ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc. MARCH 9, 1929 Twenty Cents Per Copy

THE PUBLIC *be* Pleased

BEAUTIFUL and useful residential, recreational, and business structures are rapidly establishing a new standard of living in American cities. These developments insure the continuance of prosperity and well-being for our increasing population.

Only transportation facilities, in keeping with the requirements of the times, will retain the patronage of the public. Electric railway service with modern street cars, Westinghouse equipped, contributes to this prosperity program in the following ways:

1. Enhances the standing of the transportation company in the community.
2. Improves the morale of the operating staff.
3. Affords improved service through greater courtesy, comfort, speed and safety.
4. Increases receipts because the public is pleased.

Put some of these modern cars on your lines and keep the electric railway industry in step with the times. Now-a-days the public must be pleased!

Westinghouse products for street railways include:—arc welding sets, electric babbitt pots, car heaters, circuit-breakers, snow melters for track switches, fans, instruments and meters, insulating materials, lighting equipment, lightning arresters, line material, motors and control, panelboards, rectifiers, substation equipment.

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

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Westinghouse

Electric Railway Journal

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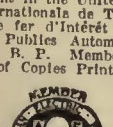

1929

Vol. 73, No. 10 *Pages 383-418*

March 9, 1929

In This Issue

680,000 MILES IN 14 YEARS .... AND STILL GOING

The first Westinghouse-Nuttall Helical Gear and Pinion as it appeared after 632,000 miles of service.

ON February 25, 1915, the first Westinghouse-Nuttall BP grade helical gear and pinion was installed on a car for the West Penn Railways.

Today, after more than 680,000 car-miles of service, this same gear and pinion is still in operation.

Exceptional gear mileage! Yes, but BP grade helical gearing can always be depended upon for extraordinary mileage—mileage that means concrete maintenance savings, because:

The teeth mesh with fifty percent more rolling action than other gears, consequently there is less wear.

Loads are transferred from tooth to tooth gradually, uniformly and smoothly thus preventing "ridging" at the pitch line, which preserves the correct involute tooth form at all times.

The exclusive BP heat-treatment scientifically combines great hardness to resist rapid wear with ample tensile strength and ductility to prevent breakage, spawling and chipping due to the unusual loads, and shocks and jolts of service.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
NUTTALL WORKS PITTSBURGH, PA.

Westinghouse

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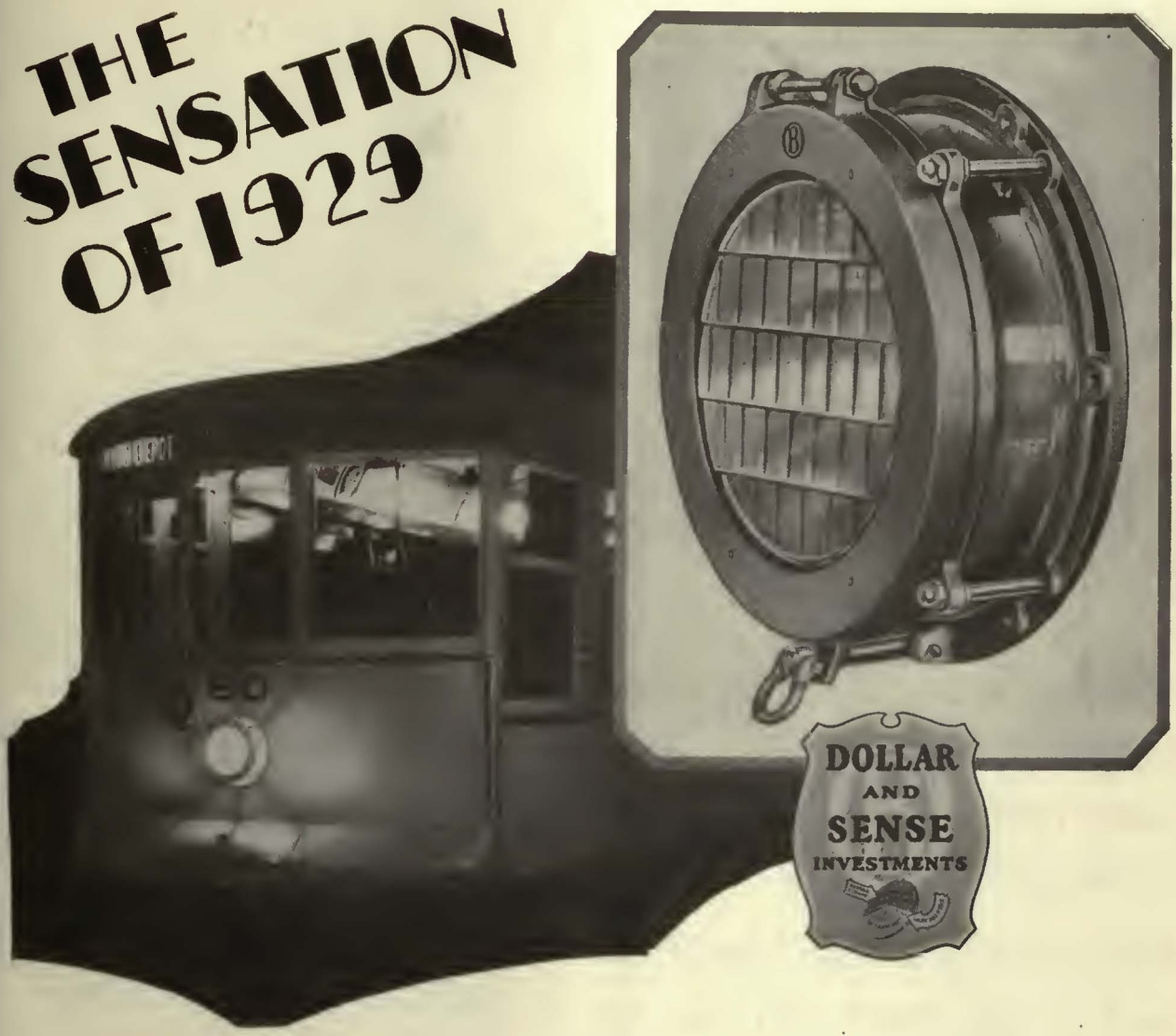
THE SENSATION OF 1929



