

Babbitt Metals—all grades.

Bearings for Steel, Paper, Lumber and Sugar Mills.

Miscellaneous Castings in all non-ferrous metals.

Trolley Wheels and Harps.

Pig and Ingot Metals.

Blast Furnace Castings.

Copper Tuyeres.

Bosch Plates.

Etc.

WINNERS

"for excellence in editorial work"

WE ARE PLEASED TO ANNOUNCE THAT

Morris Buck

and

George J. MacMurray

of *Electric Railway Journal's* Editorial Staff have been awarded the A.B.P. ("Associated Business Papers, Inc.") prizes for 1929, as follows:

2nd Prize to Mr. MacMurray in the contest for

"BEST EDITORIAL, judged by importance of subject, clearness of style, sound reasoning and power to influence."

Awarded for "Editorial in February 16, 1929, issue of *Electric Railway Journal,* entitled 'The Subsidy as a New Shibboleth.'"

2nd Prize to Mr. Buck in the contest for

"BEST ARTICLE, SERIES OF ARTICLES OR NEWS REPORT, judged broadly on the basis of timeliness, accuracy, thoroughness, originality, clearness of expression and usefulness."

Awarded for "Series of articles published in *Electric Railway Journal* during the year 1929, entitled 'Result of Industry-Wide Survey of Electric Railways.'"

This is the first time in the history of the Associated Business Papers Awards that any one publication has won two awards in a single year. And in 1927, *Electric Railway Journal* won the first award for having rendered the most outstanding editorial service to its industry, making three awards in all won by *Electric Railway Journal* for editorial excellence during the past three years.

ELECTRIC RAILWAY JOURNAL

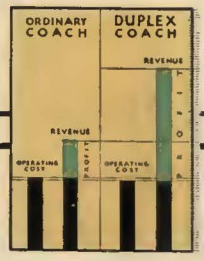
The NEW PICKWICK

53 Passenger DUPLEX OBSERVATION COACH

Is the greatest stimulant to motor coach travel ever offered the industry.

Makes service more comfortable and easier to render.

Increases the operator's potential profit 300%.



A DUPLEX PAY LOAD

53 PASSENGER CAPACITY . . . BUILT OF DURALUMIN AND STEEL . . . STAGGERED COMPARTMENT CONSTRUCTION . . . LAVATORY ABOARD . . . BUFFET OPTIONAL . . . THE MOST COMFORTABLE AND SAFE COACH ON THE ROAD . . . A POWERFUL ADVERTISEMENT OF YOUR

The history of the growth of Motor Coach Transportation is the history of improved equipment.

As coaches have become more comfortable, terminals more modern, and service more reliable, bus transportation has grown till it today ranks as the great public carrier.

In this respect, the new 53-passenger Pickwick Duplex Observation Coach is the greatest contribution ever offered the industry. Built of duralumin and steel along the lines of the famous Pickwick Nite-Coach, it offers the public the greatest possible comfort and convenience.

Duplex uses the unique staggered compartment construction. It is both compact and roomy. Passengers enter either level by a single step. Two-thirds of the seats are on the more desirable upper level. A lavatory is carried. A buffet or dining service is optional. There are eight compartments for family travel. The hot water heating system, the ventilating system, the special lighting, the large baggage capacity, the portable tables, the special reclining seats — all contribute to the passengers' well being. The coach rides easily and steers easily. Its rigid metal honeycomb frame, its double metal walls, its low center of gravity, its front-roof exhaust, its upper level driver's compartment — make it the safest coach on the road.

Duplex is a powerful stimulant to all motor coach travel. In use on your lines it is the best possible advertisement of your

33 PEOPLE — COUNT THEM

bsiness. It will convert many to motor coaches who have nver used them before.

Dplex makes service more dependable and easier to render. It s designed and built from the operator's standpoint, by mtor coach operators. All parts of both body and chassis ar easily accessible and easy to service. The whole power plnt can be replaced in fifteen minutes. This is in itself one ofthe greatest advances ever made in motor coach practice. It eliminates the chief cause of motor coach failure. Other mjor parts are similarly easy to remove or replace.

Fially Duplex increases your profit. It cuts operation and maintenance costs. It is no larger (8 feet wide, 9 feet 10 nnes high, 33 feet long) nor heavier (17,000 lbs. empty, 25000 lbs. loaded) and costs no more to operate (approximtely 29 cents per mile as indicated by past experience) thn many coaches of far smaller capacity. The use of metal nstead of wood gives long life and cuts depreciation to a minimum.

Duplex is capable of a gross return of 75 cents per mile. This aic increase in revenue, without increase in operating cost an with an actual decrease in maintenance and depreciation exense increases the potential profit over 300% above ordinary equipment.

Pu Duplex on your schedules and both your business and your profits will grow.

BUSINESS . . . DESIGNED AND

BUILT FOR OPERATORS, BY OPER-

ATORS...EXCEPTIONALLY HIGH

ACCESSIBILITY, LOW MAINTE-

NANCE COST, LONG LIFE . . .

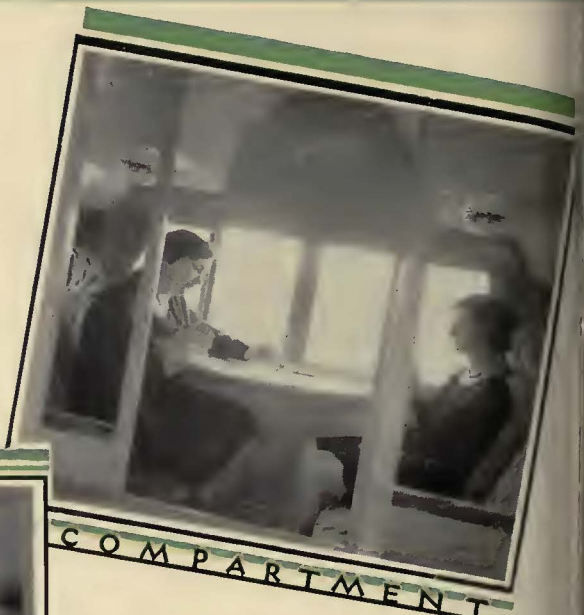
REMOVABLE POWER PLANT . . .

NO INCREASE IN WEIGHT, SIZE

OR OPERATING COST . . . 300%

INCREASE IN POTENTIAL PROFIT

THRU THE REAR WHEELS



COMPARTMENT

REMOVABLE MOTOR

LAVATORY

INTERIOR

If you attend the AERA Convention at San Francisco you can see Duplex at the Union Stage Depot (5th and Mission Streets). Better still, stop off at Los Angeles, and see Duplex being made. If you do not come West, write at once for complete specifications and details. Duplex is being put into operation by various lines throughout the country as fast as our production facilities permit.

PICKWICK COACHES

DAY OR NIGHT

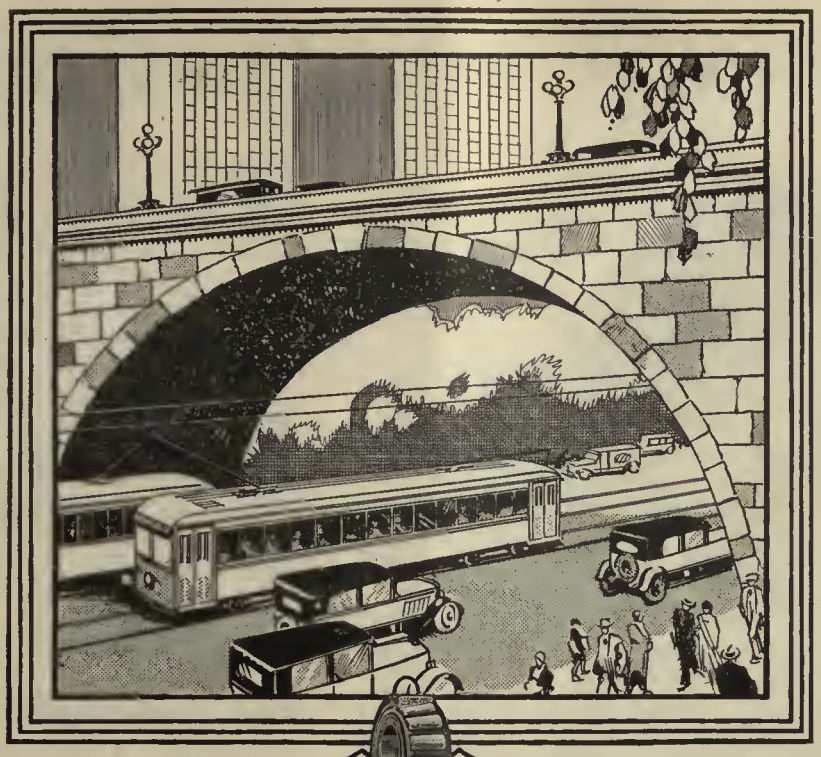
CLEAN COMFORTABLE ECONOMICAL TRAVEL

PICKWICK MOTOR COACH WORKS, Ltd.

(Builders of Pickwick Nite-Coach)

INGLEWOOD (Los Angeles) CALIFORNIA

Eastern Representative: Chester G. Moore, 100 N. La Salle St., Chicago



TIMKEN BEARING EQUIPPED

Is Keeping Electric Railways Up With *the* Times

Electric railway operators who have put their cars on a Timken-equipped basis are not worrying about the future. They have found a way to keep electric railway profits well abreast of the times.

