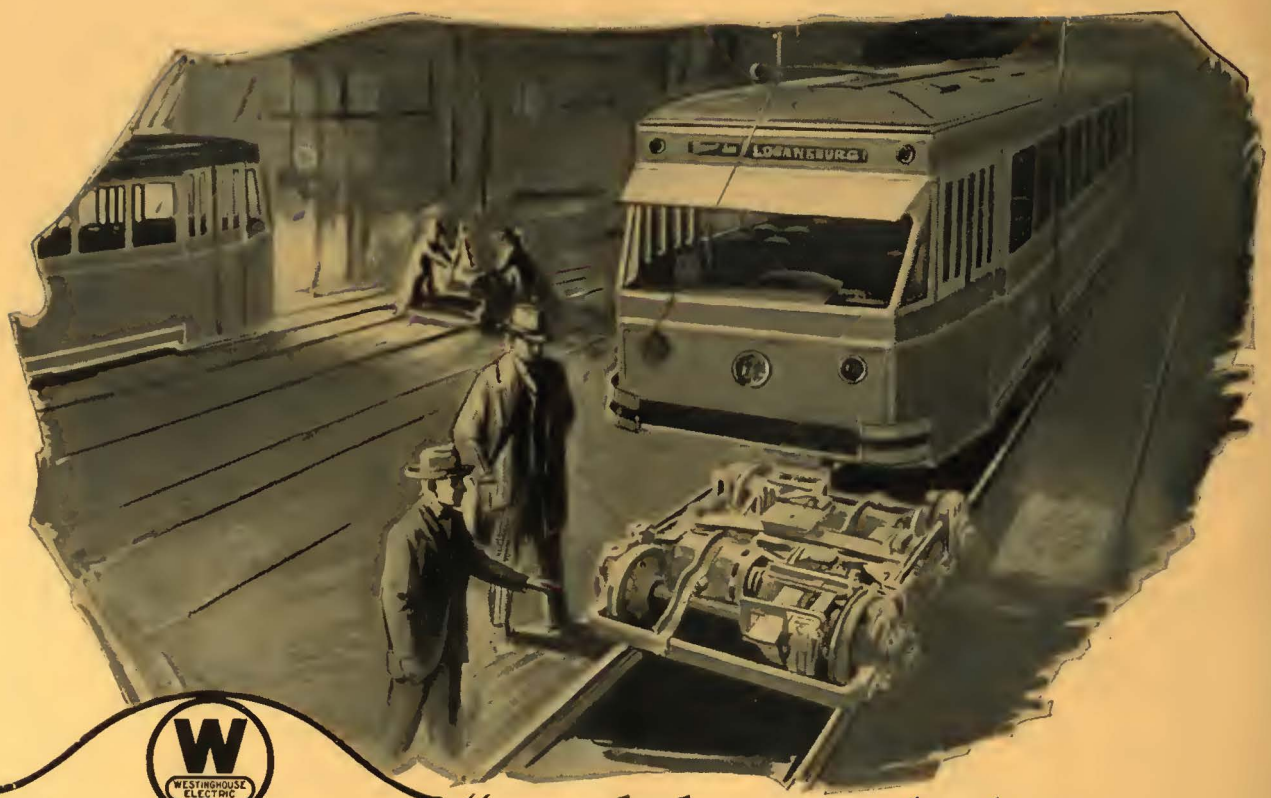
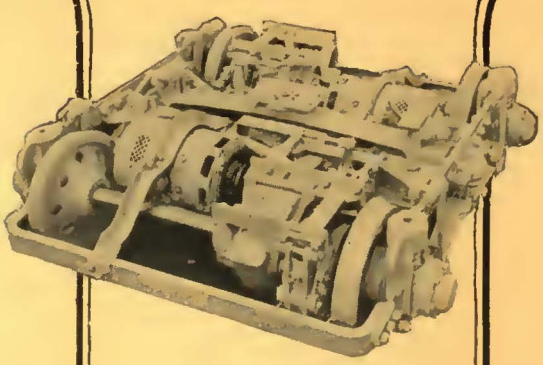
ELECTRIC RAILWAY JOURNAL

w-Hill Publishing Company, Inc. MARCH 10, 1928 Twenty Cents per C



"–and then, with the W-N Drive, the Motor is Spring-Borne"



W-N Drive Installation

W-N Drive advantages

- Lowest steps
- Faster acceleration
- Quiet operation
- Motors spring borne
- Gears run in oil
- Greater clearance
- Lighter weight
- Lower maintenance

THE entire W-N Drive motor is spring supported! The conditions of operation are thus made much more favorable for the motor than those obtaining when the motor is mounted on the axle and subjected to all the roadway shocks.

With the W-N Drive, the motor weight is all carried on the truck frames so that the dead weight is entirely removed from the axle.

The new W-N Drive light-weight, high-speed, low-voltage, spring-borne motor, pronounced the ultimate in modern railway motor design, has been evolved from the vast experience and engineering genius that has been manifested in all of the extensive pioneering by Westinghouse in the development of electric railway equipment.

Write our nearest District Office for a copy of Leaflet 20341.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA 1928

Westinghouse

X97159

MORRIS BUCK
Managing Editor
JOHN A. MILLER, Jr.
Associate Editor
CLARENCE W. SQUIER
Associate Editor
G. W. JAMES, Jr.
Assistant Editor

ELECTRIC RAILWAY JOURNAL

CHARLES GORDON, *Editor*

HENRY W. BLAKE
Senior Editor
GEORGE J. MacMURRAY
News Editor
PAUL WOOTON
Washington Correspondent
ALEX McCALLUM
Editorial Representative
London, England

Vol. 71
No. 10

Pages
385-424

CONTENTS

MARCH 10, 1928

Annual Maintenance Number

NEXT WEEK!

NEXT week's issue of ELECTRIC RAILWAY JOURNAL is the Annual Maintenance Number. Here will be discussed specifically the improvement of maintenance and construction practice in the various divisions of equipment, track and overhead line departments.

There are articles on equipment maintenance; steel and wood tie track; lubrication; insulation; overhead line; shop practices; controllers; welding; door devices. Each article is written by a specialist.

Regardless of your individual responsibility, regardless of the size or character of your property, if you have anything to do with electric railway maintenance there is something of interest to you in the Annual Maintenance Number next week. Don't miss it!

McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Avenue at 36th Street, New York, N. Y.
New York District Office, 285 Madison Ave.

JAMES H. McGRAW, President
JAMES H. McGRAW, JR., V.-P. and Treas.
MALCOLM MUIR, Vice-President
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
C. H. THOMPSON, Secretary

WASHINGTON: National Press Building
CHICAGO: 7 S. Dearborn Street
PHILADELPHIA: 1600 Arch St.
CLEVELAND: Guardian Building
ST. LOUIS: Bell Telephone Building
SAN FRANCISCO: 883 Mission Street
LONDON: 6 Bouverie Street, London, E. C. 4

Member Associated Business Papers, Inc.
Member Audit Bureau of Circulations

1928

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record
American Machinist
Power
Chemical and Metallurgical Engineering
Coal Age
Engineering and Mining Journal
Ingeniería Internacional
Bus Transportation
Electric Railway Journal
Electrical World
Electrical Merchandising
Radio Retailing
Construction Methods

Electrical West
(Published in San Francisco)

American Machinist—European Edition
(Published in London)

The annual subscription rate is $4 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Chile and Paraguay. Extra foreign postage to other countries $3 (total $7 or 29 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 20 cents.

Change of Address—When change of address is ordered the new and the old address must be given, notice to be received at least ten days before the change takes place.

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

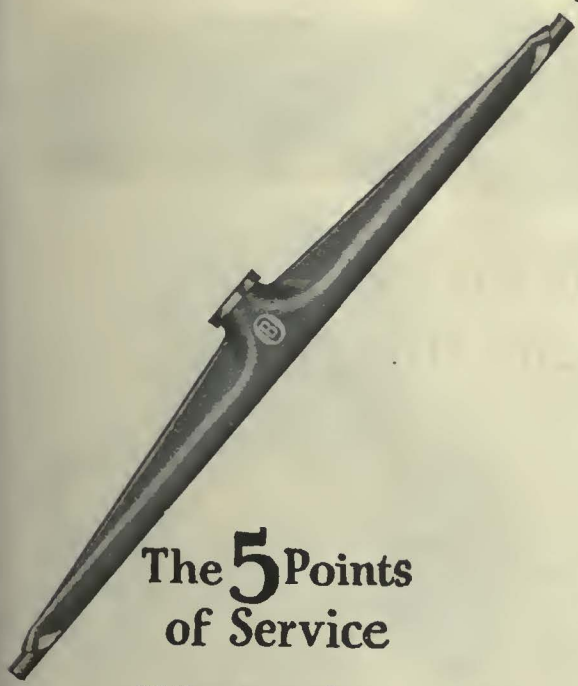
Number of Copies Printed, 6,210

Advertising Index—Alphabetical, 32; Classified, 28, 30, 32; Searchlight Section, 27

DOLLARS AND SENSE

INCREASING THE NET

with MARATHON EARS



The 5 Points of Service

(1) Easy approach
(2) Smooth underrun
(3) Protection to the wire
(4) Correct proportioning
(5) Extra long life

IF YOU save a penny here and a penny there, and the hundreds of other places on the operating end where it is possible to save—net earnings will soon begin to swell with the ferment of economy. For one per cent saved in operating expenses adds nearly 20% to the net.

You can be absolutely certain of substantial savings by adopting Marathon Ears. No other type of ear approaches it in length of service—number of car passes or ear life measured in days. Competitive tests made by any number of progressive railway properties prove it. Some time ago we published the facts about one Marathon Ear which stood the gaff of 701,478 car passes. This is an exceptional record, of course. But 200,000 to 400,000 car passes are *not* unusual. Think that over!

No practical railway man need be told of the necessity for economy in maintenance and operation. The most that he asks is to be shown how and where it may be accomplished.

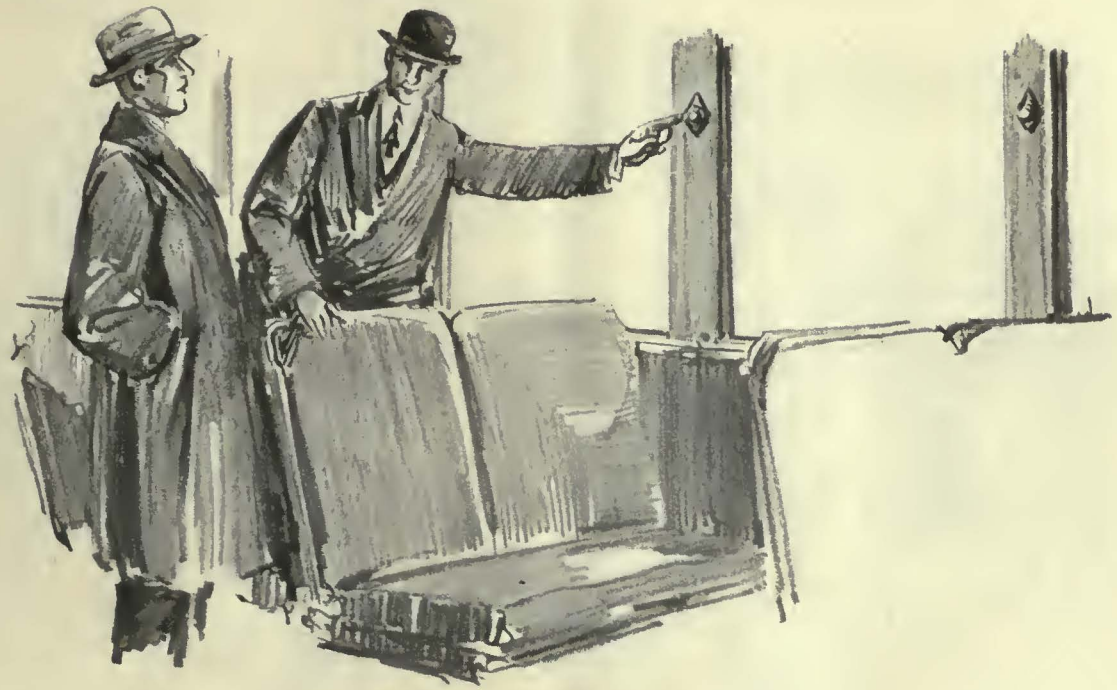
We cordially ask you to see if it can't be done with trolley ears. Test Marathon Ears on your lines *against the field.* That's all we ask.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
7988

Ohio Brass Co.

NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND ST. LOUIS SAN FRANCISCO LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



AN INSPECTION TOUR OF THE WELL EQUIPPED CAR

A convenience the public appreciates

FARADAY PASSENGER SIGNAL SYSTEMS

Build up your prestige and your patronage by providing every convenience for the riding public—such as reliable, easily reached Faraday passenger signal systems.

Faraday Car Signal Systems constitute a complete line of high and low voltage bells, buzzers, resistances, and pushes. These different devices are substantially constructed to withstand long service.

They enable passengers without commotion to signal the motorman to stop at intersections. They may also be used for various other signaling requirements.