WITH the development of the modern, lighter-weight, higher-speed cars came a need for greater safety—some method of emphatically identifying an approaching electric car as such to motorists and pedestrians alike.

To do this, many new cars have been equipped with a bank of lamps, concealed in the dash, to illuminate the entire dash.

Now, O-B makes this expensive method unnecessary with a new headlight offered the industry. The O-B Dash Illuminating Headlight provides full dash illumination *from the headlight itself,* as well as ample track pick-up without glare.

The O-B Dash Illuminating Headlight is not designed alone for new cars. It provides up-to-date illumination of the dash for all cars, new or old.

It has been accorded a hearty welcome by equipment superintendents, master mechanics and claim agents wherever it has been shown, and has been specified in orders for many cars at present under construction.

Naturally it follows modern car design principles and is of lightweight aluminum-alloy construction with a ray-deflecting lens and a heat-resisting Pyrex side lens. Fitted with a Crystal Ray glass reflector.

Of course you will want to see the O-B Dash-Illuminating Headlight—the sensation of 1929—on *your* cars. Get in touch with your O-B representative or write or wire

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1014D

Ohio Brass Co.

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

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

GETTING DOWN TO BRASS TACKS

REDUCED to its essentials the "One-Wear" idea is to make a wheel with sufficient wear resistance to give the desired life without contour conditioning.

Only an unusual steel can develop the desired resistance to wear. That is why a special heat-treated wheel steel is used in making the Davis "One-Wear" Steel Wheel.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

A new Golden Glow Headlight

especially designed for city and suburban service

The new Railway Type Golden Glow headlights are of particularly attractive appearance to conform to the lines of modern electric cars, being intended for general city and suburban service where a high beam candle power headlight is not desired.

The 9-inch Golden Glow prismatic glass mirrored reflectors and the Keystone refracting front lens give a pleasing, soft but penetrating yellow light of sufficient intensity for ordinary city and suburban speeds.

Two types:—one for surface mounting and one for semi-flush mounting. They both have polished aluminum front doors fitted with a small visor giving a very attractive appearance.

Let us send details of these modern headlights for modern cars.

ELECTRIC SERVICE SUPPLIES CO.

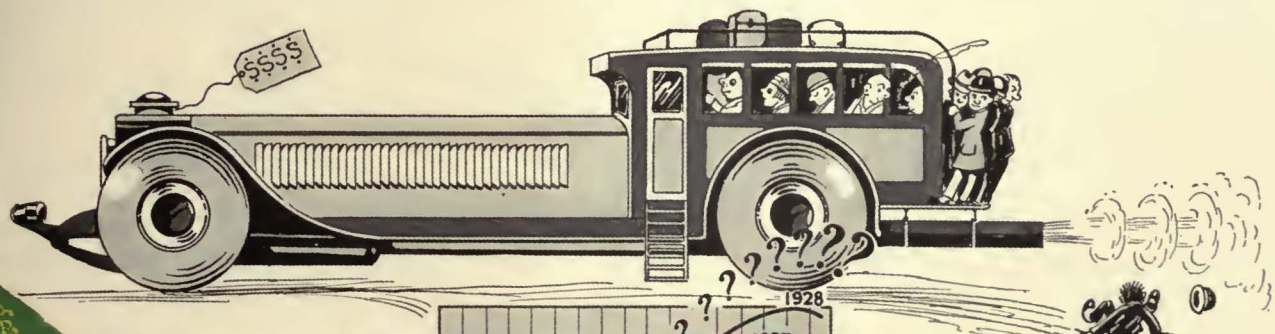
MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

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

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

More and More Powerful Engines

Where Will the Trend Stop?