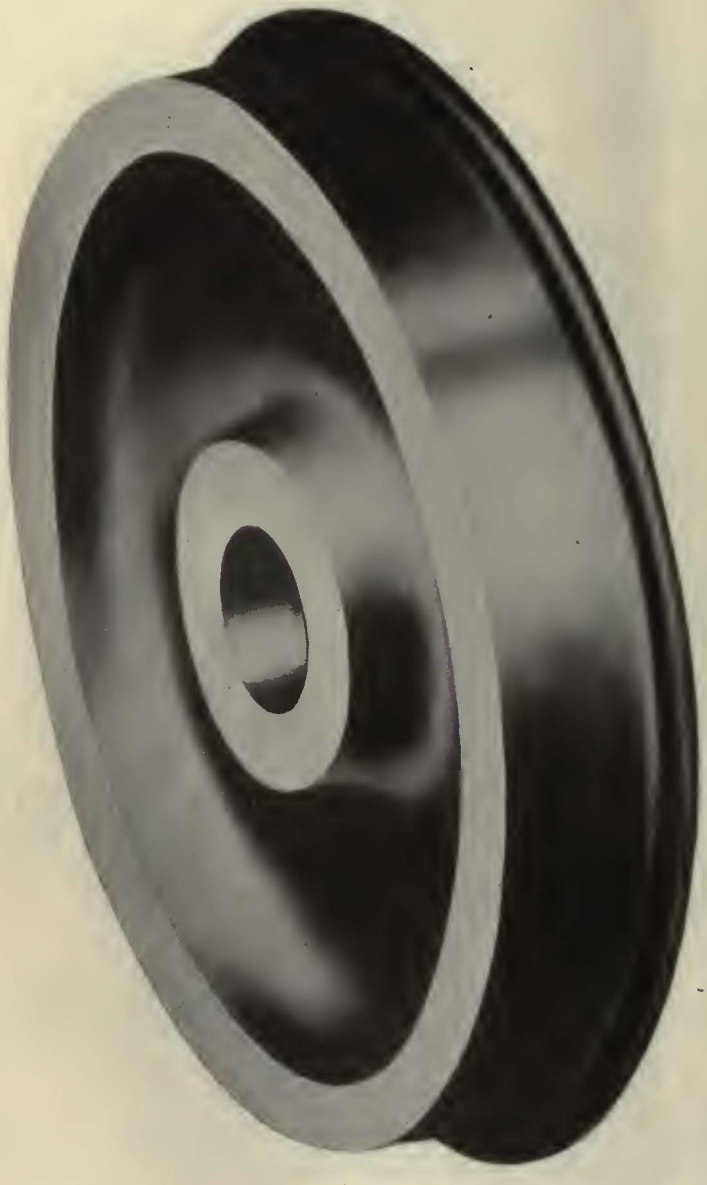
The field for electric railway operation is broader than it ever was. It's a question of making electric railway travel as efficient and as attractive as newer methods of passenger transportation, and of revising operating and maintenance costs in accordance with present day necessities.

The most urgent need is for faster running schedules with greater convenience and comfort for car riders. It is being met by modern Timken Bearing Equipped cars in which speed, easy jerkless starting and smooth joltless running are combined with radically reduced power demands, substantial lubrication savings and greater endurance.

Car builders are naturally anxious to see electric railway transportation thrive and prosper, and they will gladly cooperate with you in bringing your car equipment up-to-date by means of the exclusive radial-thrust carrying combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

They're *STRONG!* They're *SAFE!* They *LAST!*



Bethlehem Wrought Steel Wheels are ideally suited to the requirements of modern electric-railway service, which makes such severe demands on wheels.

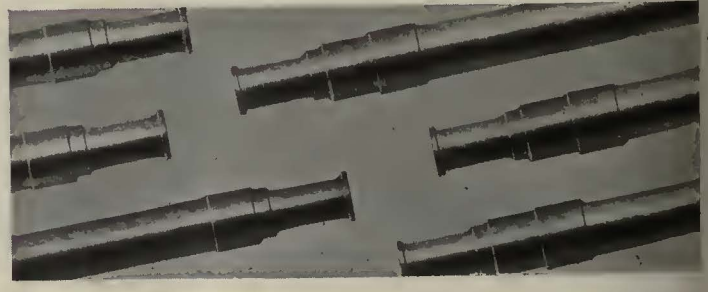
Bethlehem Wrought Steel Wheels have long been known for their stamina, and for their economy, the result of their exceptionally long life and the many thousands of miles of trouble-free service that they give.

Strength, endurance and wearing qualities are worked into Bethlehem Wheels in the making. Each wheel passes through five separate forging and rolling operations. The forging gives the metal density and toughness. The rolling produces a refinement in grain structure throughout the entire wheel. Bethlehem Wheels are virtually immune to crystallization, and the possibility of breakage is reduced to a minimum.

If you investigate you will discover what so many electric railway executives have learned about Bethlehem Wrought Steel Wheels. That they're strong. They're safe! They last!

Your inquiry will receive prompt attention. Write today.

FORGED AXLES. Extreme care is exercised in the manufacture of Bethlehem Axles. Special heat treatment gives them ductility and a high elastic limit. They give excellent service under severe torsional stresses.



BETHLEHEM STEEL COMPANY

General Offices: **Bethlehem, Pa.**

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, 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
Wrought Steel Wheels

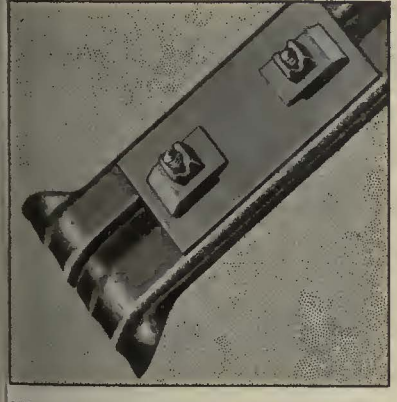
Reduce track construction cost with these Steel Ties

Bethlehem Steel Ties offer many new advantages and economies in street railway track construction. Substantial savings in installation costs are to be had, because of the low first-cost of these steel ties, the simplicity of track laying, the saving in height and the reduction in foundation material and in labor.

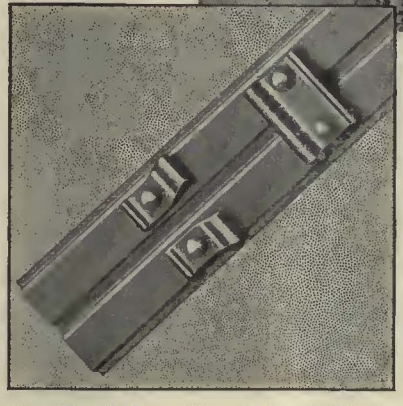
Due to the shallow section of these ties, excavation is greatly reduced and there is a corresponding reduction in the amount of ballast or concrete. Actual cost records of track construction jobs show that the use of Bethlehem Steel Ties results in a saving of from 30 to 40 per cent as compared with the use of wood ties. Consideration must also be given to the savings in handling and in distribution costs, due to the shallow, compact section of these steel ties, which reduces bulk in handling.

Bethlehem Steel Ties for street railways are made in two sizes to meet different ballasting conditions and track construction practices. Complete information about Bethlehem No. 3 Steel Tie and Keystone No. 9 Steel Tie will gladly be supplied. Write for literature.

Reconstructed single-track structure with Bethlehem No. 3 Steel Ties.



The Keystone Steel Tie No. 9 is a heavy-duty tie with tie plates, bolted rail clips and "whale-tail" ends.



The Bethlehem No. 3 Steel Tie is equipped with a broad stationary clip and two rotating clips.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

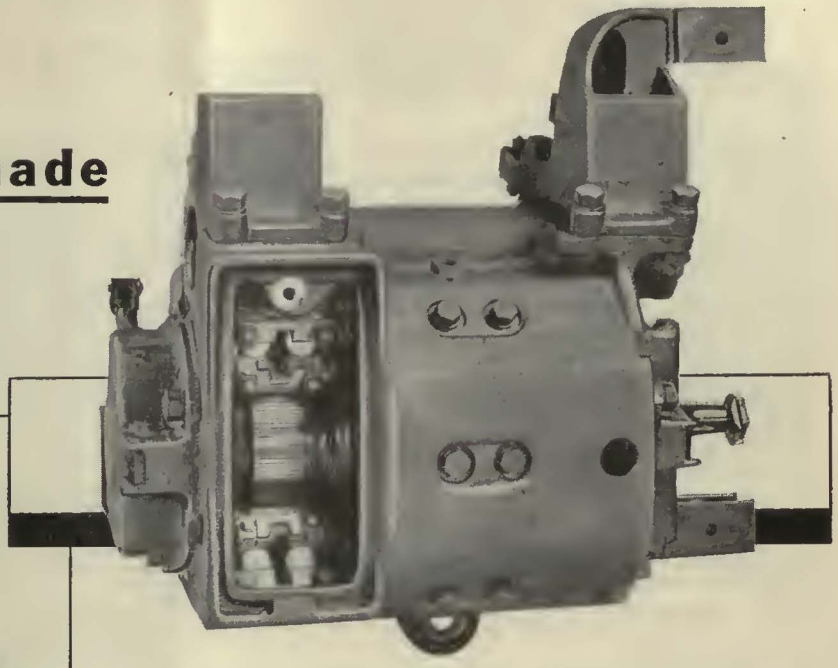
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu

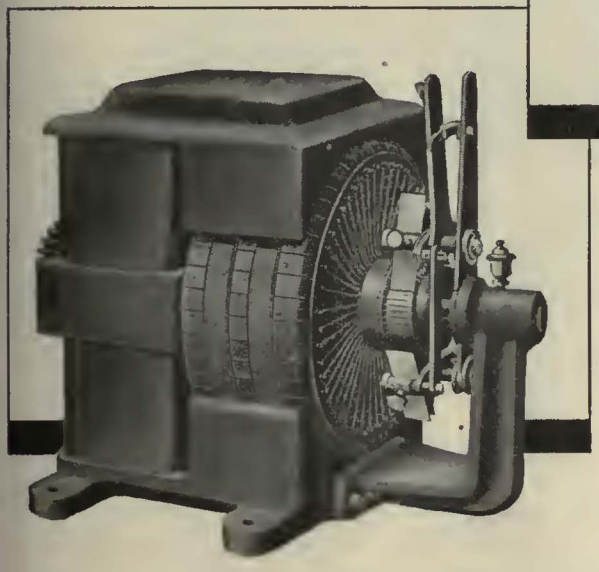
Export Distributor: Bethlehem Steel Export Corporation 25 Broadway, New York City

BETHLEHEM Steel Ties

the brush that made electric railways



Bottom view of a modern interpole railway motor showing position of brush holders. Only the highest-quality carbon brushes will meet the demands of modern high-speed traction.



Early Van Depoele motor for electric railways. It was equipped with two sets of metal brushes, one set for operation in either direction of rotation. Notice levers used to raise and lower the brushes as required.

IN 1894 ELIHU THOMSON, one of the country's most eminent electrical engineers, published an article from which the following is quoted:

"It is, I think, true that no single thing has had a greater or more direct influence upon the technical success of electric railway machinery than the introduction of the carbon brush as a substitute for the various forms of metal brush, many forms of which had been tried previously on railway motor commutators but without even the beginning of success.... It came about in this way....

"We had been trying to use . . . various forms of copper and other metal brushes, all of which, however, had soon been condemned as either quite worthless for the purpose or so nearly worthless as practically to be so. A discussion of the matter between Mr. Van Depoele and myself . . . led him to remark in substance: 'I have used a plate of carbon as a brush on a stationary motor, which carbon brush worked well, and I think it might answer the purpose here.' . . .