No. 19403 Buzzer

Faraday Passenger Signal Systems

Type FB Type CB

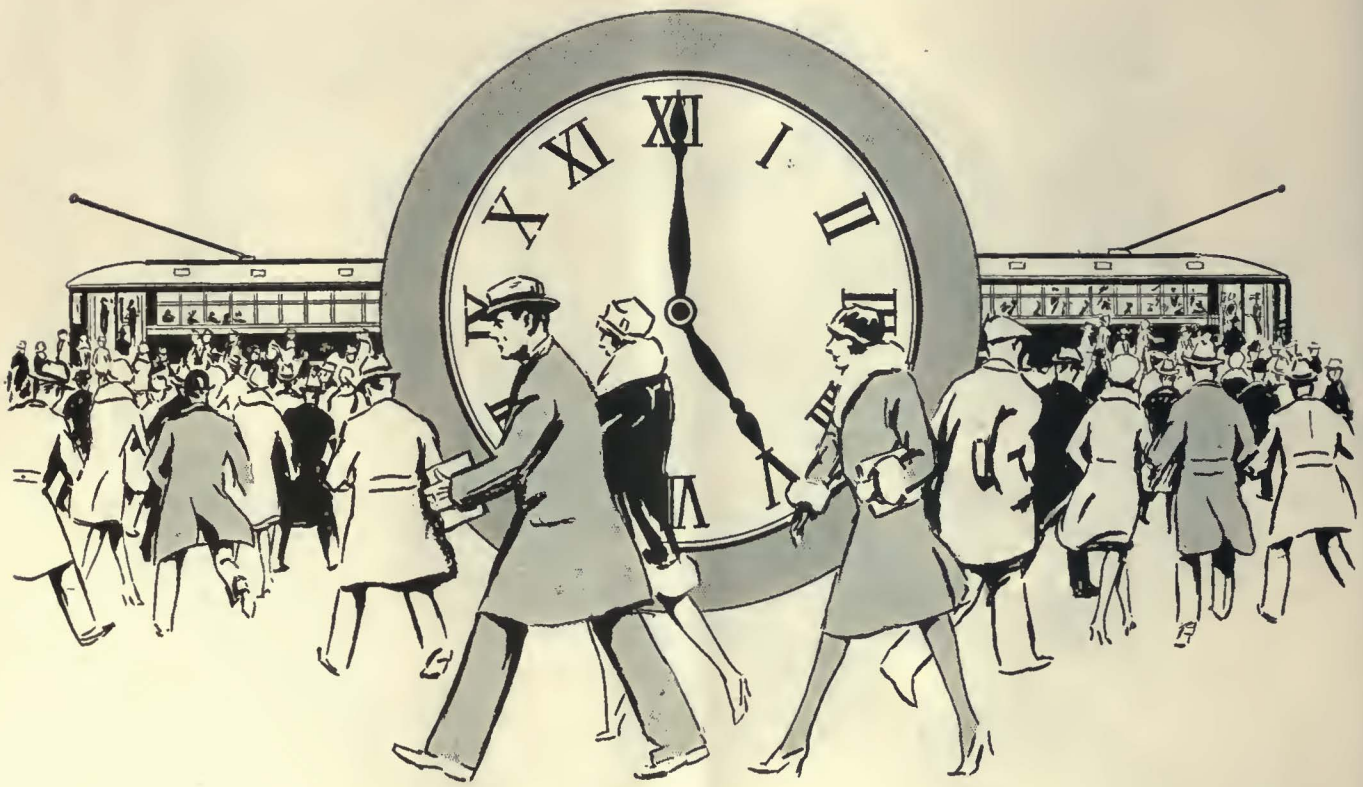
Send for full particulars of Faraday Signal Systems. Also for details of other Keystone Equipment used on the modern well-equipped car.

Get ESSCO Catalog No. 7

Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District offices at 230 So. Clark 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.

ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL



The 5 o'Clock Rush

Thousands of feet hurrying toward the tracks that lead to *home;* thousands of minds centered on *home;* thousands of tired men and women depending on electric railway service to get them *home.*

And electric railway service seldom fails them!

GARY WHEELS play an important part in the dependability of electric railways because, being of *wrought steel,* they combine the advantages of forging with those of rolling. They are made in a modern plant and rigidly inspected at every stage of manufacture. Their increasing use is the best evidence of their quality.

Illinois Steel Company

General Offices: 208 South La Salle Street
Chicago, Illinois

G A R Y

WROUGHT STEEL WHEELS

1 or 1000

No need to wage a losing fight!

Not when reinforcements are right at hand!

The engineer with his back to the wall, struggling against rising costs, more and more joints going bad, limited budgets for doing the work, is up against it. He must do something! Just patching joints and patching again is only putting off the inevitable day of reckoning.

Thermit Welding is the answer! It settles the problem of joint repairs, just as it has settled the problem of total joint elimination in so many big track construction jobs.

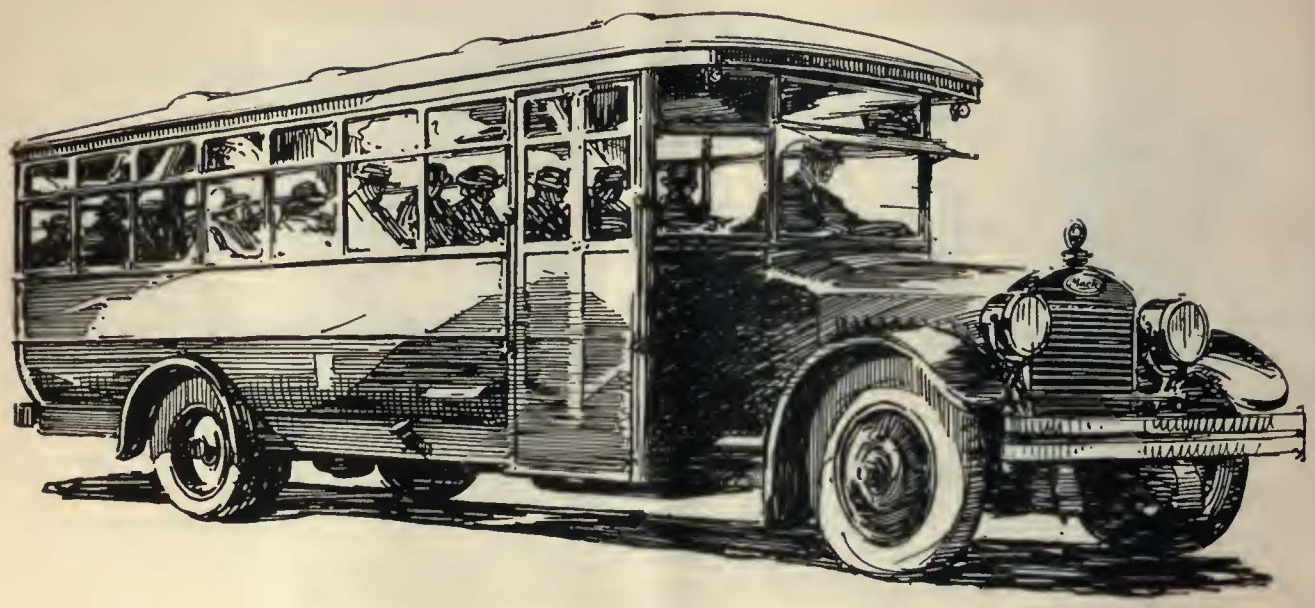
Thermit Welding is proving just as successful, just as economical, just as logical for scattered joint repair jobs, as it has for straight-a-way track laying jobs.

If you're not posted on what Thermit does, ask Birmingham; ask Grand Rapids, ask Milwaukee, or a hundred others.

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO



For Coach Operation . . . . . .

WESTINGHOUSE AIR BRAKES

—increase revenue by facilitating the use of vehicles of higher carrying capacity, and permitting higher schedule speeds in safety.

—save time by allowing drivers to confidently hold close formation in traffic lanes, eliminating the annoying small car cut-ins from side lanes.

—make for satisfied drivers, by minimizing physical effort in braking—one of the most arduous operations of modern coach control.

—stimulate public confidence in the stopping ability of the modern heavy coach whose power and speed rivals that of the trimmest roadster.

Westinghouse Automotive Air Brakes have been adopted as standard equipment by leading manufacturers.

WESTINGHOUSE TRACTION BRAKE COMPANY
Automotive Brake Division: WILMERDING, PENNA.

WESTINGHOUSE
AUTOMOTIVE AIR BRAKES

STYLES IN TRACK CONSTRUCTION

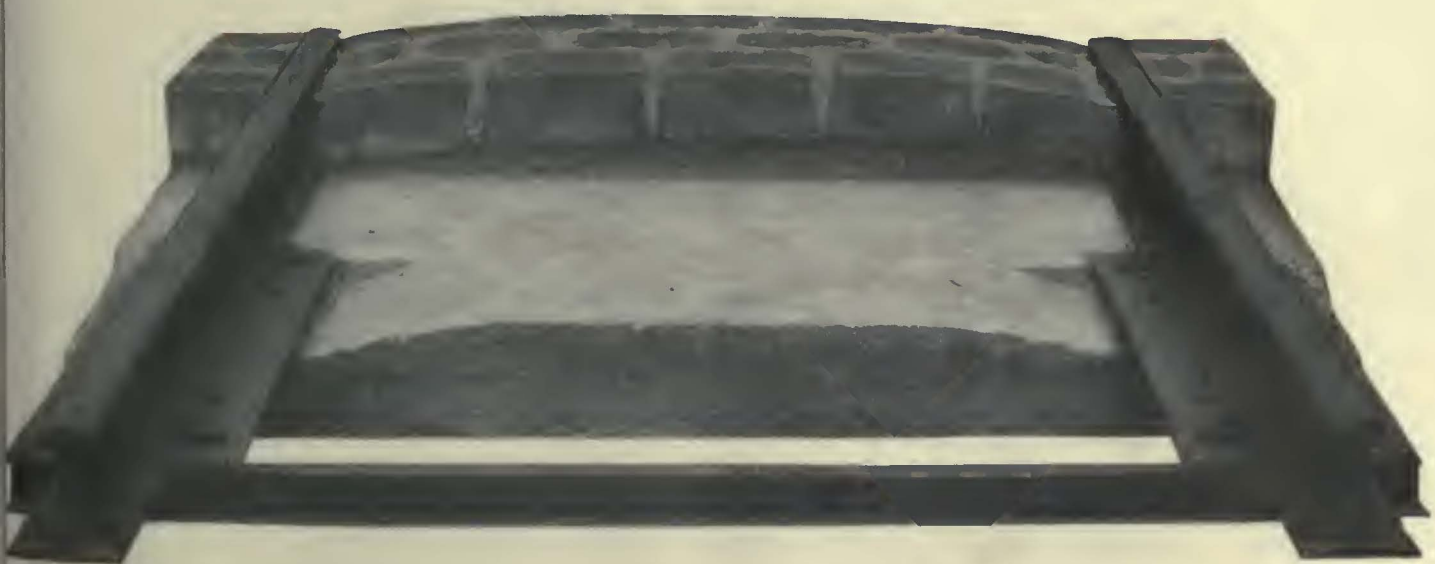
6

This is No. 6 of a series on paved track design with STEEL TWIN TIES as used in over 45% of the cities of over 200,000 population in the United States. No. 7 will appear in an early issue.

TODAY

YESTERDAY

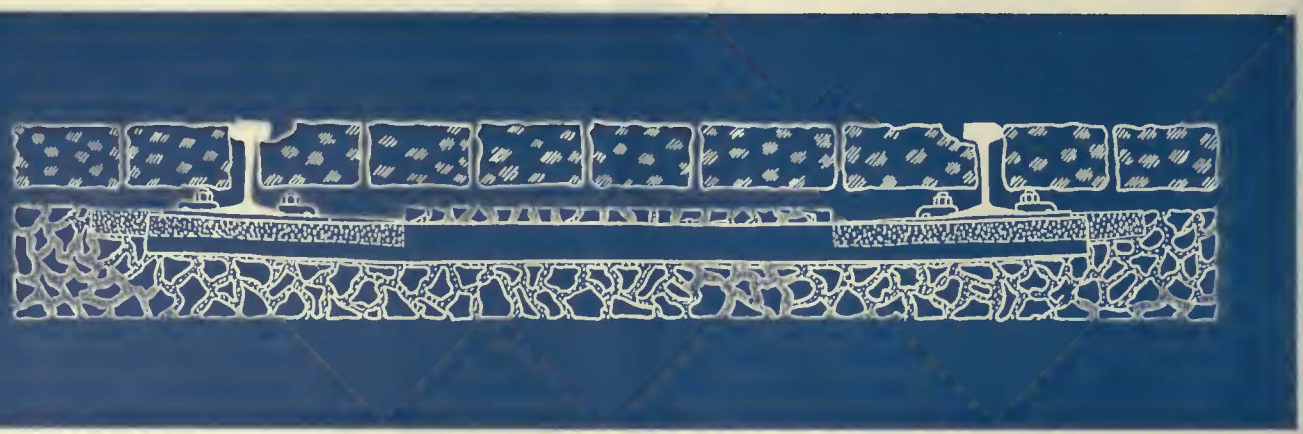
No. 1 Cincinnati
No. 2 Boston
No. 3 Detroit
No. 4 Philadelphia
No. 5 Kansas City
No. 6 Cleveland
No. 7 Washington
No. 8 Buffalo



STEEL TWIN TIE TRACK

THE BASE OF MODERNIZATION

In Cleveland



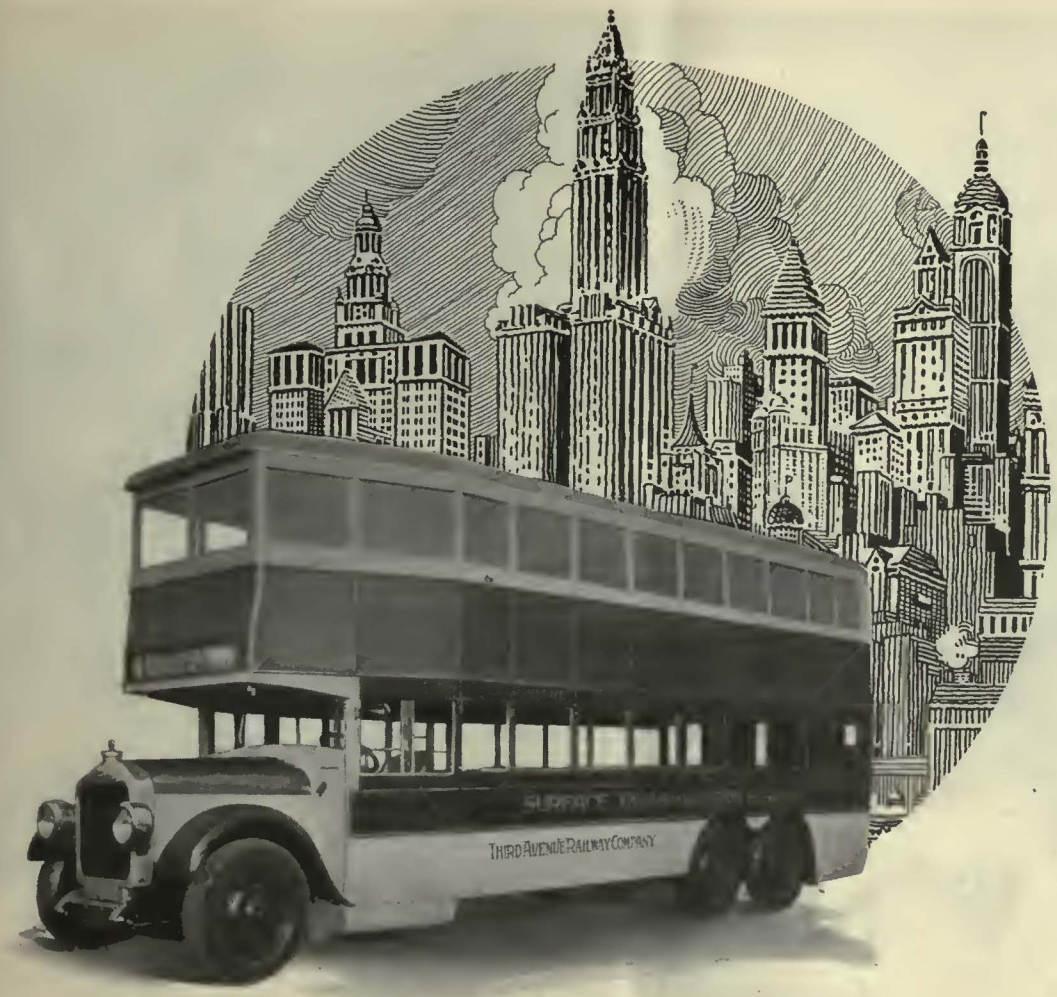
STEEL TWIN TIES were furnished for Payne Avenue, Cleveland, with the ends bent upward to cant the rail 1 in 25 and punched for 102-516 Tee rail. The Clark joint was used in this construction, and the track was paved with granite block.