VE KEEP ON *in*
ng engine
tely? Has
power
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CONSTANTLY increasing motor coach weights—particularly of those designed for what is generally termed heavy-duty service—is causing the manufacturer to consider seriously the use of larger and more powerful engines. That several manufacturers are at present experimenting with engines designed to give a power output well in excess of 100 hp. is more or less common knowledge. Just how well these units will fit into the motor coach ...cture is open to conjecture. ...appreciate better what has ... way of develo...

...st what has happened ...e-year period ending ..., 192... is shown in ... table.

...d at the ... humiliating ...hat this ...en built ... result ...cour- ...rs

who has the answer ?

we believe

Frank R. Fageol solved the problem ahead of time

Two years ago he foresaw the "big motor" situation which today finally has struck home forcibly to the entire coach industry.

Two six cylinder motors of practical size was his answer and his contribution to the coach field.

He found the way—for more power—while he increased the capacity of the coach 40% and decreased the weight per seat by 30%.

Was his answer sound?

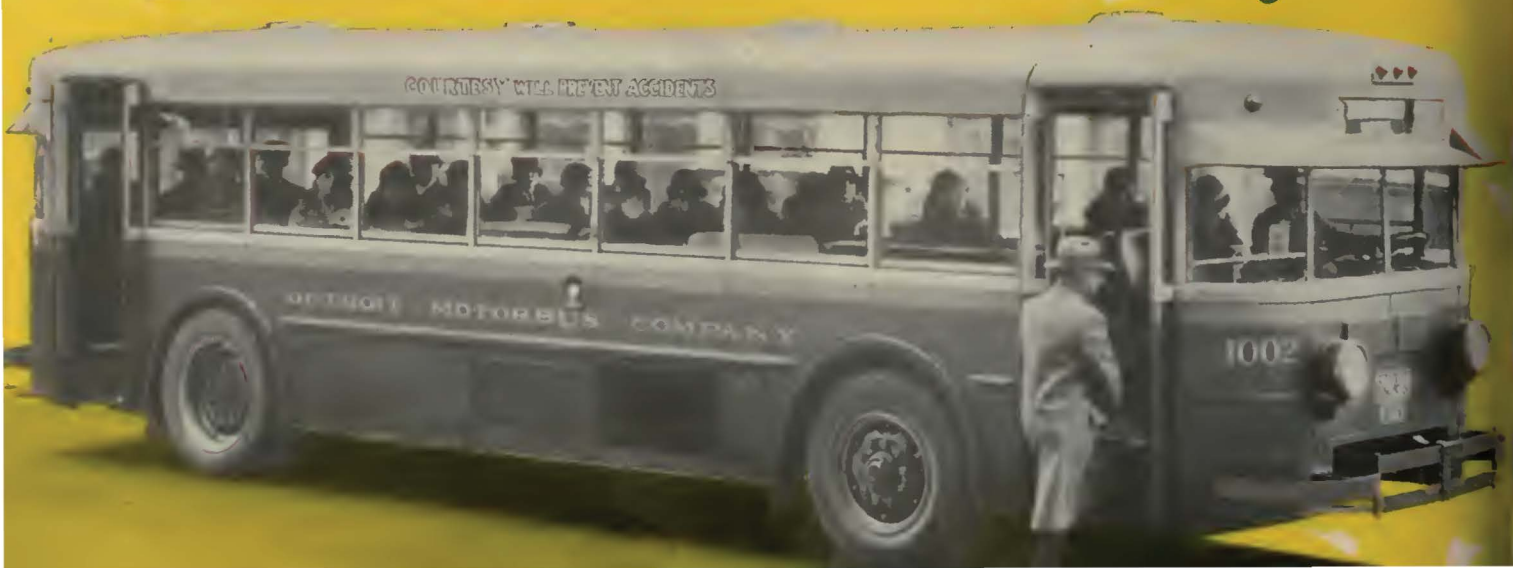
1928 records of buses bought by electric railways show:

TwinCoach 1st

in large capacity buses bought

TwinCoach 2nd

in total buses bought



The Test of Time

(Reprint from First Twin Coach Advertisement Electric Railway Journal, July, 1927)

Always, the leader is that man able to select fundamental principles shrouded in the maze of counter-opinion and professional prejudice.

The maintenance of leadership is based upon that peculiar gift of mechanical analysis which ahead of all strikes through the confusion of practices straight to those elements of design which are suddenly, but none-the-less positively approved as standard—the synonym for "best suited."