"The trial was made and was at once so eminently successful that scarcely any time elapsed before the metal brush became a thing of the past."

Carbon brushes, like railway motors, have undergone marked development since the foregoing words were written. The development of the motor is clearly depicted in the illustrations. The early Van Depoele motor with its two sets of brushes — one set for either direction of operation — is in striking contrast with the modern, interpole railway motor by its side. Enclosed frame, compact design, forced ventilation and high commutator speed place a heavy burden on the brushes, but brush manufacture has kept pace with the increasingly heavy demands. The railway brush of today is a symbol of sturdy dependability.

National Pyramid Brushes are backed by over fifty years' experience of National Carbon Co., Inc., in the manufacture and application of carbon products.

Systematic inspection and maintenance of brushes, commutator and brush holders insure longer brush life, more satisfactory performance and greater machine efficiency.

To avoid expensive shut-downs, anticipate your requirements for replacement brushes.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

Carbon Sales Division	SILVER STRAND CABLE TRADE MARK REGISTERED	Cleveland, Ohio

Branch Offices and Factories
New York Pittsburgh Chicago Birmingham San Francisco

LEAD IN ELECTRIC RAILWAY SERVICE

One of a Fleet of 115 Whites in the Service of The Virginia Electric and Power Company

102 Railways Operate 3,256 Whites in Fleets of Ten or More Each . .

ELECTRIC Railway operators since the earliest days of motor transportation have shown a marked preference for White Truck and Bus equipment. The most successful companies build their truck and bus fleets with Whites. One hundred and two railway operators use 3,256 Whites in fleets of 10 or more each. Scores of additional railways operate fleets of less than 10 Whites. They know White dependability and economy. *Their experience is your safest guide in buying truck and bus equipment.*

Fleets of 10 or More Whites in Electric Railway Service

Alabama Power Company	11
American Commonwealth Power Corporation	11
American & Foreign Power Co. Inc.	11
American Power & Light Company	21
Arkansas Power & Light Company	10
*Associated Gas & Electric Company	33
Baltimore Coach Co.(United Rys. & Elec. Co.)	26
Birmingham Electric Company	19
Blue Ridge Transportation Co. (Potomac Edison Co.)	17
Boston Elevated Railway Company	148
Brooklyn & Queens Transit Corporation	32
Carolina Coach Co.(Southern Cities Utilities Corp.)	17
Carolina Power & Light Company	15
Central Illinois Public Service Co.	11
Central Maine Power Company	15
Chicago, N. Shore & Milwaukee R. R. Co.	40
Chicago Surface Lines	21
Cleveland Railway Company	160
*Commonwealth Power Corporation	13
Community Traction Company	32
Connecticut Company	30
Cumberland & Westernport Transit Co.	11
Des Moines City Railway Company	10
Dominion Power & Transmission Co.	15
Duluth Street Railway Company	10
*Electric Power & Light Corporation	21
Emprezas Electricas Brazileras	13
*Engineers Public Service Company	17
Florida Power & Light Company	36
Gray's Harbor Railway & Light Co.	23
Illinois Power & Light Corporation	23
International Utilities Corporation	16
Interstate Public Service Company	14
Lewiston Transportation Co. (Lewistown & Reedsville Electric Ry. Co.)	15
Los Angeles Railway Corporation	38
Louisville Railway Company	11
Manila Electric Company	13
Memphis Power & Light Company	13
*Middle West Utilities Corporation	40
Middlesex & Boston Street Railroad	98
*Midland Utilities Company	12
*Milwaukee Electric Railway & Light Co.	36
Mississippi Power & Light Company	12
Monongahela West Penn Public Service Co.	19
Montreal Tramways Company	13
*National Power & Light Company	18
*National Public Service Corporation	12
*New England Power Association	17
*New England Public Service Company	11
New Orleans Public Service, Inc.	76
New York State Railways	65
Newburg Public Service Company	16
*North American Company	10
Northern Ohio Power & Light Company	119
Northern States Power Company of Minn.	25
Northern Texas Traction Company	13
Ohio Public Service Company	17
*Pacific Electric Railway Company	80
Pacific Gas & Electric Company	47
*Penn Central Light & Power Company	12
Penn-Ohio System	125
Philadelphia & West Chester Traction Co.	13
Pittsburgh Motor Coach Co.(Pbgh.Rys.Co.)	20
Portsmouth Public Service Company	15
Power Corporation of Canada, Ltd	17
Public Service Company of Colorado	23
Public Service Company of Oklahoma	16
Public Service Co-ordinated Transport Co.	236
Public Service Electric & Gas Company	189
Puget Sound Power & Light Company	12
Rio de Janeiro Tramway Light & Power Co.	39
St. Louis Public Service Company	53
Safety Motor Transit Corp.(Roanoke Ry. & Electric Co.)	15
Saginaw Transit Company	10
San Antonio Public Service Company	27
San Francisco Municipal Railway	15
San Joaquin Light & Power Corporation	22
Shawinigan Water & Power Company	22
Sioux Falls Traction System	18
Southern California Edison Company	27
Southern Pacific Company	13
Southwestern Bus Company (Cleveland Southwestern Ry. & Lt. Co.)	16
Southwestern Gas & Electric Company	10
*Southwestern Power & Light Company	13
*Standard Gas & Electric Company	45
*Stone & Webster Interests	20
Tennessee Electric Power Company	23
Toronto Transportation Commission	16
Transportation Holding Co., Inc.	11
Twin City Rapid Transit Company	31
Union Railway Company of New York	10
Union Traction Company of Indiana	20
United Electric Railways Company	66
*United Rys. & Electric Co. of Baltimore	35
Virginia Electric & Power Company	115
Virginia Public Service Company	10
*Washington Railway & Electric Company	16
*West Penn Electric Company	12
J. G. White Engineering Corporation	42
Wisconsin Michigan Power Company	20
Wisconsin Motor Bus Lines (Milwaukee Elec. Ry. & Lt. Co.)	24
Worcester Consolidated Street Railway	14
Total	3,256

*Exclusive of subsidiary or affiliated companies individually listed.

THE WHITE COMPANY, *Cleveland*

WHITE

A COMPLETE LINE OF FOUR AND SIX CYLINDER

TRUCKS

BUSSES

Mica in every form
for A.C. motor insulation

Protect A. C. motors and generator slot cells and coil phase sections with built-up mica! That's the way to assure lasting maintenance-free performance and the maximum of operating efficiency. Super-Micanite is practically indestructible under the heat and vibration of the severest motor and generator operation.

Flexible Super-Micanite in sheets or strips, Micanite Coil Insulation, Rope Paper and Mica, Micanite Paper, and Micanite Tape represent the built-up mica insulations ideal for A. C. machines. And the Mica Insulator Company offers in addition a complete line of Varnishes, Armco Paper, Varnished Cambric Tubing, in fact, a performance-proved electrical insulation for every need from slots to leads.

Complete information is given in Catalog 87. Write for a copy.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

Works: Schenectady, N. Y. London, England

Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal

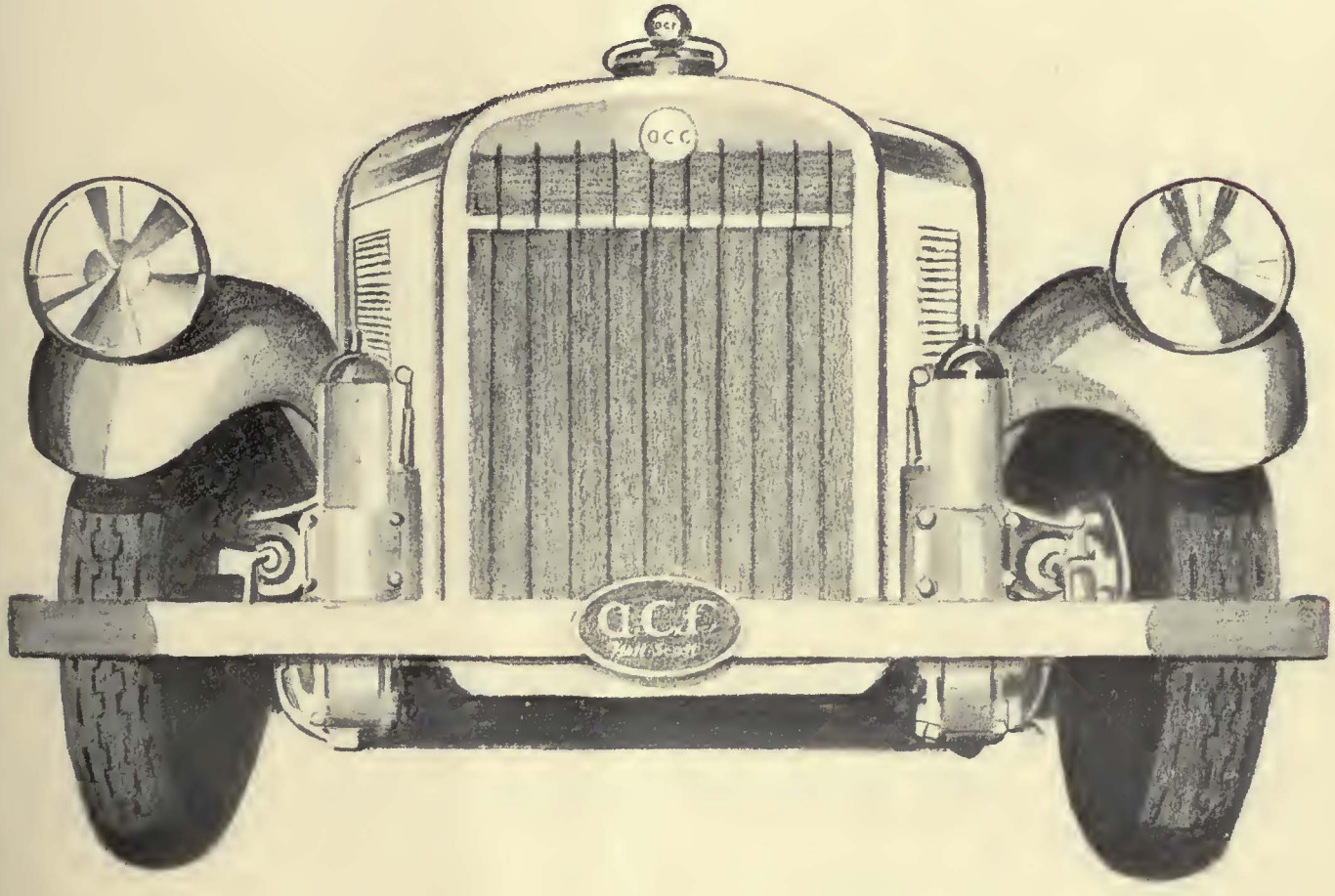
PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Electrical INSULATION

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

MICA INSULATION OILED CLOTH INSULATION

12 more a.c.f. observation parlors to north coast lines because a.c.f. coaches have *proved* themselves in north coast's daily runs!



a. c. f.