Complete detailed drawings and specifications will be sent on request.

Engineers of The International Steel Tie Company have played no small part in the design of better, more lasting track. We have in our files a fund of data on paved track construction that is at your disposal. We will be pleased to discuss with you your paved track problems, and to help you start your modernization program right. Steel Twin Ties are the first step toward better service, and lower initial and maintenance costs.

The International Steel Tie Co.
Cleveland, Ohio

TWIN TIES ARE ALL STEEL



also—

On the Safeway Buses

ordered by the

THIRD AVENUE RAILWAY CO.
OF NEW YORK

NP

TREADLE DOORS

have been specified to handle crowds with the efficiency found only in
CIRCULATING LOAD

National Pneumatic Company

Executive Office: Graybar Building, New York

General Works, Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

Interurban operators sought these features in a fare register

The National Fare Register was not introduced until it embodied all of the practical suggestions gained in long contact with interurban operators and actual field tests.

"It must be fast," said the operators, "it must give absolute control of fares, prevent over-riding, be convenient to conductor or motorman and passenger, tie in with our auditing system and be accurate in its operation."

National Fare Registers meet those requirements and go a step beyond. The prominent indication is visible to passengers, making them inspectors of the record made. A keyboard, fast and positive in its action plus electric operation, speeds up loading.

The printed detail-strip gives a complete, locked-up record of every fare. Printed tickets showing zone from and to and amount and kind of fare paid are issued to passengers and collected at the end of the ride.

This ticket shows whether or not the passenger is leaving at the zone paid for and prevents over-riding.

Complete information about these and other features of National Fare Registers is available from our nearest representative or by letter or wire to Dayton. Also many interesting facts on savings and profit increases which have resulted from the use of these machines.

Improved Ticket

The ticket issued by a National Fare Register is convenient for passengers to handle without folding. It is printed on heavy stock and its printing is always legible even though crumpled.

NOV-3 011

DO NOT DESTROY TICKET

25·35 -.55★ -02

From To Fare Oper.

Surrender ticket when leaving.

1 National Transit Co. Anywhere, U. S. A.

Ticket, Actual Size

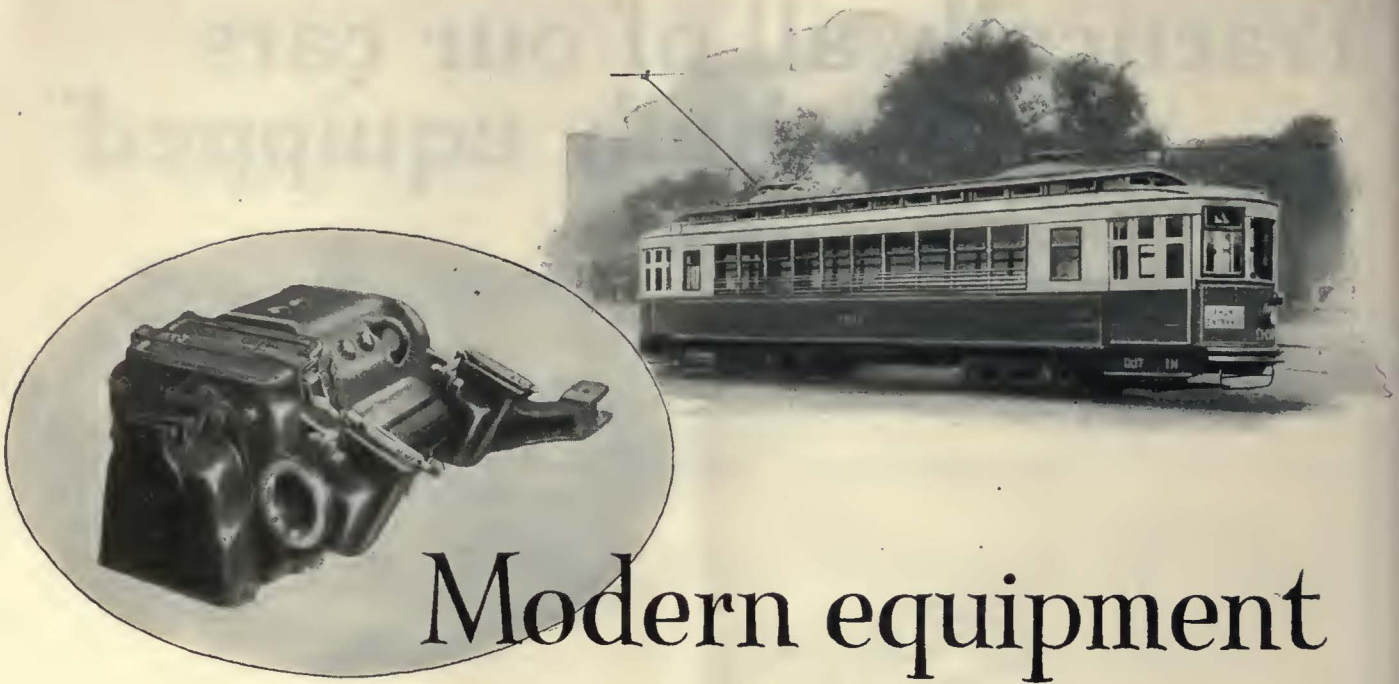
Important Features

Prominent indication. Fast keyboard. Electric operation. Printed record of every fare. Total of all cash fares. Small size and strong construction. Improved ticket. Repeat key.

NATIONAL FARE REGISTERS

The National Cash Register Company

Dayton, Ohio



Modern equipment returned 25 per cent

The Georgia Light and Power Company's recent program of modernization at Atlanta involved 170 new one-man cars and has shown a return of 25 per cent on the investment. Revenue was increased because of the higher speed, larger capacity, lighter weight, and attractive appearance of the new cars; and operating expenses were materially reduced.

These new cars, equipped with G-E motors and control, have traveled 15,874,570 car-miles with only six armature rewinds. During the eight months ended August 31, 1927, they ran 4,821,132 miles with one electrical failure per 321,000 miles. Pull-ins have been reduced to one per 28,578 miles.

Forty additional new cars, equipped with the same type G-E motors and control, have only recently been placed in service in Atlanta.

330-68

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Publishing Company, Inc.
CHARLES GORDON, *Editar*

Volume 71 New York, Saturday, March 10, 1928 *Number 10*

Commemorating a Service to Humanity

IF THERE is any doubt left at all about the importance of the rôle played by the individual employee in the success or failure of a railway's operations, that doubt is dissipated by the events following the Brady Safety Medal Award to the Louisville Railway. This company, through its president, J. P. Barnes, accepted the award in the name of its employees, and then gave the men themselves the opportunity of celebrating in adequate fashion their accomplishment in the service of humanity. The unique celebration took the form of two great dinners—one for day men and one for men on night runs—given to 2,400 employees and their wives.

It was particulary fitting that this dinner commemorated two other notable events in Louisville. During the preceding month every carhouse on the property had exceeded the record of 25,000 miles per chargeable accident which had been set as the bogie for eligibility to one of the safety dinners that have come to mean so much to Louisville trainmen. The occasion also witnessed the annual award of the Anthony F. Connelly medal to William T. Kays, a motorman on the Oak Street car line, for outstanding public service. This medal, fittingly named in honor of an employee who died three years ago after 50 years of railway service, has come to typify the spirit of public service on the Louisville property.

There is something deeply impressive in this story of 2,400 trainmen and their wives sitting down at a dinner to celebrate collectively their own good work in the interest of humanity and to honor specially one of their own number who had achieved outstanding recognition. Can one doubt but that each of these men went back to his car with the feeling that his job means something more than merely putting in a given number of hours for a specified rate of remuneration? Suppose, then, that each street car operator went forth daily with the conviction that he is concerned not only with the effect an accident might have upon himself and the company, but also with the discomfort and suffering which it might entail; and suppose that he came to see clearly that an accident avoided through his own alertness, regardless of the carelessness of others, is a direct contribution to the welfare of humanity and to the progress of civilization. Suppose he came to regard himself as entrusted with a power to protect human life and property, equal, or in some respects greater, than that of his superiors.

To establish such an *esprit de corps* in its carhouses is the desire of every progressive railway management. But men do not react to such sentiments until they come to understand in its full significance the part they play in their company and to feel the motives that inspire its management. Since time immemorial, the act of breaking bread with a man has been associated with friendliness; and that is the first step toward confidence and understanding. When motorman and manager sit at the same board to commemorate mutual accomplishment in the preservation of human life and happiness the service of humanity becomes a meeting ground of mutual inspiration. Any man who works in this spirit does not live in vain, and any man who helps him to see himself in this light renders no ephemeral contribution to the transportation industry.

The Doctrine of Thrift Is Still Sound Today

THOMAS E. MITTEN did workers everywhere a real service when in the series of articles about him in the New York *Sun* he sounded a note of warning about following what he called "The New American Religion." He was referring, of course, to the practice, particularly by the wage earners of all classes, of mortgaging their future so as to secure present comforts that they have been led to believe are essential to their happiness. No one decries the right of the worker to aspire to better things—so long as they are better things. It is highly desirable that he should, desirable from his standpoint and desirable from the standpoint of better business. But that desire is fraught with great danger, danger alike to the man who permits his wants to outstrip his capacity to pay, and danger to business itself.

Since electric railways are such large employers of labor, these admonitions may well be sounded through such channels as are at the disposal of the railways. Mr. Mitten sees an economic change as inevitable. He says that the doctrine that prosperity depends upon spending freely and pledging future earnings has been sponsored even by business men who would not consider such a rash policy in the financial management of their own properties. In this he is right. He is just as right as the banker was who some time ago said that the trouble with America is that many men are riding around in Packards who ought to be using Fords and that many are riding around in Fords who ought to be pushing wheelbarrows. There was a certain amount of literary license about this characterization, but there was also about it a very large element of truth.

In the present era of inordinate prosperity in the United States a lot of pseudo economics has been paraded which will not stand the acid test of the crucible of experience. The baser metal of slipshod thinking has passed for the gold of fact. Mr. Mitten pointed out that the wise business man uses the surplus of his good years as a cushion for the bad years and that the business man owes it to his workers and his customers to educate them in similar conduct of their personal finances. Many other far-sighted men in business, particularly those who have fostered employee ownership, have made a serious effort to encourage a sound economic policy among the men in the ranks. In recent years, however, anyone who propounded the idea of thrift was likely to find himself persona non grata in

many quarters. Thrift and parsimony are very different things that have too often been accepted as one and the same. There is one thing about it—few ever had cause to regret the practice of thrift, but countless numbers have had cause to lament their profligacy. The man who earns $10,000 a year and lives beyond his means is no less profligate than the motorman who permits his outgo to exceed his intake. Each is equally doomed. The doctrine of thrift is as sound today as it was when it was first enunciated by "Poor Richard."

Developing Latent Transport Possibilities

RECENTLY the surprising statement was made by a real estate man that the necessity for adequate parking space will soon force the development of suburban business areas which ultimately will sound the death-knell of retail stores in the larger urban centers. His prediction was based on the difficulty of finding parking space in the centers of certain of the large cities.

A statement such as this certainly shows a very narrow viewpoint. It entirely overlooks the possibilities of public transportation. Should any large number of persons decide to do business in the outskirts because of lack of facilities in the center of the city it would be just that much easier for the street cars and buses to move through the congested districts. This in turn would lead to a larger use of public transport and with it bring greater prosperity for the stores in the central area.

However, to plead for public transportation without giving further thought to it than this would be to leave it just where it has been for a number of years. Even with a reduction in the use of automobiles in the congested district there is need for considering the advantages and limitations of every type of vehicle, both public and private. It is possible to provide better facilities, give higher speeds, and keep the cost commensurate with the value of the service, only if all the transportation agencies are fitted into the picture where they will appear to the best advantage.

Few persons are able to view the entire traffic and transportation problem of a community in such a broad-gage manner that they can determine absolutely the proper place for each of the various vehicles. Even in the matter of parking, well-intentioned city officials have been forced to back down when the merchants have demanded that the ban be lifted. What is needed is not alone co-ordination of services to give real transit relief but a control which will enforce such co-ordination.

A move such as that outlined above has been made in London within recent months in the appointment of a Minister of Transport, who has supervision over all forms of transportation in the metropolitan area. A somewhat similar development has taken place in this country in the appointment of the Port of New York Authority, which has control not only over passenger transport but also over the rivers and harbors in the port and all the rail and highway lines leading to the port. These bodies are making steady progress in dealing with the problems of local transportation. But they are only instances where outstanding communities have attacked the problem. It exists in every city and metropolitan district, and only by careful analysis can the proper solution be arrived at that will give the transport that is needed to develop the possibilities that lie dormant in any locality.

Detroit's Express Line Deserves an Extended Trial

OPERATION of the express street cars service with supplementary local buses on Jefferson Avenue in Detroit is provoking widespread discussion among various factions in the motor city. The article on this operation published in the Jan. 7, 1928, issue of ELECTRICAL RAILWAY JOURNAL has been followed by various supplementary developments. The most recent items, published last week on pages 358 and 376, refer to the results of a questionnaire sent out to operators of automobiles and trucks by the Traffic Survey Bureau of the Detroit Police Department, and to a report made by the city's Rapid Transit Commission.

It is unfortunate that this initial installation includes so many special conditions that the full possibilities of the plan and its suitability for application on other streets and in other cities becomes difficult of determination. Nevertheless it is important, now that the project has been in operation since Sept. 18, 1927, that every effort be made to derive from experience a full analysis of the possibilities and limitations of the idea.