There's a message for every operator interested in maximum coach efficiency in the records that G.C.F. coaches have made for North Coast Lines in that company's runs from Portland to Vancouver.

These coaches, only 33 feet long, but with a 264" wheel base, seat comfortably 38 passengers. They are powered with 175 horsepower Hall-Scott engines, turning at 1000 to 1400 r. p. m., the range of maximum torque and minimum fuel consumption . . . engines with reserve power to keep schedules right up to the minute without straining.

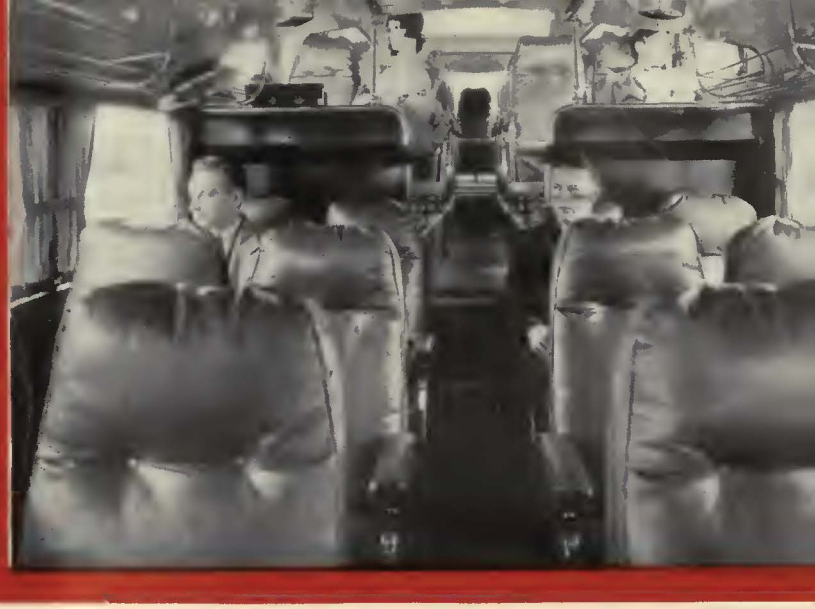
In twenty-three car months, these four coaches operated 240,389 miles, which figures 10,451 miles per month per coach, or a little more than 125,400 miles per year each. Gas mileage for these runs has averaged 4.49 miles per gallon, and oil mileage 92.03 miles per quart, both unequalled ratings for coaches of this size, power and performance.

Mechanical maintenance has been at an absolute minimum, and the engines have a long way to go before they will require any overhauling.

As a result of their excellent performance, North Coast Lines are taking delivery of five

ore large Observation Parlors im-
ediately . . . the choice being based
on results proved by service. In
ddition to these coaches, North
oast Lines also operate two A.C.F.
aches of similar type powered with
20 horsepower engines, which have
so proved so satisfactory that seven
ore of these smaller coaches are
ing delivered at the same time,
aking a total of 18 A.C.F. coaches
this operation.

These patented A.C.F. Obser-
tion Parlor Cars offer numerous



a.c.f.

a. C. f.

exclusive advantages. Particularly important are the rider-appeal due to full visibility from eve seat; the clean-cut and convenient interior arrangement due to no wheel-housing interferenc the entirely unobstructed view, and the perfect ventilation. From the operator's standpoint great advantage is the fact that the rear seats automatically tend to fill first.

Heavy baggage is handled and loaded at curb level, and is carried safely in a fully seal dust-proof and water-proof compartment. These A. C. F. Observation Parlor Cars have full hea room throughout, and convenient inside parcel racks for the riders' convenience.

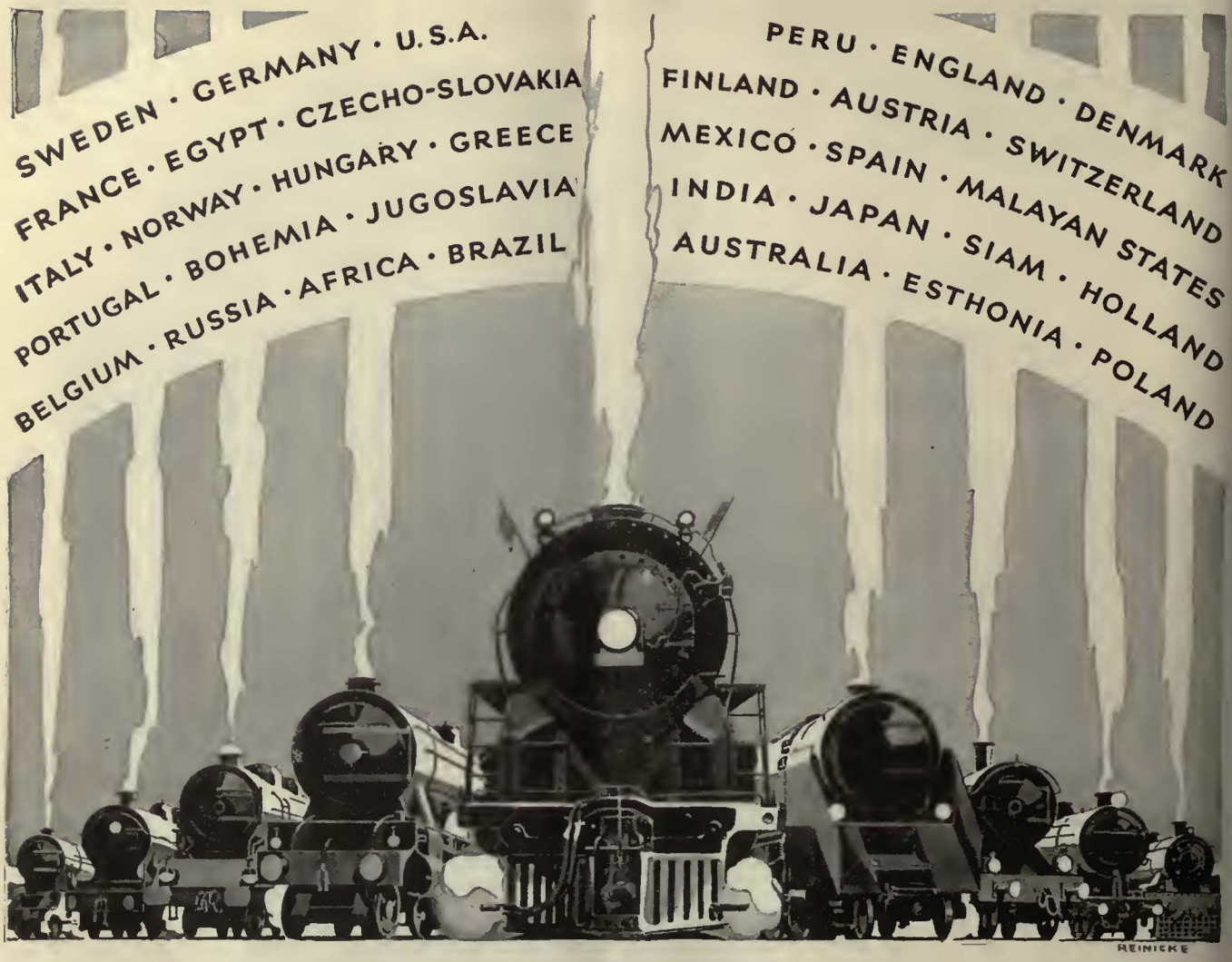
The method of heating is also new, but is backed by sound and sensible engineeri Clean, fresh air, heated by the engine radiator, is forced through air-tight ducts into the coa thereby both warming and ventilating. The large volume of incoming air forces out any objecti able stale air and makes for passenger comfort at all times.

This patented Observation Parlor Car, available only from A. C. F., has given distinguish service on motor coach operations from the Pacific to the Atlantic. Through its ability to incre the number of passengers carried, combined with the characteristically low operating expe associated with Hall-Scott powered A. C. F. coaches of all types, it meets most effectively requirement of both the Transportation and the Operating Departments.

AMERICAN CAR AND FOUNDRY MOTORS COMPANY, 30 Church St., New Yo

"STANDARD" STEEL

have the additional safety, strength and wearing qualities that reduce operating costs in modern high-speed electric railway service where fast starts and quick stops put heavy loads on vital parts.



On the railroads of the world

. . . *including its four crack trains!*

WHAT'S all this conversation on railway journal bearings about anyway? Why, **SKF** put its first Spherical Bearing into a railway journal so long ago that **SKF** had just about forgotten that this is supposed to be some sort of a super-bearing feat. Of course, it is a tough job for a bearing . . . that is if it stays on the job. But tackling that kind of an assignment is everyday business for **SKF**. Why, there are more **SKF** Bearings . . . many times more . . . in railroad service than all the other bearings of the world combined.

It was sixteen years ago that an **SKF** Bearing went into a journal box for the first time. Since then, that first bearing has been followed by 71,999 other bearings for locomotives, tenders, dining cars, baggage and passenger cars . . . in 33 countries throughout the world.

Get this significant fact when you judge bearing performance by railroad records . . . **SKF** Bearings are used on the four crack trains of the world—The Broadway Limited, The 20th Century Ltd., the Blue Train* of France and the Rheingold Express of Germany!

For, mark you this fact now. The railroads of the world find it far too expensive to buy a bearing on the basis of price . . . which means that the only thing left for consideration is performance . . . and that in turn means **SKF**—always. **SKF** Industries, Incorporated, 40 East 34th Street, New York, N. Y.

SKF

* The Cotois-Mediterranean Express

2502

"THE HIGHEST PRICED BEARING IN THE WORLD"

One of these days you'll be operating Aluminum Cars on your system

...G. Brill Co., for Third Avenue ...ystem, N. Y. Aluminum used ...nder-frame and parts of the ...l weight of car 27,000 lbs.

Built by Cincinnati Car Corp., for Louisville Railway Co. In service Sept. 1929. Aluminum used for body, under-frame and truck. Total weight of car 29,150 lbs. 2,300 lbs. of aluminum used. 2,500 lbs. dead-weight saved.

Built and operated by Cleveland Railway Co. In service Dec. 1926. Aluminum used on body, under-frame and trucks. Total weight of car 30,300 lbs. 6,647 lbs. of aluminum used. 12,901 lbs. dead-weight saved.

...d by Twin City Rapid ... service Dec. 1927. Alu... ...heets, posts and carlins. ...t of car 27,670 lbs. 1,372 lbs. ... used. 2,618 lbs. of dead-...

Built by Canadian Car and Foundry Co., for Montreal Tramways Ltd. In service 1927. Aluminum used for framing and exterior sheathing. Total weight of car 33,400 lbs. 2,275 lbs. of aluminum used. 3,700 lbs. of dead-weight saved.

Built by Osgood-Bradley Car Corp., for Pittsburgh Railways Co. In service June 1929. Aluminum used for body and under-frame, also for trucks, except axles, wheels and springs. Trucks built by Timken-Detroit Axle Co. Total weight of car 25,200 lbs. 3,325 lbs. aluminum used. 7,863 lbs. dead-weight saved.

Built by J. G. Brill Co. for Delaware Electric Power Company. Aluminum used for sheeting, seats and miscellaneous parts. 10 cars in service Dec. 1928. 10 additional cars in service 1929.

Built by Cummings Car & Coach Co., for Chicago & Joliet Electric Railway Co. In service Nov. 1927. Aluminum used for body and under-frame. Total weight of car 23,722 lbs. 10,000 lbs. of aluminum used. 13,500 lbs. dead-weight saved.

ALCOA

ALCOA ALUMINUM

Study the record of the use of Alcoa Aluminum in the Electric Railway Field

ALCOA

STATISTICAL RECORD ON THE USE OF ALUMINUM IN THE RAILROAD AND ELECTRIC RAILWAY FIELD.

OPERATOR	BUILDER	DATE BUILT	NO CARS	WEIGHT OF SUPERSTRUCTURE INCLUDING ACCESSORIES: (1) STEEL OR COMPOSITE STEEL CONSTRUCTION	WITH ALUMINUM APPLICATION	SAVED	WEIGHT OF UNDERFRAME: (1) STEEL OR COMPOSITE STEEL CONSTRUCTION	WITH ALUMINUM APPLICATION	SAVED	WEIGHT OF TRUCKS INCLUDING MOTORS: (1) STEEL OR COMPOSITE STEEL CONSTRUCTION	WITH ALUMINUM APPLICATION	SAVED	TOTAL WEIGHT OF CAR: (1) STEEL OR COMPOSITE STEEL CONSTRUCTION	WITH ALUMINUM APPLICATION	SAVED	PER CENT	WEIGHT PER SEATED PASSENGER: (1) STEEL OR COMPOSITE STEEL CONSTRUCTION	WITH ALUMINUM APPLICATION	SAVED	WEIGHT PER LINEAR FOOT: (1) STEEL OR COMPOSITE STEEL CONSTRUCTION	WITH ALUMINUM APPLICATION	SAVED	ALUMINUM APPLICATIONS
RAPID TRANSIT LINES:																									
BOARD OF TRANSPORTATION, NEW YORK CITY																									
PASSENGER CAR (MOTOR)	AMERICAN CAR and FOUNDRY CO	1930	300																						
ELECTRIC STREET AND INTERURBAN RAILWAYS:																									
CLEVELAND RAILWAY																									
CITY STREET CAR	CLEVELAND RAILWAY	1926	1	15,500	12,000	3,500	6,300	4,400	1,900	21,400	13,900	7,500	43,200	30,300	12,900	29.9	785	551	234	844	592	252	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS AND SIDE SILLS;
SPRINGFIELD STREET RAILWAY, SPRINGFIELD, MASS.																									TRUCKS COMPLETE EXCEPT WHEELS, AXLES AND SPRINGS.
CITY STREET CAR	WASON MANUFACTURING CO.	1926	1										35,500	25,300	10,200	28.7	789	562	227	1,154	822	332	SIDE MEMBERS; LETTER BOARD; BELT RAIL; AND BODY BOLSTERS.
CHICAGO AND JOLIET ELECTRIC RAILWAY CO., JOLIET																									
CITY STREET CAR	CUMMINGS CAR AND COACH CO	1927	1	16,800	7,800	9,000	7,100	2,600	4,500	13,300	ANU	–	37,200	23,700	13,500	36.3	744	474	270	894	576	318	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS.
ST. LOUIS PUBLIC SERVICE CO.																									
CITY STREET CAR	ST. LOUIS PUBLIC SERVICE CO.	1927	1	17,950	15,100	2,850	6,950	4,450	2500	12,450	ANU	–	37,350	32,000	5,350	14.3	633	543	90	737	632	105	" " " " " " "
MONTREAL TRAMWAYS, LTD.																									
CITY STREET CAR	CANADIAN CAR AND FOUNDRY CO LTD	1927	10	21,100	17,400	3,700	WEIGHT INCLUDED IN SUPERSTRUCTURE			16,000	ANU	–	37,100	33,400	3,700	10.0	843	759	84	804	723	81	" " " " " " "
" " "	" " " " " "	1927	40	21,100	19,900	1,200	" " " "			16,000	ANU	–	37,100	35,900	1,200	3.2	843	817	26	804	778	26	ALL SHEET IN SUPERSTRUCTURE
TWIN CITY RAPID TRANSIT CO., MINNEAPOLIS																									
CITY STREET CAR	TRANSIT SUPPLY CO.	1927	25	17,500	14,900	2,600	" " " "			12,800	ANU	–	30,300	27,700	2,600	8.6	606	554	52	666	609	57	ALL METAL IN SUPERSTRUCTURE; SUPERSTRUCTURE PRINCIPALLY OF WOOD.
MONTREAL TRAMWAYS, LTD.																									
CITY STREET CAR	CANADIAN CAR AND FOUNDRY CO LTD	1928	30	21,100	19,900	1,200	" " " "			16,000	ANU	–	37,100	35,900	1,200	3.2	843	817	26	804	778	26	ALL SHEET IN SUPERSTRUCTURE.
BRILL CO., THE J. G. (DEMONSTRATOR)																									
CITY STREET CAR	BRILL CO., THE J. G.	1929	1	14,850	10,400	4,450	" " " "			13,600	ANU	–	28,450	24,000	4,450	15.6	677	571	106	854	720	134	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS.
DELAWARE ELECTRIC POWER CO., WILMINGTON, DEL.																									
CITY STREET CAR	BRILL CO., THE J. G.	1929	15	22,550	19,550	3,000	" " " "			15,700	ANU	–	38,250	35,250	3,000	7.8	911	833	78	884	815	69	SHEETING; SEATS; AND MISCELLANEOUS PARTS.
DEPARTMENT OF STREET RAILWAYS, DETROIT																									
CITY STREET CAR	THOMAS CAR CO., PERLEY A	1929	100																						
LOUISVILLE RAILWAY																									
CITY STREET CAR	CINCINNATI CAR CORP.	1929	1	23,450	20,950	2,500	" " " "			8,200	ANU	–	31,650	29,150	2,500	7.9	659	607	52	769	708	61	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS AND BODY BOLSTERS.
PITTSBURGH RAILWAYS																									
CITY STREET CAR	OSGOOD-BRADLEY CAR CO.	1929	1	23,200	14,000	9,200	" " " "			13,100	11,250	1,850	36,300	25,250	11,050	30.4	864	601	263	804	558	246	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS;
ST. LOUIS PUBLIC SERVICE CO.																									TRUCKS COMPLETE EXCEPT WHEELS, AXLES AND SPRINGS.
CITY STREET CAR	ST. LOUIS PUBLIC SERVICE CO.	1929	1	17,950	15,100	2,850	6,950	4,300	2,650	16,800	ANU	–	41,700	36,200	5,500	13.2	673	584	89	823	714	109	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS.
THIRD AVENUE RAILWAY NEW YORK CITY																									
CITY STREET CAR	BRILL CO., THE J. G.	1929	1																						
UNITED TRACTION CO., ALBANY, N.Y.																									
CITY STREET CAR	CINCINNATI CAR CORP.	1929	1	27,200	24,700	2,500	WEIGHT INCLUDED IN SUPERSTRUCTURE			7,700	ANU	–	34,900	32,400	2,500	7.2	831	771	60	818	759	59	ENTIRE SUPERSTRUCTURE AND UNDERFRAME EXCEPT WOOD APPLICATIONS AND BODY BOLSTERS.
BROOKLYN AND QUEENS TRANSIT CORP., BROOKLYN																									
CITY STREET CAR	BRILL CO., THE J. G.	1930	100																						
ELECTRIC COACHES (TRACKLESS TROLLEYS):																									
UTAH LIGHT AND TRACTION CO., SALT LAKE CITY																									
CITY COACH	CINCINNATI CAR CORP.	1928	25																						
BRILL CO., THE J. G. (DEMONSTRATOR)																									
CITY COACH	AMERICAN CAR CO.	1929	1							BUS TYPE CHASSIS			16,350	14,500	1,850	11.3	545	483	62	584	518	66	ENTIRE SUPERSTRUCTURE EXCEPT WOOD APPLICATIONS; SEATS; FLOOR FRAMING; AND FLOOR REINFORCEMENTS.

NOTES: 1. IN THE MAJORITY OF CASES NO SIMILAR EQUIPMENT EXISTS IN STEEL OR COMPOSITE STEEL CONSTRUCTION. FOR THIS REASON WEIGHTS ARE ESTIMATED FOR STEEL OR COMPOSITE STEEL EQUIPMENT. ANU- ALUMINUM NOT USED.

ALCOA ALUMINUM

THE modern street car must compete with motor traffic that gets away like a herd of scared deer and stops on a dime. Schedules must be faster—safety must be maintained—all unnecessary dead-weight must go.

The light, strong Alloys of Alcoa Aluminum have come to reduce the excess dead-weight of street cars. Having the same structural strength, but only 1/3 the weight, of iron or steel, these Alloys used in street car construction bring quicker acceleration and deceleration, higher top speeds, greater riding comfort.

Our representatives will be glad to consult with you. ALUMINUM COMPANY of AMERICA, 431 Oliver Building, PITTSBURGH

Sullivan 220-ft. Compressor and Sullivan Busters removed 300 ft. of 10-in. Concrete, in 10 Hours.