Observation of the Detroit operation indicates several interesting features. First of these is that the elimination of many car stops and the regulation of other traffic to synchronize with the movement of public transportation vehicles speeds up all traffic on the street and materially reduces interference and congestion. Furthermore it has been demonstrated that the scheme of furnishing local service with supplementary buses does not demand an excessive number of buses, because only a small proportion of the passengers carried on the cars actually use the combined service. Of course this situation is subject to considerable variation, depending on the travel characteristics of any given street; but the Jefferson Avenue operation indicates that such a combined service can be operated with only a small proportion of the number of buses that would seem to be required from a purely theoretical analysis of the plan.

Beyond this point it is hard to draw definite conclusions regarding costs or the effectiveness of increased speed in attracting riders. It is important to bear in mind that the present operation includes many expedients and does not represent in any way the full possibilities of the express service. An important change was made in the route simultaneously with the starting of express operation. This consisted of cutting the old Jefferson Avenue-Grand River through line. The experiment was started on a street having many special traffic conditions that are not typical because of the absence of normal cross traffic. Another factor to be considered is that some of the oldest type of cars in Detroit were used for starting the express line. The buses used for the local service were not selected with a view of meeting the particular requirements of this type of service, but were adopted for the purpose merely because they were available. The existence of competition by independent buses and by numerous jitneys, still further complicates the problem of analyzing the economics of the new service.

All of these conditions must be borne in mind when attempting to draw conclusions. Obviously, the success or failure of the idea, or the possibility of its extension should not be judged without considering the various expedients in the present operation. The smoothness with which the operation is being carried out, however, even with these makeshift facilities, and the absence of

any really serious operating difficulty is particularly worthy of note. When it is considered that the elimination of many stops reduces the need for a conductor and opens the possibility for one-man operation, the wisdom of witholding judgment on the cost of this combined car-bus service becomes obvious. Operation of single cars with one man would reduce the headway between express units in comparison with present two car trains and would thereby make more convenient the transfer from local buses.

It is fitting that this experiment is being conducted in the motor city from which issue the millions of automobiles that create present day traffic congestion throughout the country. The plan of operating surface cars express is worthy of attention both by transportation men and those who represent the community point of view. Prejudice and snap judgment have no place in this consideration. Any plan which offers even a possibility of giving faster service on the one hand and of avoiding or postponing the heavy expenditures demanded by rapid transit construction, strikes directly at the very heart of the transportation and traffic problem in many American cities.

A Convincing Answer by Those Who Use the Service

THE INTERURBAN is dead—long live the interurban! This salutation by residents of Rosedale, Merriam and Shawnee, Kan., will usher in the resumption of railway service on the Hocker line scheduled for April 1. In good measure the laurels for this revival go to the people living along the Hocker line who willingly subscribed $10,000 in order to have service reestablished and a dependable transportation system a surety.

Events in the restoration of the Hocker line are worth repeating. Officially known as the Kansas City, Lawrence & Topeka Electric Railroad, this line, operating 21 miles, went into receivership in 1919. After eight years the sale of the property at public auction was ordered by Judge Pollock of the Federal Court in Kansas City, Kan., following a request for a termination of the receivership and sale of the property as scrap. In August, 1927, at the courthouse in Olathe, Kan., it was bought by the Sonken-Galamba Corporation, Kansas City, Kan., for $28,500. Mr. Sonken expressed his intention of junking the line. Immediately, appeals to save the road were voiced by residents and property owners who from then on worked indefatigably for the restoration of railway service. Despite setbacks, delays and disappointments an agreement was finally reached with the Kansas City Public Service Company to furnish power at cost, to rent four cars and to purchase $15,000 in bonds of the new company to be known as the Kansas City, Merriam & Shawnee Railroad.

All this took place, even though the line is paralleled by a fine brick highway on which licensed buses are operated. Apparently the experience of those people whose convenience and property value depend on adequate and reliable public transportation service, wanted the interurban badly enough to dig down into their own pockets for the money needed to restore operation. It is to be hoped that their action will result in the ultimate rehabilitation of the road and in the development of a class of service that will repay them for their public spirit and courage. Here is a convincing answer on the part of those who use the service, to those who would have us believe that the interurban of this type has outlived its usefulness.

"Caveat Emptor" Not Part of Modern Business

WHAT is known as a buyers' market exists at present. There is no disposition to quarrel with the purchaser who seeks legitimately to take advantage of it. It is only natural that every one making purchases should seek to do so on terms favorable to him, but that is not the end in itself. Price is important, but price alone is not the controlling factor, or should not be. Other factors are equally important, because they themselves constitute the value for which the price is paid. The chief concern of the buyer should be to see that he obtains a value proportionate with the price. The chief concern of the seller should be to see that he obtains a price commensurate with the value. Railway men are big buyers. They know that under a fixed fare the service rendered tends to approximate the limits which that fare imposes. They should know that it is equally as poor business for them to be a party to a transaction in which either side is going to lose money as it is for the public or its representatives to be a party to inflicting an inadequate fare on the railway.

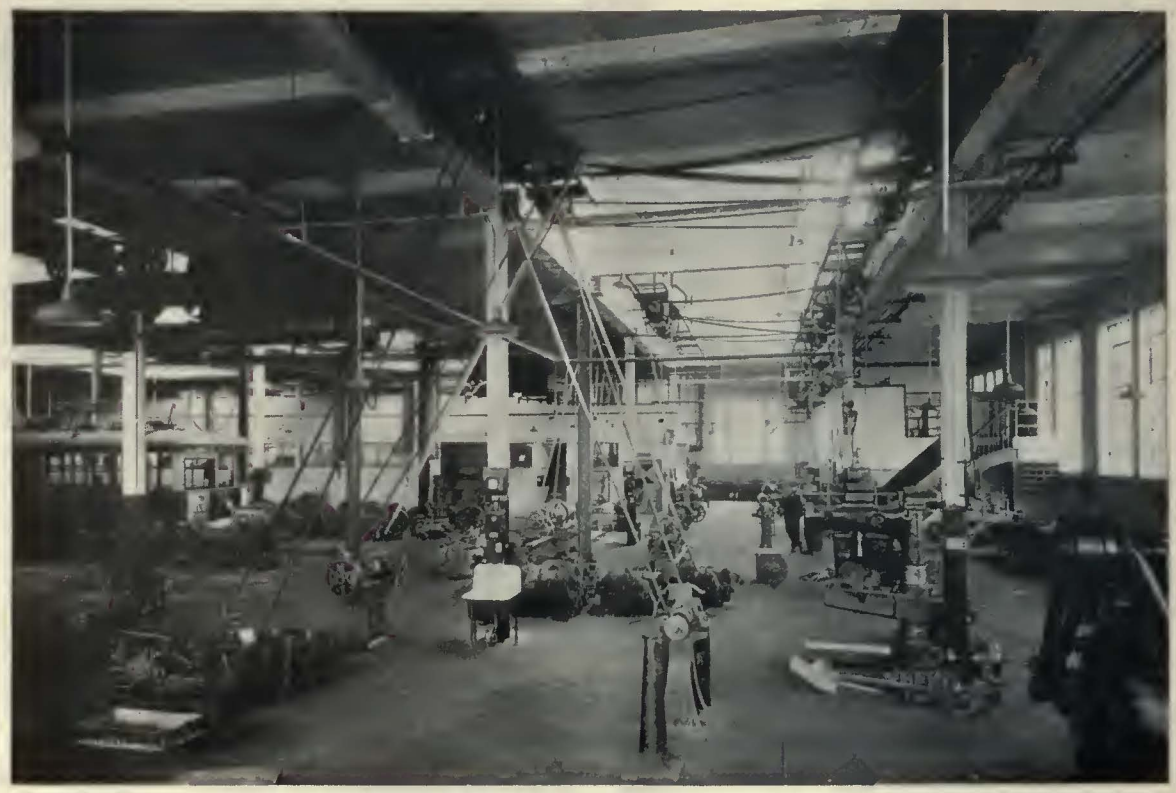
Samuel Insull, as quoted by Earl Whitehorne in his recent article in the ELECTRIC RAILWAY JOURNAL, put the matter succinctly in talking to electrical men about purchases when he said that if competition is so keen as to hamper research work and threaten the quality or the rate of development; if margins that are too narrow restrict the wholesaler's ability to carry adequate stocks, supply sales service and extend credit to the retailer the purchaser suffers no less than the seller. And if the policy is carried too far the seller is virtually ruined or forced out of business. It is a complex economic problem that would at first appear not to admit of the entrance of the issue of ethics. But an ethical issue is involved. The pressure that can be brought to bear on the seller is, of course, very great. Some are in a position to resist it stoutly, but others are not so fortunately situated. The secret bid is, of course, one of the greatest hindrances to the correction of present-day abuses. Three recommendations made for reform follow:

1. That bids on standard listed apparatus should be offered for examination by any bidder who is called back and asked for a reduction of his price.

2. That salesmen should demand this as evidence of good faith on the part of the buyer whenever asked to cut a price after bids are in.

3. That post mortems on competitive bids should be made standard practice among all manufacturers so that losers may understand their lost business.

As the advanced thought of the day sees it the seller should not be made to fight for this reform unaided. Purchasing agents individually and as nationally organized should also become the exponents of this idea. It is another step to be taken in the banishing of trickery from trade. In other words, in this era of economic intelligence the gentle art of profiteering by purchasers should be laid away in shrouds along with the wooden nutmeg and that once popular commercial slogan—*caveat emptor.*



Machine shop, looking from the blacksmith shop toward the stores department

Overhauling and machine shop, looking from the transfer table

View of the woodworking shop from the transfer table

Paint shop, looking from the transfer table

New Repair Shop at Quebec

A main shop building and a carhouse were constructed. Additions provide a boiler room, general storeroom and lumber storage. Interior transfer tables not affected by extreme winter conditions

DIVERSITY of equipment operated was an important factor considered in laying out the new repair shop of the Quebec Railway, Light, Heat & Power Company at Limoilou near the mouth of the St. Charles River. This company supplies all the electric power and gas used in the vicinity of Quebec and operates the city tramway system as well as a 25-mile suburban line to the shrine of St. Anne de Beaupré. Cars for the city division include 63 double-truck and 47 single-truck passenger cars together with 16 miscellaneous cars, making a total of 116. The suburban division has the following cars:

Passenger cars, steam railway type	22
Electric suburban type motor cars	11
Electric suburban type trailer cars	5
Steam locomotives	2
Electric locomotives	4
Freight cars	142
Portable substation	1
Miscellaneous Equipment	7
Total	194

Daily freight and passenger trains of the Canadian National Railway system are operated over the company's tracks between Quebec and St. Joachim, which is the western terminus of the 60-mile branch line of the Canadian National Railway to Murray Bay. In addition to a large amount of local freight, the company serves two large pulp and paper companies with raw material and moves their products back to the trunk line terminals at Quebec. Steam locomotives have been superseded by electric for regular service, but two are kept in readiness for service in case of electrical breakdown.

Transfer table, looking toward the wheel shop and paint shop

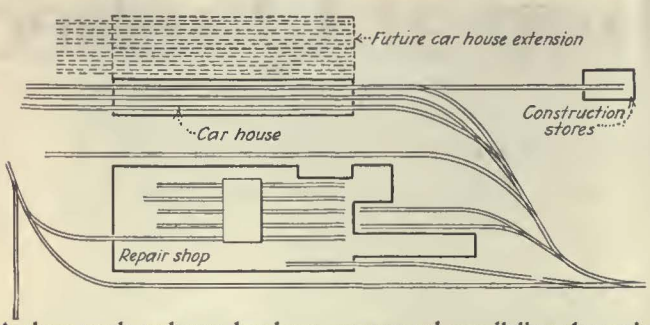
The immediate result of the completion of the new shop was the closing down of independent repair shops on the suburban division at St. Anne de Beaupré, and at Montmorency Falls. Repair work previously carried out at the St. Malo, St. John Street and St. Paul Street shops of the city division, has been transferred to the new shop and the former are now operated as carhouses for inspection and storage. The concentration of facilities will allow the carrying out of an effective reconditioning program after which the cost of maintenance should decrease.

The buildings are of light buff-colored Citadel brick with steel sash and skylights. Roof members and supporting columns are of steel with gypsum fireproof covering. This results in a very favorable insurance rating. Floors are of concrete base with creosoted wood block surfaces. The main building is 312 ft. long and 138 ft. wide. Additions provide space for the boiler room, lumber storage, wheel stores, and general stores. The building occupied by the stores department is two stories high, the upper part being used for the lighter material and for the offices of the superintendent of equipment and general foreman. The stores for all departments of the company are now concentrated at this point.

Machine shop, looking from the armature repair department

In the design and layout of the buildings, consideration has been given to an arrangement which will allow for general extensions without altering existing plans and loss of efficiency. The shops were planned by P. J. Quinn, superintendent of equipment, co-operating with D. E. Blair, general superintendent of the Montreal Tramways. The buildings were designed and constructed under the supervision of John S. Archibald, architect, of Montreal.

Climatic conditions in winter are such that the entrances were limited to a main lead-in track feeding an interior transfer table from the north side, and a special rear entrance for long wheelbase steam locomotives in the south end of the building. This south track



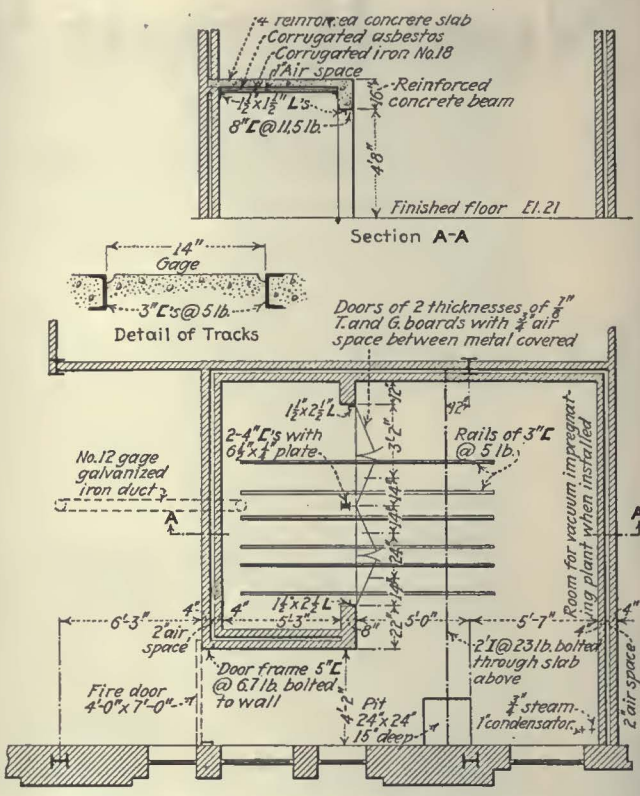
A three-track carhouse has been constructed paralleling the main shop. Ultimately it will be a nine-track building

is also used during the summer months for repairing the large number of box and freight cars used on the suburban system.