For Speed on track work

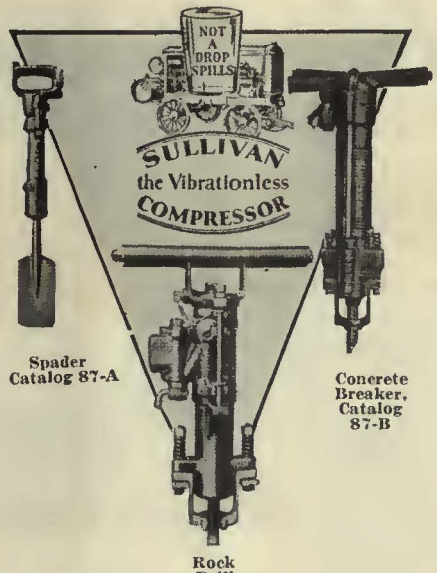
Sullivan air power equipment offers the means of speeding rock drilling, concrete breaking, clay spading, and other compressed air tasks.

Dependable Air Power

Sullivan Vibrationless Compressors have made constant day and night runs as long as 5700 hours. They stay on the job, save waiting time for men, and interest charges on all equipment. Sizes: electric, 120, 175, 240, 350 feet; gasoline, 66, 110, 220, 310 feet; steel wheels, trailers, or skids.

Rock Drills Exactly Suited

Sullivan Rock Drills, in solid and hollow piston types, air tube, water tube, auger, and extra light drills, medium and heavy sinkers, and numerous other models are available.



Spader Catalog 87-A

Concrete Breaker, Catalog 87-B

Rock Drill Catalog 81-U

Concrete Breakers and Clay Spaders

Two concrete breakers are available, with pick points, chisels, tampers, asphalt cutters, or sheet pile driving tools. Clay Spaders have long or short shanks, for open trenches or tunnels.

Portable Hoists

Sullivan Portable Hoists will save you time and money in pole setting, rail handling and on many other jobs around your barns, shops, or garages. The 345-lb. single-drum Turbinair Hoist will lift a ton on single line, or pull a 50-ton car. Electric hoists also available in single and two-drum models to 75 hp. *Send for Catalogs.*

Send for the picture book "Speed Up With Air."

SULLIVAN AIR POWER EQUIPMENT

Sullivan Machinery Company

809 Wrigley Bldg. CHICAGO

30 Church St. NEW YORK

Relaxation is invited by these Art Rattan Seats installed in the New Twin Coach Trolley Buses for the Chicago Surface Lines.

On The Chicago Surface Lines

Passenger Comfort is Assured.....

PART of the equipment for the feeder expansion program of the Chicago Surface Lines consists of 29 Twin Coach Trolley Buses.

The last word in modern design, every effort has been made, by means of appearance and comfort, to create patron appeal.

It is significant that in each of these Trolley Buses the seats are by Art Rattan.

Scientifically designed and constructed to invite and permit relaxation, we are convinced these Art Rattan Seats are the most comfortable ever built. Passenger comfort is assured.

ART RATTAN WORKS, INC.

Builders of DeLuxe Bus Seats

CLEVELAND . . . . . OHIO

The RIGHT ANSWER *to your wheel question*

Carnegie Wrought Steel Wheels fulfill every requirement of the perfect wheel for electric railway service. They are safe—as only *rolled* steel wheels can be. 10,000 ton hydraulic presses impart to the steel a tough, dense structure, free from irregularities that might cause failure. They are durable—rendering long and continuous service. In addition to forging, they are thoroughly rolled, further refining the wearing surface. Mileage is forged in and rolled in—extra mileage that makes Carnegie Wheels the outstanding value in the wheel market today.

In city service these wheels have an added advantage in that cars may be speeded up with safety over special track work at crossings—an important factor in rush hours.

Carnegie Wrought Steel Wheels have satisfactorily answered the wheel questions of many prominent electric railways. Let them answer yours. Your inquiry will receive prompt attention.

CARNEGIE STEEL COMPANY

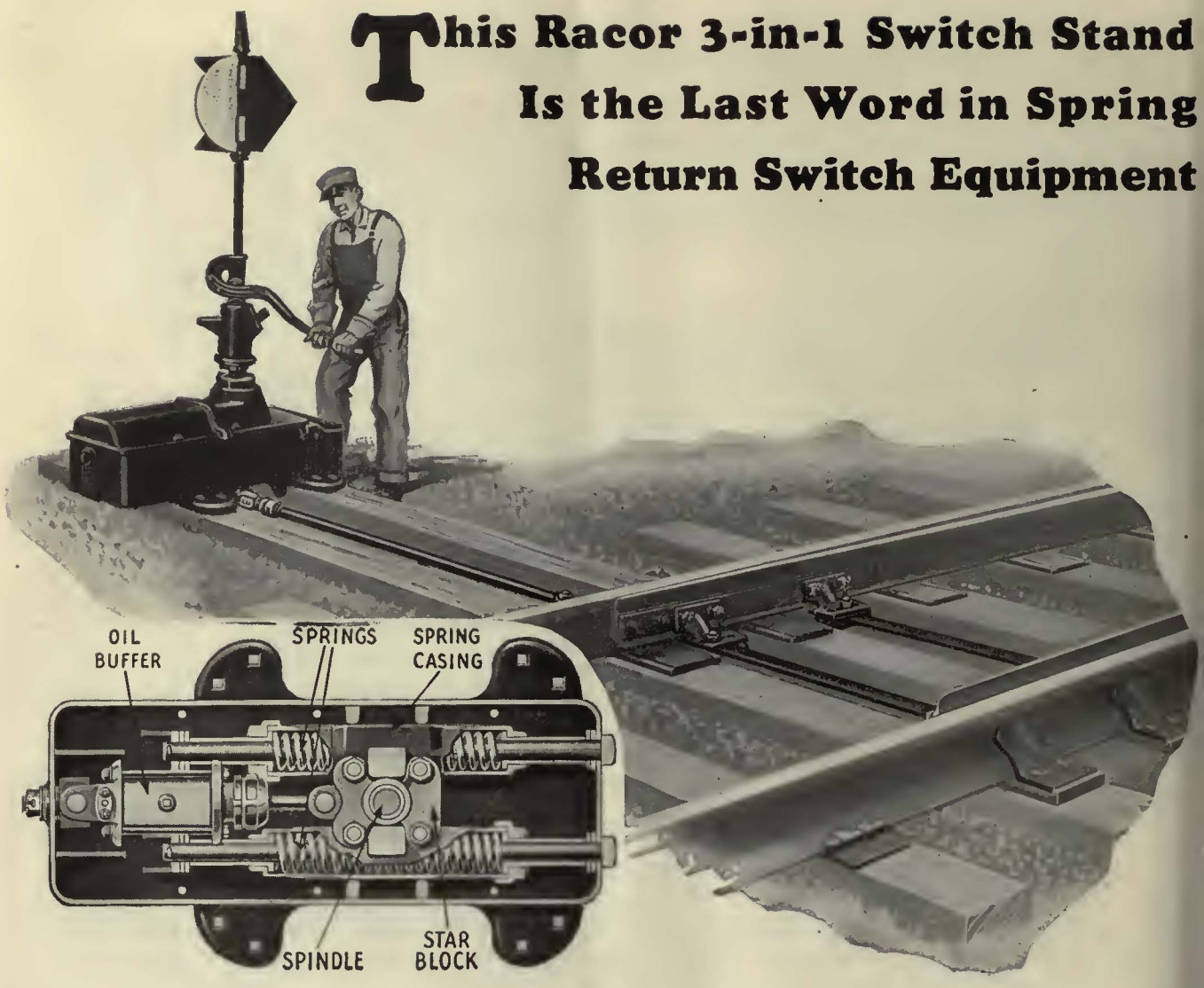
Subsidiary of United States Steel Corporation

PITTSBURGH, PA.

70

CARNEGIE WHEELS

This Racor 3-in-1 Switch Stand Is the Last Word in Spring Return Switch Equipment



THE illustrations clearly show the construction of this newest Racor development. In one, self-contained, enclosed and protected unit it combines every desirable feature of

(1) An independent, rigid switch stand for hand operation

(2) A spring head rod for automatic return of points

(3) An oil buffer to retard the return of points and prevent slamming.

The stand is easy to install and when operated by hand is as easily thrown as any rigid stand. The target always follows the points.

The spring-return feature, contained within the base, permits points to be trailed through without injury and returns them to their set position when the last pair of wheels has passed. Always the target indicates the true position of the switch points.

This spring return feature is controlled by the oil buffer or dash pot. Acting somewhat like a door check, this dash pot permits the points to move over freely when trailed through, retarding their return until the last pair of wheels has passed. Then the points are returned, as slowly as may be desired, until nearly home, when they close rapidly into their original position.

The Racor 3-in-1 Switch Stand (Style No. 100-A) is a big factor in reducing operating costs. It maintains an uninterrupted schedule of train movements, safeguards equipment and promotes economies in lower installation and maintenance costs.

Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.

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 BLDG, WASHINGTON
BUILDERS EXCHANGE BLDG, ST. PAUL

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

BUS COMPANIES

that use Socony Special *plus* Ethyl and Socony Lubricants *cut down costs*

MANY bus companies throughout New York and New England are finding greater economy in using Socony lubricants and Socony Special Gasoline *plus* Ethyl.

For example, the buses and taxis of Holden's Motor Tours and Taxi Service at Melrose, Mass., are 100% Socony.

These coaches tour New York State, New Hampshire, and Connecticut on pleasure trips, and also make many trips for Boston employment agencies over rough going to the logging camps.

You can secure equally good results from the use of Socony products in your fleet. You will find not only that every lubricating and power-demanding emergency is met, but also that mileage is increased and repair bills are cut down.

SOCONY

Special Gasoline *plus* Ethyl

Motor Oil Aircraft Oil

STANDARD OIL COMPANY OF NEW YORK

2 GREATEST ELECTRIC RAILWAYS *in the world* select SOCONY

MORE than six million people a day use New York City's great subway, elevated and surface systems—the Interborough Rapid Transit and the Brooklyn-Manhattan Transit Company. It is imperative that schedules be maintained to handle this enormous traffic. The slightest delay is serious—means an appreciable loss in revenue.

Socony lubricants have been chosen to lubricate the power plants and rolling stock of these two great systems, that operation may be smooth and schedules unbroken at all times.

We submit this endorsement of the dependability of Socony lubricants for your consideration in selecting lubricants for your operation.

SOCONY

INDUSTRIAL LUBRICANTS

STANDARD OIL COMPANY OF NEW YORK

Spray Equipment
Engineered For This Particular Industry

DeVilbiss spray equipment brings an exclusive economy and efficiency into the finishing and finish maintenance departments of the electric railway operation because DeVilbiss units are designed and made for that particular task.