As shown on the accompanying plan, the section of the shop north of the transfer table is devoted to overhauling work and machine shop work. Four tracks, each with a pit, lead into this section from the transfer table. Two of these overhauling tracks are fitted with Columbia car hoists and provision has been made for the installation of a third when necessary. A 10,000-lb. traveling electric crane over the truck repair tracks is used for dismantling and handling the heavy electric locomotive equipment. The runways of this crane can be extended as required. Jib cranes serve the motor overhauling tracks and benches as well as the two heavy lathes in the machine shop.

The machine shop is well equipped to carry out the kinds of railway repairs necessary. A list of the various machine tools is given on the accompanying plan. Space has been reserved for the installation of a planer and some other machine tools as these become necessary for economical operation. Machine tools that are used intermittently have direct motor drive. Lathes, drill presses and other tools in constant use are driven in groups from line shafts with counter shafts.

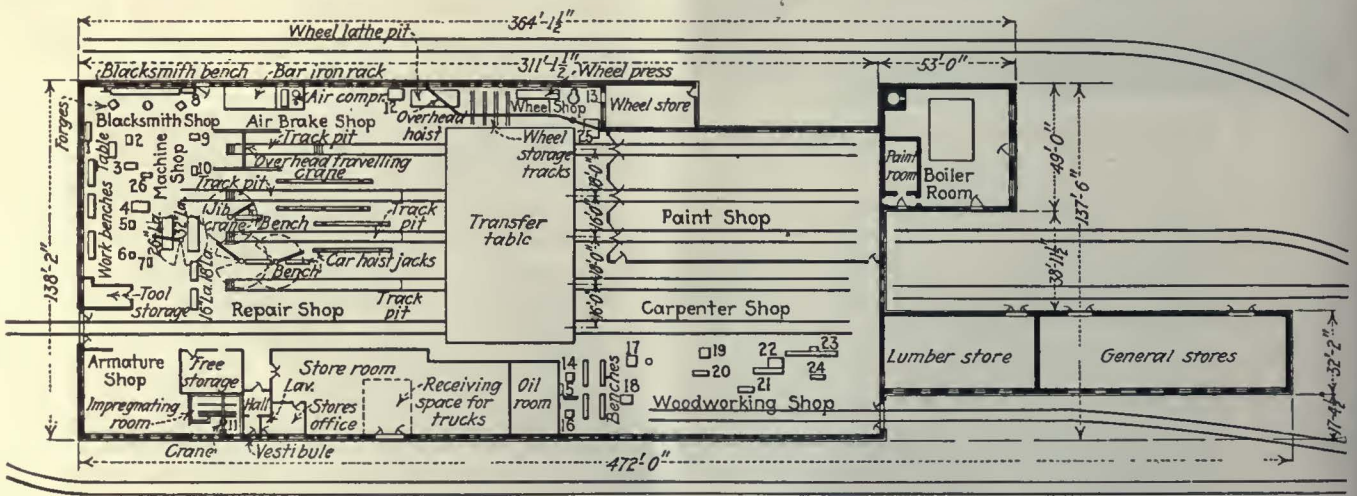
The blacksmith shop, located in the northeast corner, is equipped with Canadian Blower & Forge Company's down-draft forges. The air brake shop is along the east



Layout and details of the impregnating room

wall adjacent to the blacksmith section, and just south of this and at the end of the transfer table, is the wheel shop. This is fully equipped with a double-drive wheel turning lathe, wheel-boring machine, wheel press, axle racks and storage trucks for wheels mounted on axles. This department is so placed that wheels and axles can be handled to and from the shop and to outside stations with a minimum of labor and no interference with working tracks. The wheel storage is just south of the wheel shop.

The northwest corner of the shop is taken up with the armature repairing department. This is equipped with an overhead traveler carrying an 8-in. air hoist. An im-



Floor Plan of New Quebec Shop

1. *Blacksmith's tool rack.*
2. *Power hammer.*
3. *Radial drill.*
4. *Shaper.*
5. *20-in. drill.*
6. *Sensitive drill.*
7. *Tool grinder.*
8. *Babbitt tool rack.*
9. *Hacksaw.*
10. *Bolt cutter.*
11. *Dipping pit.*
12. *Cleaning tank.*
13. *Wheel borer.*
14. *Knife grinder.*
15. *Grindstone.*
16. *Saw grinder.*
17. *Shaper.*
18. *Bandsaw.*
19. *Chain and H. C. mortiser.*
20. *Molder.*
21. *Jointer.*
22. *Surfacer.*
23. *Crosscut saw.*
24. *Ripsaw.*
25. *Spare axle rack.*
26. *Wet grinder.*

pregnating room is provided which is arranged for dipping and baking of armatures and field coils. The baking oven is heated electrically and is served by an overhead hoist and small trucks on rails, each truck having a capacity of five armatures standing vertically. Drip pans are provided beneath each truck. A free storeroom in this location provides for safe-keeping and handling of re paired equipment parts.

The woodworking mill, carpenter shop and painter's departments are located at the south end of the shop. All woodworking tools have independent motor drive. The woodworking shop is arranged so that the large quantity of lumber entering into the repairs of wooden box cars and freight cars can be handled from the lumber room through the proper machine onto the car repair track by the most direct and shortest possible route. A separate fireproof paint-mixing room is provided at one end of the paint shop.

The transfer table occupying the central position in the shop serves all departments. It has a capacity for handling 60-ton electric locomotives. Compressed air outlets have been installed throughout the shop for various purposes. These are supplied by a 100-ft. air compressor located adjacent to the air brake department.

A new carhouse just east of the general shop is 312 ft. 4 in. long and 46 ft. 4 in. wide. It has three tracks, each with a pit. This is the first bay of what will ultimately be a nine-track operating carhouse and is parallel and close to the main shop for convenience. The pits are equipped with Watson-Stillman hydraulic pit jacks supported by rails set into the concrete pit floor.

Heating of the building is partly by direct ceiling type heaters with electrically operated blowers, and partly by wall radiators placed under the windows in the main repair shops and service section.

Rapid Transit Faster Than Autos

SOME interesting figures regarding the relative time consumed by and the convenience afforded to suburban commuters in traveling to and from Chicago's Loop district by automobile, elevated train and steam railroad are given in a survey by the Chicago *Tribune*.

Taking a central point in the north side suburb of Evanston, the test showed that the Chicago & Northwestern steam line commuters accomplished the 10-mile journey to the "heart of the Loop" in 39 minutes, elevated line travelers in 45 minutes and motorists in 48 minutes. In actual riding minutes, however, the trip by elevated was thirteen minutes faster than by automobile and ten minutes slower than by the steam line express trains, as the figures were based on a five-minute walk to the elevated and steam road stations, but with no walk for the motorist. The test was made at the height of the morning rush hour. In the automobile test no attempt was made to speed. The return trip during the evening rush hour showed the elevated line commuter six minutes slower in reaching his destination than the autoist and twenty minutes slower than the steam road user, but in actual riding time he consumed about four minutes less than the motorist did.

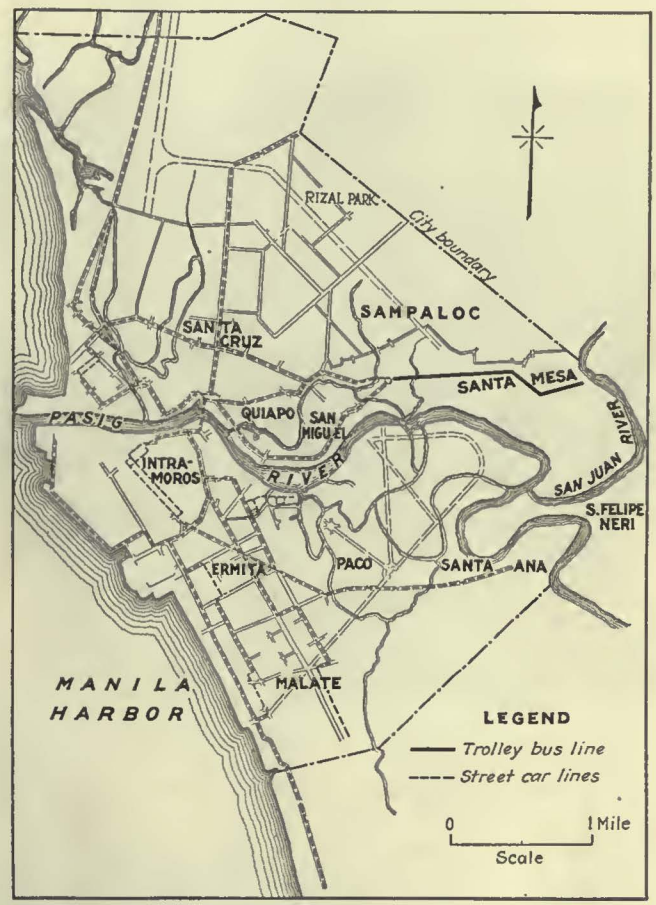
Similar studies made of transportation service from the south side of Chicago brought out that the electrified Illinois Central Railroad service in one direction is three minutes faster for the 10-mile trip from 81st street to the Loop than the automobile and five minutes faster in the other.

Manila to Use Trolley Buses

Economy of electric operation and need for reconstructing track if street car service were continued led to their purchase

EIGHT Twin Coach trolley buses have been purchased by the Manila Electric Company, Manila, P. I., operated by the J. G. White Management Corporation, New York, N. Y., to replace the street cars on the San Juan line of the property. The need of reconstructing all track of this line and the economy of the electric operation prompted the purchase of the trolley buses in preference to rail cars or gasoline buses.

The route, shown in the accompanying map, extends on Calle Santa Mesa from the Rotonda to the bridge over the San Juan River at the city limits, and is 2.96 miles in length. Calle Santa Mesa is a narrow street and is subject to heavy traffic. Continued operation of the street cars would have required construction of double track, at a cost of approximately $100,000.



The new trolley buses on the San Juan line will feed two lines entering the central business district of Manila

The management of the Manila Electric Company was convinced of the practicability of operating trolley buses in the Orient by the example of the electric railway in Shanghai. This company has been operating trolley buses successfully for ten years and is planning to extend this class of service. The street railway in Singapore also is planning to use the new type of vehicle. The Shanghai installation is the more convincing since commodity costs are much lower in Shanghai than in Manila and labor costs there are only 20 to 25 per cent as much.

As mentioned previously, the buses will replace the street cars now operating on the San Juan line and will feed two trolley lines routed from the Rotonda to the heart of the city. Six buses will be used on regular schedules while two will be retained as extras. A headway of ten minutes will be maintained throughout a sixteen-hour day with a reduction to 3½ minutes during rush hours. To give this service it is estimated that 196,100 bus-miles will be operated annually. An average speed of 8.88 m.p.h. will be maintained over the route.

Considering both operating costs and fixed charges trolley buses were considered to offer the least expensive type of vehicle, figures being on a vehicle-mile basis. The cost of operating rail cars was found to be 29.6 per cent and the gasoline buses 36.4 per cent greater than the trolley buses. The high cost of gasoline in the Philippine Islands makes the gasoline buses very expensive. The comparative costs as computed on a vehicle-mile basis for the street car and the trolley bus are given in the accompanying table.

COMPARATIVE OPERATING COSTS OF STREET CARS AND TROLLEY BUSES, COMPUTED ON A VEHICLE-MILE BASIS

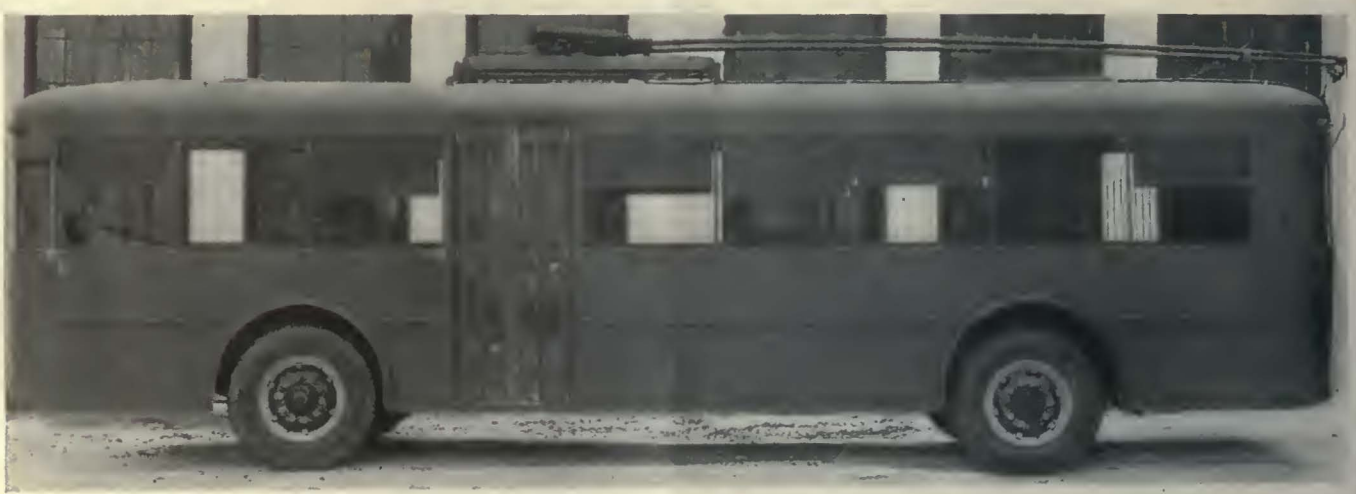
	Street Car	Trolley Bus
Way and structures	$0.0170	$0.0085
Equipment	0.0170	0.0360
Power	0.0255	0.0176
Conducting transportation	0.0600	0.0600
Traffic	0.0019	0.0019
General and miscellaneous	0.0290	0.0290
Totals	$0.1504	$0.1530

Fixed charges, including interest, taxes and depreciation, respectively total 14.6 per cent and 16.3 per cent of the street car and trolley bus investments. Including $100,000 for track work and approximately $20,000 for paving charges the sum required to continue street cars was found to be $215,700, as against $104,350, including a $10,000 paving charge, the cost of starting trolley bus operation.

Considering both operating costs and fixed charges the comparative figures on a vehicle-mile basis are $0.311 and $0.240, for the street car and trolley bus, respectively. The actual saving was estimated to be $14,000 per year.