DeVilbiss exhausting installations have established a valuable precedent. DeVilbiss spray guns and other necessary units harmonize with the conditions, materials and requirements of transportation industry. Learn what DeVilbiss can do to save you time and money. Write for catalog of DeVilbiss specialized spray equipment.

THE DeVILBISS COMPANY
272 Phillips Ave.
Toledo, Ohio

Sales and Service Branches

New York Philadelphia Cleveland Detroit Indianapolis Chicago
St. Louis San Francisco Los Angeles Windsor, Ont.
Direct factory representatives in all other territories.

- Spray guns of various types and sizes
- Pressure feed paint tanks and containers
- Exhausting equipment designed and built to order, spray booths, exhaust fans, and approved lighting fixtures
- Air compressing equipment
- Air transformers and accessories
- Air and fluid hose and connections
- Oil spray guns, grease guns and washing guns for cars and buses
- Liquid spray shield and masking paper
- Complete outfits from the smallest "touch-up" units to the largest installations

DeVilbiss
Spray-PAINTING FINISHING System

Announcing the 1930 McGraw Electric Railway Directory

CONTAINING DETAILED INFORMATION ON ELECTRIC RAILWAY COMPANIES . . . AND AFFILIATED BUS LINES . . . INCLUDING NAMES, TITLES AND ADDRESSES OF IMPORTANT OPERATING OFFICIALS

THE 1930 Edition of the Electric Railway Industry's standard reference authority is especially designed for those who need comprehensive information covering this field. It is an up-to-date, reliable guide to the active Electric Railway Companies in the United States and Canada.

The McGraw Electric Railway Directory contains vital data on all Electric Railways including Interurban and Street Railways, Subway and Elevated Roads, and the important Electrified Steam Roads.

Listed in this authoritative survey of the Industry are all the active Operating Companies; the Holding Companies, their Executives, Managing and Operating Personnel; Towns Reached; Rolling Stock; Track Mileage; Number of Cars; Shop Locations; Location and Generating Capacity of Power Plants; Capacity of Substations; Transmission and Trolley Voltages—and other pertinent information essential to all who have contact with or interest in the Electric Railway field.

Affiliated Bus Lines

Names and Addresses of the Bus Companies owned, operated or controlled by Electric Railway Companies —Companies that are soundly established and financed, ably managed and operated along broad aggressive lines. The 1930 McGraw Electric Railway Directory tells you who and where these Companies are—whether they are a subsidiary of big Railway Systems or operated as a separate department under Railway management. It gives you the Names and Titles of the men in charge of Bus Maintenance and Bus Operations, together with his address regardless of whether he is connected with the controlling Electric Railway Company or the subsidiary Bus Company.

Operating Data for Bus Companies include: Number of Buses in Operation; Miles of Route; Fares Charged; Number of Garages with Location and Capacity—just the data wanted and needed by manufacturers and distributors contacting these "A-1" prospects in the bus operating field.

All this information is so presented that it is readily available and easily selected.

Names and Titles of Important Personnel

As a roster of Electric Railway Executives and Operating Officials, the 1930 McGraw Electric Railway Directory serves you better than any previous edition.

By reference to the 1930 Directory you can instantly determine departmental responsibility—know name and title of the man in charge of each department and where you can reach him. In addition to listings of Chairman of Board, President, Assistant to President, Vice President, Secretary, Treasurer, Purchasing Agent and Master Mechanic, you have the name, title and address of the man in charge of such departments as: Railway Operations, Legal Department, Transportation Department, Track Department, Rolling Stock Department, Electrical Department, Claims Department, Accounting Department and Public Relations Department —together with their chief assistants.

In preparing this Edition all possible latitude has been allowed so that we could carry additional officials supplied by many companies who want total personnel reported. These men are shown under heading "Additional Officials."

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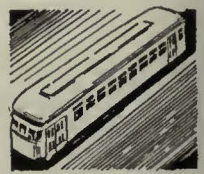
McGRAW ELECTRIC RAILWAY DIRECTORY

Published by

McGraw-Hill Catalog and Directory Company, Inc.

475 Tenth Avenue at 36th Street, New York, N. Y.



Special
Ohmer displays
have been arranged at our West Coast Branches for
A. E. R. A.
convention delegates

Here's the Ohmer Class 80 Ticket-Printing Register. Note the harmonious lines . . . the extra large visual indicator. Write today for full information about the Class 80 Register.

You are cordially invited to visit our Western Showrooms and inspect the latest Ohmer developments. You'll get new ideas about fare protection . . . transportation accounting . . . cutting operating costs . . . increasing profits.

Our Branch Managers will answer any questions you may care to ask and will try to make your visit pleasant and profitable. Feel free to call at any time.

OHMER ON THE PACIFIC COAST

In the West, as in the East, the Ohmer Fare Register Company has long been identified with the development and growth of electric transportation. Many of the largest western electric railway systems have used Ohmer Registers continuously for more than twenty-five years.

Big Contracts Renewed

The Key System Transit Co., Oakland, California, is now using 215 Ohmer Registers. The original contract, made in 1904, was recently renewed. When the term of this new contract is completed, this company will have used Ohmer Registers for *31 consecutive years.*

The Pacific Electric Railway Co., Los Angeles, is now using 1000 Ohmer Registers. Including the term of the contract, recently renewed, this company will have used Ohmer Registers *continuously for 28 years.*

The Southern Pacific Co., San Francisco, has 200 Ohmer Registers in use. The latest contract renewal will give it *24 years of continuous Ohmer service.*

The Northwestern Pacific Railroad Company, of San Francisco, using approximately 100 Ohmer Registers, recently extended its contract for a long term of years.

The Market Street Railway Company, of San Francisco, is also using Ohmer Registers under a long-term contract.

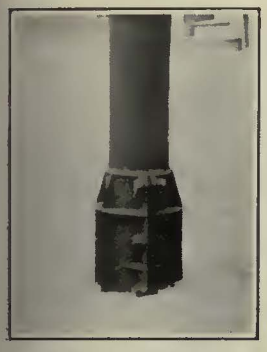
OHMER FARE REGISTER CO.
Dayton, Ohio, U. S. A.

OHMER
REG U.S PAT OFF
FARE REGISTERS

WEST COAST BRANCHES:

LOS ANGELES—834 S. FIGUEROA STREET
SAN FRANCISCO—1428 BUSH STREET
PORTLAND—148 NORTH 6TH STREET

In Absence of Convention Exhibits—



"C" Clamp Supporting Pole Corroded at Base

"B" Clamp Reinforcing Corroded Swaged Joint

"A" Clamp Installation

As we can not show our products themselves at San Francisco, we are mailing Sales Bulletin No. 3, Accessories for Tubular Iron Poles, together with reprint of this advertisement to Companies probably having tubular poles in service. If we have missed you, we hope you will write for this new literature suggesting methods and devices assisting in the economical solution of these problems:

Ground-Line Corrosion—Reinforcing Clamps, types for use without, or over, factory sleeves. *Illustrated.*

Upper Joint Corrosion—Reinforcing Clamps, types for swaged or unswaged joints. *Illustrated.*

Corrosion in Pole Steps, under Collars, etc.—Reinforcing Clamps, suitable also for tubular switch standards corroded under ladder supports.

Pole Top Extension—Reinforcing Clamps for extensions with pipe of same size, or one inch smaller. *Illustrated.*

Temporary Construction—Build up poles of any required length from poles on hand, lengths of pipe, and Reinforcing Clamps. All material salvaged following use.

Anchorage, Temporary or Permanent—Williams Pole Mounts will anchor poles on bridges, retaining walls, rock, etc. Other types for anchoring wood poles, or for salvaging wood poles rotted at ground-line and sound above ground. *Illustrated.*

Attaching Wood Crossarms to Tubular Pole—Crossarm Gains, secured with U-bolts or back straps, requiring no drilling of pole. Other types for wood poles using through-bolt. *Illustrated.*

Also send for samples and literature on latest types of devices helping to solve these problems:

Suspension of Signal Wires, Control Cables, etc.—Span Hangers with split porcelain insulators for grouping, or with spool insulators for spacing apart—for services with, or across, the supporting messengers.

Suspension of Lead-Covered or Armored Aerial Cables—Cable Suspension Clamps of various types for all service conditions.

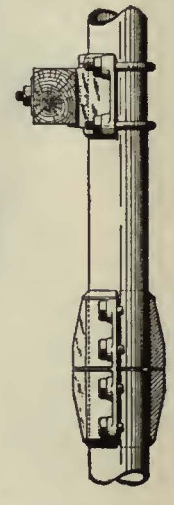
Simplification of Guying—Ingenious labor-saving Guy Hooks, Eye Nuts, Heavy Duty Guy Clamps, etc.

Securing Adjustability in H-Column Construction—Special H-Column Mounts and Adjustable Clamps for cross members eliminating all punching—also Catenary Clamps.

We feature Engineering Service for special jobs.

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Department
Factory and New England Sales Office:
Branford, Conn.
New York Sales Office:
Thirty Church Street
Canadian Mfg. Distributor:
LINE & CABLE ACCESSORIES, Ltd., Toronto

Typical Pole Mount Installation on Concrete

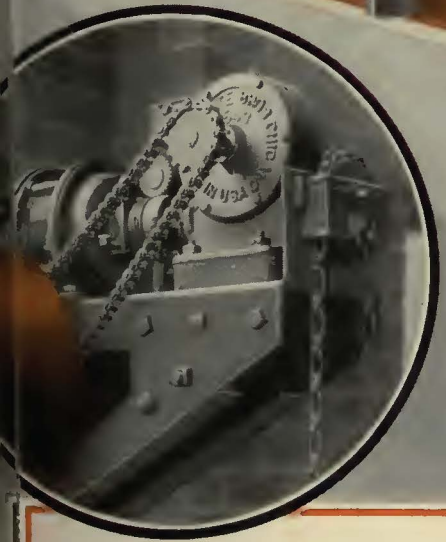


"C" Clamp Extension and Gain Assembly

"C" Clamp Supporting Pole Top Extension

MAHON

ROLLING STEEL DOORS

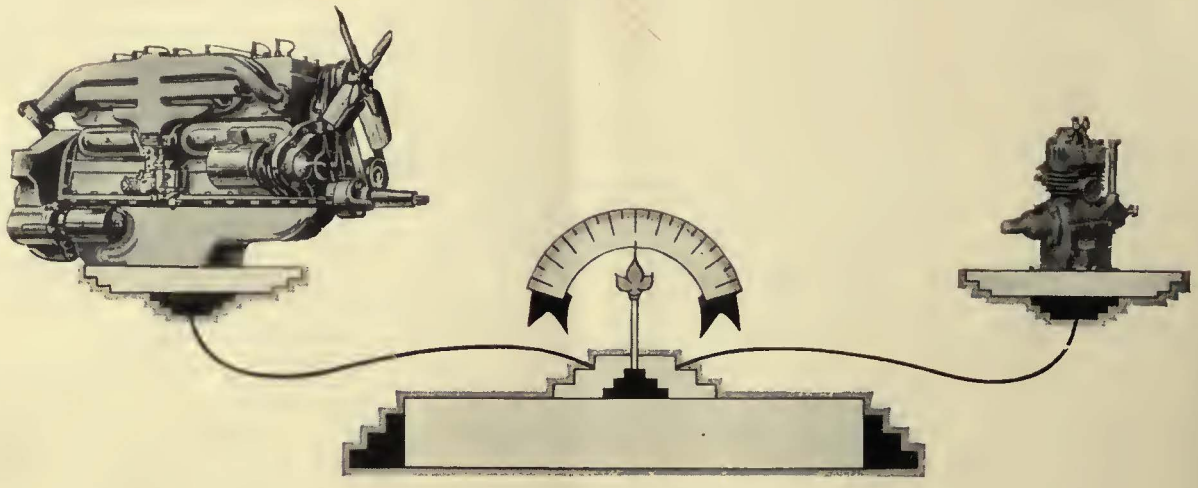


MAHON ROLLING STEEL DOORS are approved by the Underwriters' Laboratories Inc. . . . they embody the latest developments in doors of this type . . . they meet every requirement for openings in every type of industrial or commercial building.

For dividing fire walls, for elevator shafts, and for exterior openings these improved doors offer the utmost in fire and burglar protection together with long life, dependable operation and fine appearance. Write today for estimates or detailed information.

THE R. C. MAHON COMPANY

DETROIT MICHIGAN



The balance of motor power

More and more the question of adequate control becomes an important factor in the purchase of modern, heavy duty, motor transport vehicles. Day by day, fleet operators in ever increasing numbers are displaying brake consciousness to a marked degree.

Realizing the growing demand for a sure, quick, powerful stopping force . . . the necessity for a perfect balance of modern motor power, the more prominent manufacturers of commercial vehicles are featuring Bendix-Westinghouse Automotive Air Brakes as standard equipment. Such wide-spread acceptance of Bendix-Westinghouse control is in itself a tribute to its remarkable effectiveness.

Always ready to give you actual facts and figures, relative to the advantages of perfectly balanced Air Brake Control, when purchase of new equipment is contemplated . . . or to assist you in modernizing units now in service, a carefully trained force of power brake engineers is available to the operator. This service is in no way obligatory and may be had by addressing the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Penna.

Under the hood of this modern coach is mounted the sturdy Bendix-Westinghouse compressor. The heart of the Air Brake, this remarkably efficient device furnishes a never-failing air source for the braking system, air horns, and other pneumatic equipment.

BENDIX-WESTINGHOUSE

Automotive

AIR BRAKES

6274

THE PEREY
STREET CAR
COINPASSOR
in service

Don't experiment—install the Coinpassor and solve the fare collection and passenger loading problem, at one stroke. This is a proved and practical device, the combination of Perey's years of experience in turnstile design.

Photograph shows the Perey Street Car Coinpassor on the job in the new cars of the Brooklyn and Queens Railroad. One hundred of them going into service now. You are invited to make your own inspection of this Brooklyn installation if you care to.

How little space it takes! Just a slender arm across the passage entering the main body of the car. Plenty of room for people to pile onto the platform, close the doors and get the car moving, letting the operator run the car while the Coinpassor collects the fares.

How quickly it operates! Not the slightest delay! Collects the fares as fast as people can walk through.

How safe it is! Just four small arms of smooth and carefully shaped chromium plated steel rods, without an angle or corner anywhere.

Write for details and estimates.

ADVANTAGES

1. Makes one-man operation practical on cars of every size and type.
2. One-man operator can handle larger crowds without delay.
3. No rider can evade fare by slipping past the operator—the coinpassor forces all to pay.
4. Relieves operator of responsibilities for collection and registration of fares—he only has to make change and issue transfers.
5. Platform entrance well can be as large as desired.
6. Front, center or rear exit can be used with treadle operator.
7. Utilizes available platform space effectively.
8. Fast as the movement of passengers.

PEREY
MANUFACTURING CO.
101 PARK AVENUE, N. Y. C.

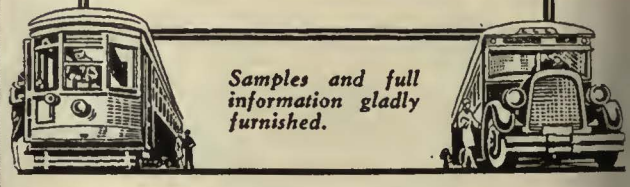
PANTASOTE
TRADE MARK

—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE
TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard
for electric railway cars
and motor buses



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The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK

N-L

Ventilators
Tail Lights
Track Sanders
Directo Door Signal
Universal Lanterns
(Safety and Signal)

Write for detailed Information.

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

SEARCHLIGHT SECTION

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Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

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

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

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1 inch $6.00
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R.J.

POSITIONS WANTED

ARMATURE winder well experienced with railway equipment desires change. Reference. PW-217, Electric Railway Journal, Tenth Ave. at 36th Street, New York.

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WANTED

Railway-Equipment
Power Plants
Rails and Overhead

Be sure to get our bid.
Dismantling done by us.

The Allite Corporation
636-38 Broadway, New York

New and Relaying Rails

All Weights and Sections

We specialize in buying and dismantling entire railroads and street railways. Also industrial and public service properties which have ceased operation. We furnish expert appraisals on all such properties.

May We Serve You?

The Perry, Buxton, Doane Company

(Capital $1,000,000.00)

Rail Department, Philadelphia, Pa. General Department, Boston, Mass.

Pacific Sales Office—Failing Building, Portland, Oregon

WANTED
SNOW SWEEPER
1—Double Truck.
PASSENGER CARS
5—Lightweight Double Truck.
W-215 Electric Railway Journal
Tenth Ave. at 36th St., New York City

FOR SALE
1000 K.W.
SYNCH. MOTOR GEN. SET
Modern type Westinghouse 575 v. D.C., 3 ph., 60 cy., 2,200 v., .8 P.F., A.C. 900 r.p.m. Motor Generator Set with Dir. Conn. Exciter and complete A.C. and D.C. Switchboards. Condition 95% New.
JOHN D. CRAWBUCK COMPANY
Empire Bldg., Pittsburgh, Pa.

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—to help you get what you want.

—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

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DISMANTLING

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Railway Equipment

BOUGHT SOLD EXCHANGED

All types of
CARS, MOTORS, TRUCKS, PARTS,
POWER HOUSE EQUIPMENT

Send us your inquiries and offerings

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393 Seventh Avenue, New York City

MAKE YOUR SELECTION

FROM 173 BIRNEY CARS

(60 May Be Sold)

Built by J. G. Brill Co.; Brill 79 E-1 Trucks; Full Safety Devices. Either Westinghouse No. 508 or Gen. Elec. No. 264 Motors. Complete with all appurtenances.

Now in Operation *Splendid Condition* *Low Price*

MORE THAN 20 YEARS AT YOUR SERVICE

For Complete Information Write:

W. M. McKEE CO.
601 Commonwealth Bldg., PHILADELPHIA, PA.

We hope you will enjoy the A. E. R. A. Convention

While there you will be in close touch with the most progressive men in your field. Many papers dealing with the latest practice will doubtless suggest marked economies that can be duplicated at least in part on your own system, by modernizing some of its equipment.

REMEMBER—that you can obtain up-to-date power plant, trackage, electrical and rolling stock equipment in the finest condition from us at savings that will enable you to purchase even if your available appropriation is limited.

We Buy Electric Railways and their EQUIPMENT

We have recently purchased the AUBURN & SYRACUSE RAILROAD CO., NEW YORK, and offer at exceptionally low prices the following:

Six Light Weight Double Truck Cars (2 to 5 years old)
Six Birney Cars
Sweepers and Rotary Plows
Freight Cars
Boring Mill
Rotary Converters:
25 and 60 cycle,
300 kw. 400 kw. 500 kw.
Motors:
76, 12-A 101B, 264-A
121, 200-J 508A
Controllers:
K-6 K-10 K-35G K-36-J
Compressors:
DH 16 CP 25 DH 25
Fare Boxes:
Johnson Cleveland
Large Quantity New Materials and Supplies.

We can make you an attractive Cash Offer for your entire system or any part thereof, including all electrical and mechanical equipment, trackage, overhead and rolling stock. Dismantling is done by us.

We will be pleased to inspect and appraise your railway property and to submit a fair bid for your consideration, without obligation.

H. E. SALZBERG COMPANY, INC.

225 BROADWAY *ESTD. 1898* NEW YORK CITY

ENGINEERS *and* CONSULTANTS

ALPHABETICAL INDEX

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Searchlight Section—*Classified Advertising*

EQUIPMENT (Used, Etc.)

BRILL TROLLEY BUSES

Thirteen 40-Passenger Type Ordered for Chicago

The answer to one of your problems—for extensions and boulevard service. Flexible enough to avoid traffic delays, yet affording modern electrically-operated transportation service economically and efficiently. Quick in acceleration and smooth in operation.

Practical for rush-hour as well as the off-peak periods—capable at all times of every power demand of load and roadway—designed and constructed for maximum service requirements.

Chicago has introduced the first of these modern Brill-built Trolley Buses. Thirteen have been ordered. Investigate.

THE J. G. BRILL COMPANY
PHILADELPHIA

American Car Company
St. Louis
The G. C. Kuhlman Car Co.
Cleveland

Wason Manufacturing Co.
Springfield, Mass.
Pacific Coast Representative
Rialto Building, San Francisco

Consistent Mack performance is the reason for consistent Mack repeat orders from Mack users all over the country—

Take the New York State Railways, for instance—

1924—purchased 2 Mack "AB" Buses
1925—purchased 4 Mack "AB" Buses
1926—purchased 6 Mack "AB" Buses
1927—purchased 5 Mack "AB" Buses
1929—purchased 23 Mack "AB" Buses
1929—purchased 8 Mack "BK" Buses

Everyone of these 48 Mack Buses is in profitable operation today.

MACK TRUCKS, INC.
25 Broadway, New York

Mack

Fourteen recent additions to the Mack fleet of the New York State Railways