The buses, manufactured by the Twin Coach Corporation, Kent, Ohio, use the single-deck street car type Twin Coach chassis and body with a seating capacity of 40. Electric motors replace the engines of the standard automotive unit. The bodies are designed for two-man operation with an entrance on the left side ahead of the center.

All electrical equipment for the buses was furnished by the General Electric Company. Two 600-volt G.E. 1126-A railway motors are used and a G.E. C-154 master controller. The controller is similar in construction to the usual street car controller, but much smaller. It is of the series-parallel type, having four steps series and three steps parallel, and will operate over a range of 300 to 600 volts. Cartridge fuses inclosed in a metal box are provided in each side of the line to protect the motors from severe overloads and short circuits. The controller is operated by a pedal and spring arrangement which permits the operator to use both hands for steering the bus. The master controller handles only the small current used to actuate the contactors which in turn handle the motor current. The master controller has seven positions, with seven corresponding contactor combinations. The rotation of the motor is reversed by a G.E. DH-69 reverse switch, hand operated.



One of the Twin Coach trolley buses assembled but not painted. A separate base and trolley pole are provided for each overhead conductor

A complete trolley base and pole is provided for each of the two overhead conductors. The poles have swivel harps and at moderate speeds the bus can diverge from 8 to 9 ft. from its regular course. The trolley poles are of sufficient length to accommodate overhead ranging from 16 to 22 ft. above the street.

The motor circuit resistors are iron grids insulated from their support and one another by mica. They are mounted under the bus body with supplemental insulation between the resistor frames and the floor. Cables for the motor control and lighting circuits have one layer of tape and one layer of compound-filled braid over the rubber. A switch connected to the emergency brake handle automatically cuts off power from the motor when the emergency brakes, which act on drums anchored integrally to each electric motor, are set.

The lighting system consists of twenty 30-watt, 30-volt lamps in series. The bus interior is illuminated by ten dome fixtures.

A test of one of the completed buses was conducted near the Twin Coach plant in Kent, Ohio, on Jan. 31, under the supervision of the factory officials and F. L. Aime of the J. G. White Management Corporation. D. C. Green, vice-president Utah Light & Traction Company, Salt Lake City, Utah, and Edward A. West, general manager of the same company also attended the test.

North Shore Line Uses

Combination Trolley and Battery Locomotives

By F. H. Brehob
Railway Engineering Department, General Electric Company

TWO combination trolley and battery locomotives of a new type have just been placed in service by the Chicago, North Shore & Milwaukee Railroad. Provision is made for charging the battery from the trolley supply when necessary. The locomotive is thus available for use both on the trolley system and on tracks not so equipped.

Each of the two-axle swivel equalized trucks has a cast-steel transom and built-up side frames, rigidly bolted together. The journals are of the A.R.A. collar type, size 6 in. x 11 in. Brake cylinders are mounted directly on the trucks, eliminating brake rigging from underneath the platform.

The steeple-type cab has a control station at each end of the central compartment with the control equipment in the middle. The battery is located in the two sloping end cabs and is divided equally between them. The battery cells are in a single tier, permitting convenient access for the addition of water. Holes cut in the floor underneath the trays provide for ventilation of the batteries, permitting the heat to escape through ventilators built into the battery compartment covers. The cab rests on a platform with structural steel framing, riveted and braced to the floor plate. Spring draft gear is attached to the center sills of the platform.

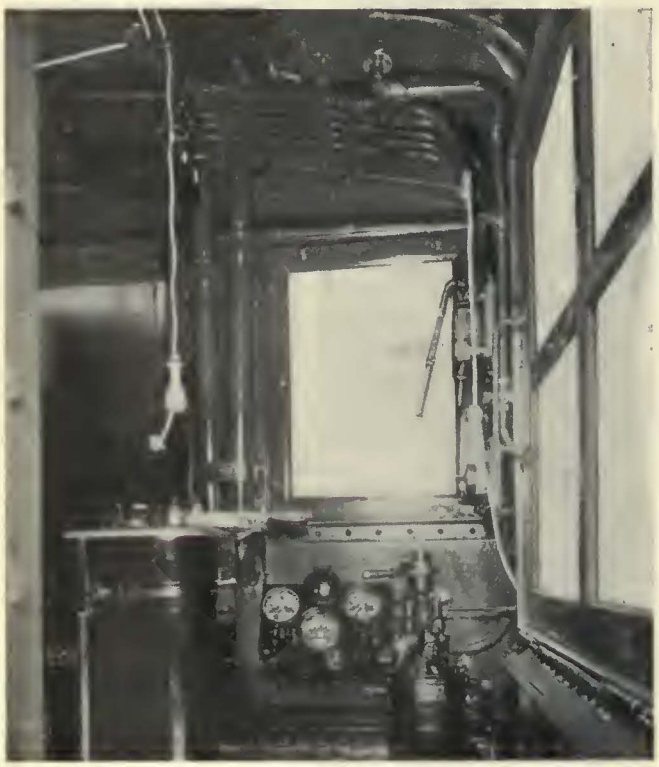
Trolley-battery locomotive—70 tons, 600 volts. The top view shows the battery in place

Four GE-251 single-geared, commutating pole, box-frame type motors are suspended on the axles and truck transoms. Each motor has a continuous rating of 4,250 lb. tractive effort, using a 69-tooth gear and a 17-tooth pinion. The motors are ventilated by an electrically driven blower in the central cab, with an intake drawing the air from the outside and discharging it to the motors through a duct built into the platform. Smaller ducts with sliding flanges distribute the air to the traction motors through the top of the magnet frame.

The control equipment is type M, multiple unit, with a master controller at each operating position. The main power contactors are actuated magnetically and the motor reverser is electro-pneumatic. Three-speed control is provided from either trolley or battery power. Transfer from trolley to battery power is automatic. A relay actuates the transfer contactors. In order to restore trolley power, however, it is necessary to move the master controller to the first notch.

Besides the air pressure gages, an ammeter at each operating position indicates the current flowing through one motor. There is also an ampere-hour meter in the battery circuit to indicate the state of charge of the battery.

Electric heaters of the sheathed wire type are located



View of operator's position

near the operating positions connected in the trolley circuit only. Power for operating the control and lights is supplied by the battery at all times. One sixteen-point coupler socket at each end of the locomotive permits use of two locomotives in multiple unit. Neither battery nor trolley are bussed through so that each locomotive receives its own power for traction purposes.

An Exide Ironclad battery is used, consisting of 192 cells, type MVA-41, furnished by the Electric Storage Battery Company. The battery is grounded at the midpoint. This reduces the voltage stress to ground to one-half battery voltage or about 225 volts. A switch breaks the battery into two sections, ungrounded, making it safe for maintenance and the addition of water.

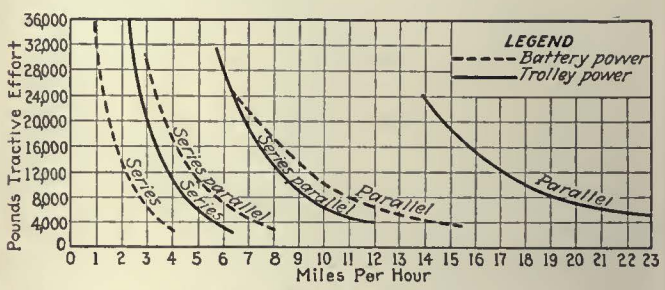
A 25-kw. motor-generator set is located in the main cab. Its control is automatic by the use of a contact in the ampere-hour meter. When the battery becomes fully charged, this contact automatically causes the motor-generator set to be shut down. When the battery becomes about 15 per cent discharged again, the set is started automatically. If, while the motor-generator set is running, the locomotive leaves the electrified line, the set will shut down, and it will start again upon the return of trolley power without attention from the operator.

Weights		Dimensions	
Electrical equipment	68,000 lb.	Height over cab	12 ft. 1 in.
Air brake and compressor	5,000 lb.	Width of main cab	9 ft. 8 in.
Mechanical portion	67,000 lb.	Length of main cab	11 ft. 6 in.
		Width of auxiliary cab	9 ft. 8 in.
Total, all on drivers	140,000 lb.	Lgth of auxiliary cab	11 ft. 6 in.
Per driving axle	35,000 lb.	Lgth between knuckles	40 ft. 0 in.
Minimum radius of curvature, locomotive alone	50 ft.	Rigid wheelbase	7 ft. 2 in.
Maximum speed	40 m.p.h.	Total wheelbase	28 ft. 8 in.
		Diameter of wheels	36 in

Battery Characteristics	
Ampere-hour capacity at six-hour rate	680
Average volts at six-hour rate	380
Kilowatt-hour capacity at six-hour rate	258
Maximum discharge rate in amperes	3,000
Maximum kilowatt discharge rate	600
Approximate weight of battery, pounds	30,000

Westinghouse 14-EL partial schedule straight and automatic air brake equipment is furnished. The leverage is so proportioned to give 75 per cent braking with 50 lb. cylinder pressure. Two General Electric CP-30 air compressors have a rated capacity of 35 cu.ft. per minute each. A hand brake operated from the main cab has sufficient power to hold the locomotive at a standstill on a grade.

The accompanying speed-tractive effort curve shows the operating characteristics. The one-hour rating is



Speed-tractive effort curve

22,000 lb. at 14 m.p.h. and the continuous rating is 17,000 lb. at 15 m.p.h. when operating from a 600-volt trolley.

The accompanying tabulation gives the principal data for this locomotive.

Milwaukee Issues Attractive Route Guide

DISTRIBUTION of a new street railway and motor bus guide is now being made to the public of Milwaukee by the Milwaukee Electric Railway & Light Company. An edition of 300,000 was printed. The guide is an attractive sheet, 12x18 in., folded in time-table form, having on one side a map of the city showing all street car and motor bus routes. The other side has an index of Milwaukee streets, list of places of interest in the city reached by street car and motor bus and a small map of the interurban system of the company, which covers southeastern Wisconsin by both rail and bus lines.

Early this year Milwaukee underwent quite a street name changing program so that the map and street guide is particularly welcome at this time. The maps are being given out on the street cars, at the information desk in the Public Service Building, at several bus and railway stations and at the company's ticket office. Copies have also been distributed to information bureaus, travel bureaus, hotels and newspapers. The maps are being advertised on dash signs and interior car cards.

Inert Gas Protects Bus Fuel

in Paris

An inert gas, largely nitrogen, is kept in contact with the surface of stored fuel both in the main fuel supply station and in the various operating garages

By Henry W. Blake
Senior Editor "Electric Railway Journal"

Photo by Brown Bros.

Place de la Concorde, Paris, looking north. This is a busy traffic center. Two buses are shown loading at the right. Near the foreground is a double electric railway track which crosses the place here on an avenue known as the Quai des Tuileries

IN ALL fuel reservoirs of the Paris tramway and bus system an inert gas is kept in contact with the fluid to reduce the danger of accidental combustion. This plan is followed both in the main receiving reservoirs and in those of the various operating garages where the buses are charged with fuel.

As mentioned in a previous article in this paper, the fuel used for buses in Paris is a mixture of gasoline, alcohol and kerosene. Most of this material is received in Paris by rail over the Nord Railway, one of the main steam railroad lines of France. A switch track from this railroad leads into the main fuel storage yard of the S.T.C.R.P., the initials of the company operating the street railways and buses in Paris. There are also branch tracks into this storage yard from the electric railway system. The railroad tank cars holding the fuel discharge their loads directly into the company's storage reservoirs, which have an aggregate capacity of about 1,600,000 liters (445,000 gal.) or a supply for about three weeks. This large capacity is provided to avoid interruptions to the servicc if delay occurs in the receipt of fuel. From these storage reesrvoirs the fuel is distributed each day to the different garages by means of tank trucks with a capacity of from 4,000 to 5,000 liters (1,000 to 1,300 gal.) each. While in storage, the fuel is kept from the air by the use of inert gas, according to the Rolland and Maurice system.

Under this system the greater amount of the inert gas is used indefinitely, additions to it being necessary only to compensate for small losses which occur from various causes. The general arrangement at the main storage reservoir is shown in Fig. 1. The arrangement consists

essentially of a group of tanks, *R*, and a compressor, *C*, which is operated by an electric motor, *D*, which, in turn is controlled by an automatic switch, *E*.

When a railroad tank car arrives to discharge its contents, as shown at *V*, the air pump, *C*, is put in operation, exhausting the inert gas contained in the tank, *R*, through the piping, 5, and storing it in the accumulator, *A*. The amount of inert gas taken out is equivalent in volume under atmospheric pressure to the amount of fuel in volume admitted into the tank reservoir. When the tank car has discharged its contents no air is allowed to enter the system, as the receiving pipe is automatically shut off by a valve which is located on piping system No. 1.

To transfer fuel from the underground tank to the tank wagon the inert gas in the accumulator, *A*, is admitted under pressure to one of the reservoirs *R* through a pressure regulator, *M*. The fuel then passes up through pipe 2 and flows out by cock *B*.

In the main storage yard there are 22 tanks, each of 65 cu.m. (about 20,000 gal.) capacity. Each has a diameter of 3.15 m. (10 ft. 4 in.) and a length of 8.50 m. (27 ft. 10 in.). They rest on supports in a large pit, which has a concrete floor. These reservoir tanks are arranged in seven groups. One of these groups includes four tanks, and each of the others consists of three tanks. Each group has a storage inlet and a discharge outlet.

There are five piping systems leading to each tank, and each piping system is fitted with a cut-off valve at the dome of each tank. These piping systems are numbered in the drawing as follows:

1 is the piping through which fuel is admitted into the reservoirs. It is connected with the storing inlet.

2 is the piping through which fuel is taken from the reservoirs. It is connected with the discharge outlet.

3 is known as the safety piping. It is of lead and connects with the piping of the discharge system, as will be explained later.

4 is the piping for admitting the inert gas from the accumulator to the reservoir tanks, *R*. 5 is the piping for removing the inert gas from the reservoir, *R*. At its outer end this piping is connected to the exhaust of the air pump.

All of the cut-off valves mentioned are operated by handwheels located in boxes on the surface of the ground. Each box also contains a gage to indicate the pressure in the tank, and another to give the volume of the liquid contained in it.

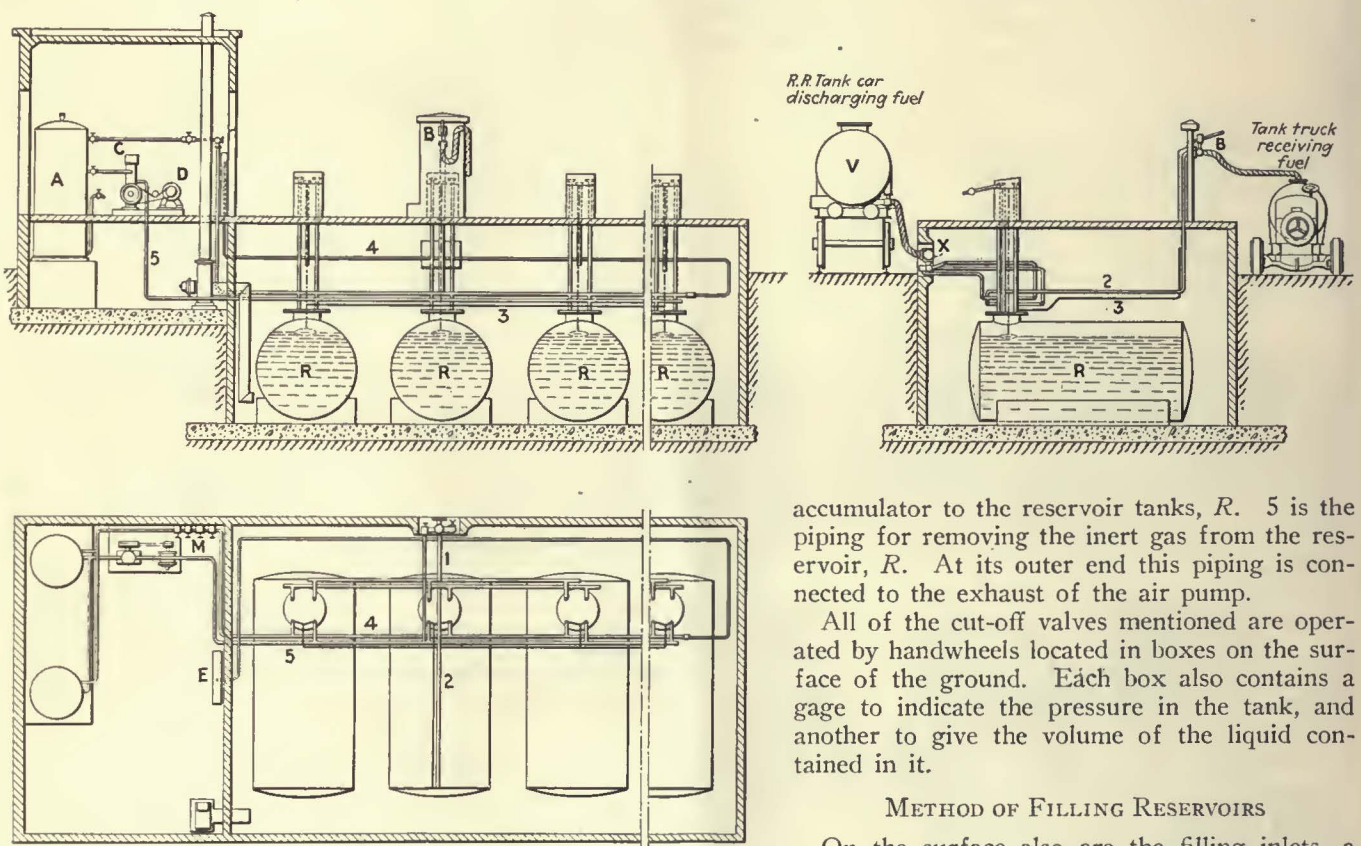


Fig. 1—Plan and sections of fuel reservoirs, inert gas accumulator, piping, etc.

LIST OF EQUIPMENT

A = Inert gas accumulator
B = safety cock
C = electrically driven compressor
D = electric motor
E = automatic electric control switch
M = pressure regulator
R = fuel reservoirs
V = railroad tank car
X = three-way valve

LIST OF PIPING

1 = piping for leading fuel from railroad tank car to main reservoirs
2 = piping for discharging fuel from main reservoirs to tank truck
3 = safety piping
4 = piping for admitting inert gas from gas accumulator to fuel reservoirs
5 = piping for exhausting inert gas from fuel reservoirs

Method of Filling Reservoirs

On the surface also are the filling inlets, a three-way cock which controls the movement of the inert gas and a safety device to prevent the entry of air into the reservoir when the tank car has finished discharging its contents into the reservoirs. This device, shown in section in Fig. 2, contains a float which lifts a valve when it is completely submerged and permits the liquid to pass through. As soon as the flow ceases a spring draws the valve back on its seat and closes the pipe.

Filling Station for the Motor Trucks

A feature of the equipment for discharging the fuel from the underground reservoirs into the tank trucks is a safety cock, which is designed to avoid any spilling of the fuel if any of the pipes should break. The location is shown at *B* in Fig. 1, shown above, and in detail in Fig. 3, which is a vertical section of this device. In the latter drawing the fuel, discharging from the underground reservoir into the tank truck, flows in the pipe *a*, through the valve *D* into the pipe *a'*. The valve, *D*, is controlled by a piston, *B*, which has an opening, *G*. When the valve, *D*, is closed and the outlet is not in use, this opening, *G*, connects pipe *b* with pipe *b'*. All the

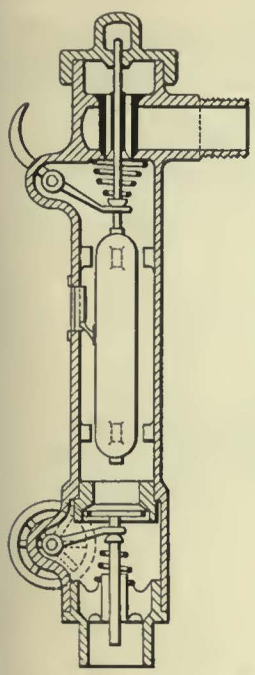


Fig. 2 — Safety cut-off on receiving piping

outlet cocks are arranged in series so that the tube *b* in one connects with the tube *b'* in the preceding cock and so on to the first cock, whose tube *b* is tapped in to the dome of its main reservoir *R*, in Fig. 1. The tube *b'* in the last cock in the series is connected with the end of the fuel piping 2 before it reaches the cut-off valve. The result is that when all the cocks are closed all the liquid in pipe 2 at each outlet exhausts immediately into reservoir *R*.

Piping 3 is in parallel with piping 2. It is of lead and is installed so that if a rupture occurs it will take place in the lead pipe rather than in piping 2, which is of steel.

Engine Room

At the western end of the fuel storage plant is the engine room, which contains ten inert gas accumulators, shown in elevation at *A* in Fig. 1. Each of these accumulators measures about 23 ft. long and 4 ft. in diameter and is fitted with a safety valve. In these accumulators the inert gas can be compressed to about five atmospheres. Adjoining the accumulators is a compressor with its electric motor. There is also the automatic electric control switch, already mentioned and shown at *E* in Fig. 1. Its function is to bring back the pressure in the fuel reservoirs to atmospheric pressure after the pressure has been increased for the purpose of discharging fuel.

Finally, in the engine room there is a blower for ventilating the pit in which the fuel reservoirs are contained. the air from this blower escapes from the pit through four outlets. There is a passageway between the engine room and a pit containing the fuel reservoirs.

The entire property is inclosed on all sides by a wall 11 ft. high and 9 in. thick.

Railway Connections

Two tracks, connecting at one point with the Nord Railway and at another point with the tramway system, permit the entrance of tank cars and provide for their removal after their contents have been discharged.

The rules in force forbid the movement of these cars while within the grounds by either steam or electric tractors. Instead, they are moved by cable. This is accomplished by means of two electrically operated capstans which are located on each side of the depot but outside of it. The apparatus for producing the inert gas is located outside of the main warehouse as shown in the plan of the property. The generating plant consists of an ordinary two - cylinder gas engine driving a compressor used to force the inert gas produced into the accumulators. A second gas engine adjoins the other for use in case its services should be needed.

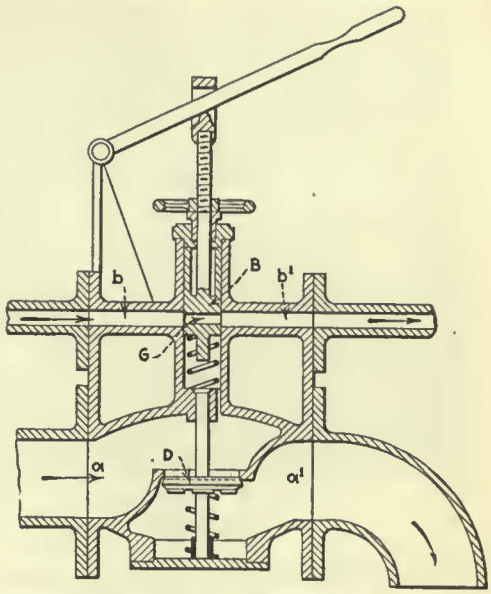


Fig. 3—Safety cut-off on discharge piping

The exhaust from the gasoline engine operating the compressor, when it is running in normal operation, has been found by chemical analysis to consist of 85 per cent nitrogen, 13 per cent CO_2 and 2 per cent CO. The proportion of free oxygen contained in this mixture is so very small that it is practically negligible and the gas so obtained has been found absolutely inert when care is taken to keep the operation of the motor normal. The care thus required is to avoid in the exhaust either an excess of air, which would increase the proportion of oxygen, or an excess of gasoline, which would increase the proportion of CO. This is the inert gas, after it has been purified, which is used to be in contact with the fuel in the fuel reservoirs, and piping.

Process of Purifying the Gas

The method of purifying the gas is shown in Fig. 5. After leaving the motor the exhaust gas first passes into the cleanser, *D*. Here it passes through water and in cooling leaves behind the greater part of any water vapor it may have contained. It then passes through the pipe *d* to the compressor *C*, which forces it through the pipe *g* into the second cleanser, *G*. This cleanser is similar in construction to cleanser *D*. Here it leaves the last traces of its water vapor. Then it passes through a filter, *H*,

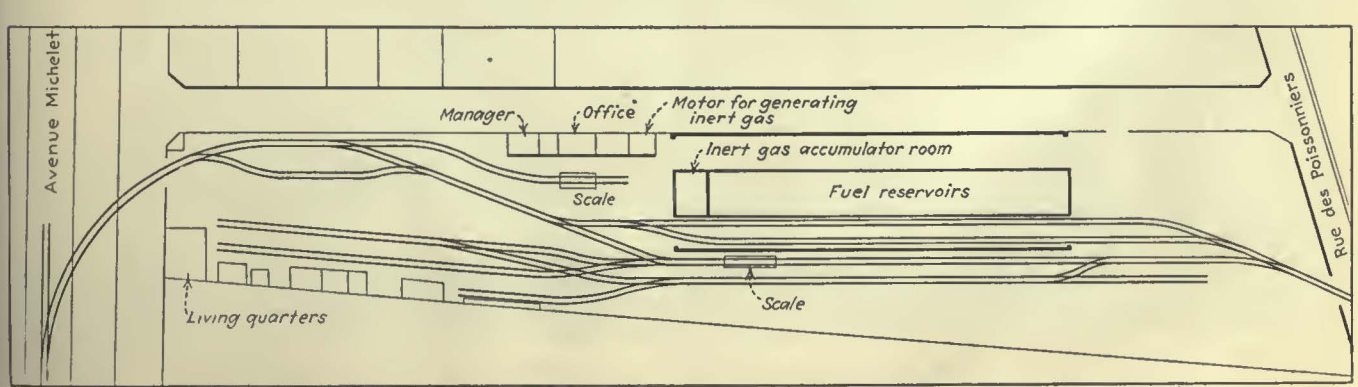


Fig. 4—Plan of central storage area showing position of buildings and switch tracks

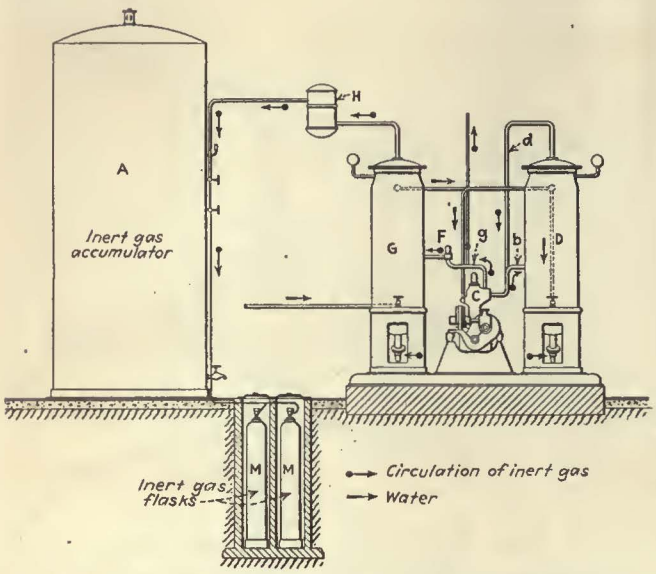


Fig. 5—Vertical elevation of inert gas pump, cleansers and accumulator

into the main gas accumulator, or it can be stored in smaller receptacles at *M*.

Between the force pump and the cleanser *G* is an automatic pressure regulator, *F*, by which the work imposed on the compressor is kept constant. The purpose of this regulator is to provide that in the event of two consecutive failures of ignition in the driving motor there will be no danger that a mixture containing any inflammable gas will pass over into the inert gas accumulator. Should there be such an ignition failure, the power of the motor falls off and it is unable to overcome the resistance provided through the pressure regulator; hence, the motor stops. This action is made more certain by the use on the motor of a very light flywheel. Finally, a cut-out on the motor exhaust pipe allows the motor to discharge its exhaust into the atmosphere for a short time after it has started running. In this way the cylinders are cleared of any air or unburned fuel before the exhaust is led to the inert gas accumulator.

At the plant described 25,000 tons of liquid fuel are passed in and out each year.

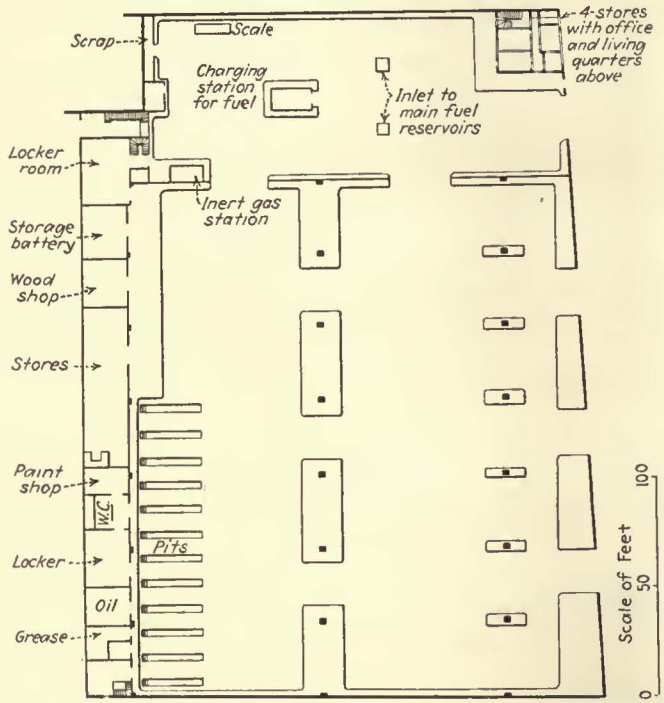


Fig. 6—Plan of Montrouge garage, Paris, with accommodations for 108 buses maximum and 104 buses normal. Like all other garages of the S.T.C.R.P., this one has an inert gas outfit for protecting the fuel supply from accidental combustion

Inert Gas Supply at Local Garages Also

The same system of fuel protection by inert gas is used in the local garages as in the main storage supply, although the equipment is not as complex or extensive as that at the central storage plant. But it is as complete so far as protection from accidental combustion is concerned.

The plan of the S.T.C.R.P. Montrouge garage, Fig. 6, shows a typical Paris garage layout. This garage has a total area of 70,203 sq.ft. and a covered area of 56,484 sq.ft. Its maximum capacity is 108 standard buses and its normal operating capacity is 104 buses. In one corner, as will be noticed, are the living quarters of the depot superintendent and his two assistants. This is a feature of all of the omnibus garages in Paris. In this case the housing quarters contain offices on the ground floor and living quarters for a family on each of the three stories above the ground floor.

Glasgow Adopts Double-truck Tramcars

This Scottish city has purchased for its municipal system 50 cars involving many changes from standard British design. Experimental changes are also being made on six of the older cars

FIFTY new type tramcars are soon to be installed by the Glasgow Tramways, Glasgow, Scotland. At the annual inspection of the corporation's car works by the Tramways Committee on Oct. 13 samples of the new type car, as well as several types of reconditioned cars, were examined. In all of these the objects aimed at are greater speed and greater comfort for the passengers in order to meet bus competition.

The lower deck of the new car is finished in teakwood, the ceiling covered with embossed paper and painted white. This deck seats 30 passengers. Twelve are cared for by six cross seats in the center, three on each side of the aisle. Sixteen passengers are seated in the longitudinal seats at each end. The body width externally has been increased by 5 in., but by introducing a specially reinforced side pillar the inside width of this deck is increased 9 in.

The upper deck is also finished in teakwood, the ceiling covered with ply-wood and painted white. The top deck is completely inclosed. A partition and folding doors are fitted around the stairhead to prevent draughts passing through. All seats face forward except four, where the passengers sit with their backs to the staircase. Two single seats in the center permit passengers to pass each other in comfort. Ten lamps of 40 cp. each are fitted in the upper saloon and eight in the lower.

The body is mounted on two bogies of the maximum traction type, thus departing radically from the former Glasgow standard four-wheeled car. The driving wheels have a diameter of 27 in. and the pony wheels 22 in. The wheelbase of the body is 4 ft. 2 in. and the distance between bogie centers 13 ft. 6 in. Each of the 50 new

The upper decks of the Glasgow cars are entirely inclosed. This is also an innovation in British design

By careful design the lower deck of the new Glasgow tramcar has an interior 9 in. wider than in the previous cars

cars has two 50-hp. light-weight ventilated motors with contactor controllers.

The car is equipped with hand, air and electro-magnetic brakes. The air brake, which operates the hand brake gear, relieving the motorman of the physical strain of braking by hand, will be used exclusively for service stops. The electro-magnetic brake is a combined electro-magnetic track and wheel brake and is reserved for emergencies. Two magnets are fitted to each bogie, each being capable of exerting a vertical pull on the rails of 2 tons. On each platform there is installed a simple cock which will set the air brake when opened. By this means the brakes can be set and the car stopped, either by conductor or passenger. On the driver's air brake handle is a trigger which opens an air-valve when depressed and forces sand under the wheels.

The combined destination and route indicator is mounted over the lower canopy, the destination letters being 5½ in. deep and the route letters 4½ in. deep. Under the top canopy the route number is shown in figures 6½ in. deep. This is a distinct advance on the present type of destination indicator.

Exterior and interior views of the car are shown in the accompanying illustrations.

The principal dimensions of the new car compared with the former standards are given in the accompanying table.

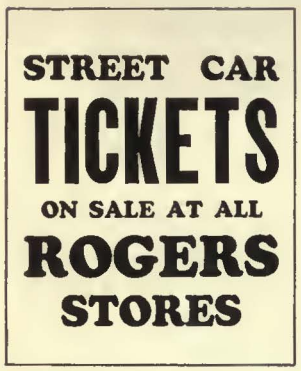
New Car		Old Car
20 ft. 6 in.	Length of body	17 ft. 0 in.
6 ft. 0 in.	Length of platform	6 ft. 0 in.
33 ft. 0 in.	Length over platform angles	29 ft. 6 in.
7 ft. 2 in.	Width of body over panels	6 ft. 9 in.
7 ft. 3 in.	Width of body over molding	6 ft. 10 in.
6 ft. 10 in.	Width inside lower saloon	6 ft. 1 in.
6 ft. 10½ in.	Width inside upper saloon	6 ft. 8 in.
6 ft. 3 in.	Height of lower saloon	6 ft. 4½ in.
6 ft. 0 in.	Height of upper saloon	6 ft. 1½ in.
2 ft. 7 in.	Height of car floor from rail	2 ft. 8 in.
15 ft. 10½ in.	Height over all from rail	16 ft. 2½ in.
30	seats, lower saloon	24
38	seats, upper saloon	38
68	Total seats	62

The first of 50 new cars for the Glasgow, Scotland, municipal tramway. These are the first double-truck cars to be used on the property

Car Tickets at One-Third Off

Discount allowed by Atlanta grocery store to customers who return bread wrappers— Tickets also sold through druggists

HOUSEHOLDERS in Atlanta are being offered a novel inducement to purchase loaves of bread made by the Southern Grocery Company. This organization owns 150 grocery stores, known as Rogers' Stores, in Atlanta and surrounding territory. Beginning Jan. 1 it has been giving an Atlanta street car ticket for two returned bread wrappers and five cents, or two car tickets for four bread wrappers and 10 cents, etc. As the car ticket sells for 7½ cents (or two for 15 cents), this means a reduction of one-third on all tickets or else 1¼ cents for each bread wrapper returned, which ever way the transaction is figured.



Dash sign carried on Atlanta cars to advertise sale of tickets at chain grocery stores

The grocery company gets no reduced rate for tickets bought from the railway company operating in Atlanta, the Georgia Power Company. It pays 7½ cents for each ticket obtained. The only consideration which it received was that at the beginning of the sale the railway company advanced to the grocery store $1,500 worth of tickets. This number the stores replenish daily for cash. At the end of the campaign the stores will naturally account to the railway company for the $1,500 worth of tickets advanced at the beginning of the sale. In addition, the company carried a dash sign for a few days reading "Street car tickets on sale at all Rogers stores." A reproduction of this sign accompanies this article.

On its part, the stores, beside the special offer mentioned, have agreed to sell tickets to anyone at the rate of four for 30 cents or in multiples thereof, to carry in their store windows a card reading "Street car tickets for sale here" and to advertise in the daily papers their plan of exchanging bread wrappers for car tickets.

Car tickets are also on sale at the company's office, the starter's office, company stores, a chain of private drugstores and at another large store. They are also sold by conductors and one-man car operators.

On Jan. 30 the store proprietors reported that during the month their sales of bread had increased 400 per cent since the campaign was started and that they considered the plan highly successful.

Up to this time the principal outlet for tickets outside of the cars and the company's office was through a chain of fifteen drugstores in Atlanta, known as the Jacobs' stores. The only expense to which the railway company is put in connection with the sale of these tickets is to carry a dash sign occasionally on its cars, similar to that illustrated but reading "Use car tickets. On sale at Jacobs' stores."

On its part the drug company in its principal downtown store, which is at a busy intersection, has posted in a conspicuous place an illuminated car destination sign to indicate the route of approaching cars. It is operated by a colored porter in front of the store who pushes the appropriate button when any car comes in sight, thus apprising the store patrons of the fact. The accompanying view shows the position of this sign and how the arrivals are indicated. The cost of the sign and its running expenses are defrayed by the drug company.

A popular drug store in Atlanta operates a car route sign for the benefit of its patrons

In a recent interview with a representative of the ELECTRIC RAILWAY JOURNAL, the manager of the drug company said that the illuminated sign and dash car card on the railway company's cars were considered excellent advertisements. The effect of the sign was to induce street car patrons to utilize the store as a sort of waiting room, especially on rainy or sultry days. This is considered an advantage because in looking around the store they undoubtedly saw and bought articles that they would not have come in to purchase. While unable to estimate the extent to which the plan had increased the business the management stated that no doubt the additional amount so obtained more than repaid the investment and maintenance cost of the sign.

These two outlets for tickets are considered advantageous by the company because they relieve the conductors and one-man car operators from selling tickets.

New Carhouse and Housing Plans in Turin, Italy

CONSTRUCTION of a new carhouse to accommodate about 300 cars has just been finished by the municipal electric railway at Turin, Italy. Adjoining the carhouse is a track yard which will be served by a bridge traveling-crane with a span of about 48 ft. Adjoining the track yard, in turn, is an apartment building, being erected to house the employees operating from this depot. This housing undertaking has 430 rooms, divided into apartments of different sizes.

The Turin electric railway system has grown rapidly during the past twenty years and in 1927 had a total of 555 cars. The passengers carried in 1927 were 203,322,000.

Training school of the New Orleans Public Service, Inc., showing the school car, the controller platform and the electric circuit board

Well-Trained Motormen Create Good Will

Co-operation between the instruction department and the rolling stock and shops department of the New Orleans Public Service aids in training motormen

By E. J. Murphy
Superintendent of Instruction and Employment
New Orleans Public Service, Inc., New Orleans, La.

This article gives details of the instruction methods of this company, which has made a remarkable record of freedom from failures. It is based on a paper presented by the author at the meeting of the Electric Railway Association of Equipment Men, Southern Properties, held at New Orleans on Jan. 25-27, and supplements information published in this paper for Aug. 2, 1924.—EDITOR.

GOOD equipment and well-trained operators mean good service to the public, as well as increased earning power for the company. As practical electric traction men, we understand in a general way what a pull-in of a defective car means, particularly during the peak; the havoc it creates in headway, causing patrons to wait an unnecessary length of time to board a car, and also the disarranging of schedules. This kind of service does not help build a good public relationship, which today is a matter of vital importance.

Frequently after an investigation of a defective car pull-in, causing a long delay, some trivial defect was found the cause of all the trouble and very easily could have been eliminated had the motormen been trained properly. In 1921, with this problem still unsolved, we decided to make every reasonable effort in New Orleans to decrease our defective car pull-ins, and with this object in view our motormen were checked in the operation of their cars.

The training school was established and all new men entering the service were instructed thoroughly in locating and eliminating nominal defects, and shown the path of the current through the electrical apparatus of the car.

An electric board is used in explaining the electrical circuit and defects which develop in the circuit. The motors can be shown either in series or in parallel

The school car, fully equipped for operation, is mounted on a stationary platform. Note how all equipment is exposed

by competent instructors. The improvement noticed in the handling of the electrical equipment by new operators became so noticeable that we decided to bring in all our regular motormen on the company's time to train them the same as new men. The response to this request was remarkable. Many of our old motormen willingly grasped the opportunity to learn more of the equipment they were handling. During this period we found 75 per cent of the old men in need of such instruction. The result has been a source of satisfaction. .The initial cost has been amply repaid to the treasury in competent operators and first-class equipment.

Co-operation of Departments a Helpful Factor

Our superintendent of rolling stock and shops and his men have co-operated to the fullest extent in our efforts to improve our operators. At various times he has made new installations in the training school. Whenever a new device is installed in the electrical equipment of the cars in service a similar device is installed immediately at the training school. A great deal of our success in training men can be attributed to the good feeling existing between the two departments.

A definite course of instruction is followed in training the motormen. New employees enter the training school the morning after being accepted by our. medical examiner for employment. The students are then taken in hand by one of the instructors at the training school and told the company's policy to the public and to the employees. Particular stress is laid on courtesy, cleanliness, loyalty and honesty. The talk is supplemented by reading copies furnished by the superintendent of transportation of a number of commendatory letters from patrons received by trainmen already in our service. Although this instruction requires but one-half hour, the students acquire a good idea of the policy of the company concerning their duties as motormen, a very important part of which is to make every passenger satisfied.

After this instruction, the students are assigned to a stationary platform equipped with one type K-36-J and two type K-11 car controllers. Here they are trained to handle the controllers. Four rows of five lamps each are connected to one of the K-11 controllers to illustrate the functioning of the resistance. On the first point, the entire cluster of lamps is illuminated, indicating that all the resistance is in the circuit. The lamps are extinguished by rows until in the running position, the lamps are all extinguished, showing the starting resistance is no longer in the circuit.

Electric Board Shows Complete Trolley Circuit

The course of the electric current from the power house through a car and return is explained next to the class. For this purpose an electric board shows by lamps and heavy white lines the several parts of the circuit. The board measures 3x7 ft. and is mounted on the wall in plain view. The flow of the current is traced from the generator at the power plant through the main feeder, feeder taps, trolley wire, trolley wheel, trolley pole, trolley base, trolley lead, automatic line breaker, overhead circuit breaker, controller, resistance, motors in series or in parallel, motor ground leads and the rails back to the power house. Each unit of the electric apparatus is illuminated by small lamps controlled by switches handled by the instructor.

Following the electric board instruction the students are assigned to the school car, an old stationary car, fully equipped. The car has a K-68-A controller on one end and a K-35-JJ on the other. The resistance is an ordinary grid resistance and is supported on a stand on the floor, with all wiring in plain view. The resistance can be grounded or open-circuited by the instructor at will. The air equipment is mounted upon the floor of the car where its operation can be explained and observed more easily. A d.c. voltmeter on the side of the car is used in the discussion of line voltage. An ammeter is used also to show the difference in the current required with proper and improper handling of the controller.

All parts of air-brake equipment are explained fully while the car is in motion.

Each student is stationed on the platform of the car and given further instructions in handling the controllers and the air valves. This trial operation takes place with the car entirely clear of defects. The instructor then opens or grounds a part of the circuit and requests the student to repeat his former operation. The car is equipped with levers, with which any of several defects can be placed in the circuit. Instruction is given in the

The air-brake equipment is mounted upon the floor of the car and can be inspected easily