The development of coach transportation and the efforts of Frank R. Fageol as a transportation engineer coincide—the one history is the other's history. Frank R. Fageol has designed a new tool of transportation for America's fastest growing form of travel.

Looking Ahead

In the Automotive Street Car Field

Which Shall It Be—30′ Overall Length or 36′ ?

We now are engaged busily in taking the Twin Coach Automotive Type Street Cars through that period and process of converting the construction and design from the experimental model stage to that of practical manufacturing.

The fundamental underlying principles and design of these cars are sound, and we anticipate getting into quantity production on them during the early spring. During the interim we shall greatly appreciate hearing from those in the industry who contemplate making purchases of medium size light weight cars regarding capacity and length.

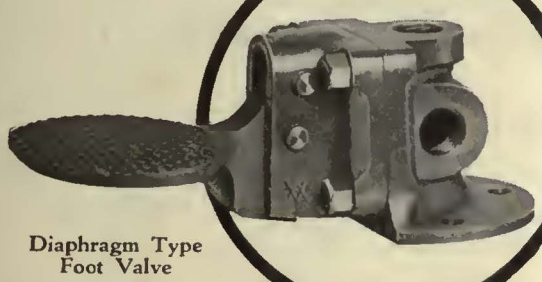
We hope for suggestions from the industry regarding this point because we want to decide and concentrate on the manufacture at this time of only one size of standardized car in the medium sized field. We hope, however, to have something to say to you at a little later date regarding a larger type car, it being our plan and intent finally to manufacture two sizes of cars.

TWIN COACH CORPORATION
Kent, Ohio

Twin Coach
BY F. R. FAGEOL KENT, OHIO

Improving a good Equipment

Diaphragm Type
Cut-Off Valve



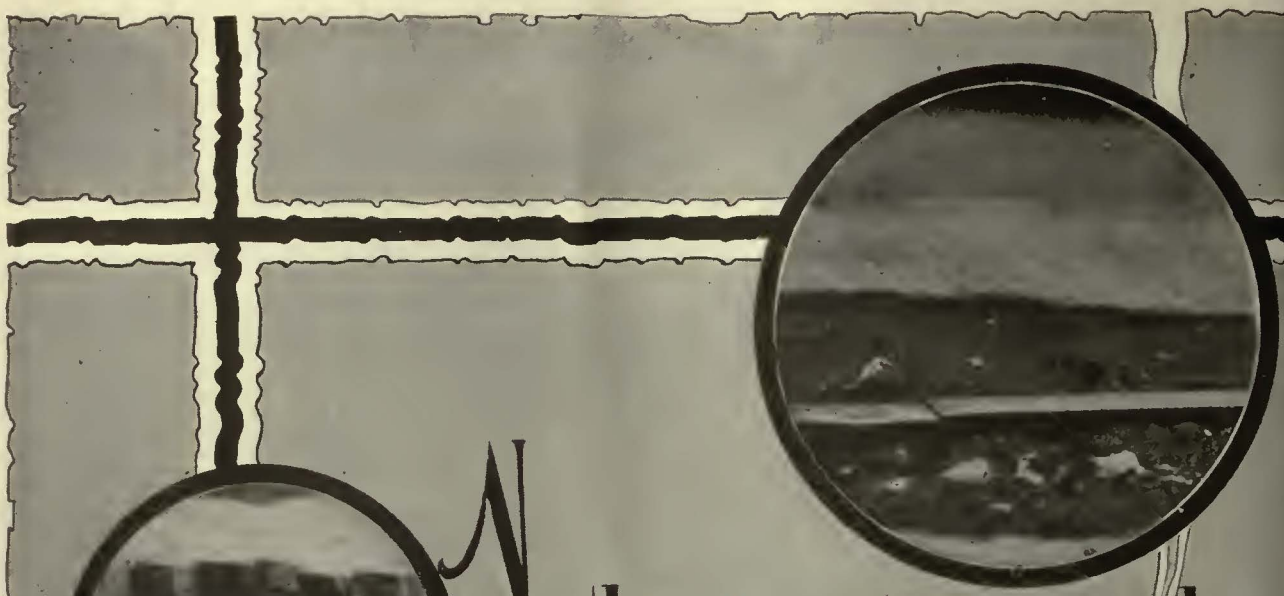
Diaphragm Type
Foot Valve

Two improved devices have been developed for the well known Safety Car Control Equipment—the Diaphragm Foot Valve and Diaphragm Cut-Off Valve — which replace the combined valve formerly used. Installation is simplified somewhat as only one Cut-Off Valve is required, and more satisfactory performance is assured because the diaphragm construction prevents leakage. These improved devices are now furnished with standard equipments.

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

Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH



Nothing costs so much as a rail joint *that costs a little less —*

Price is a deception which often blinds intelligent men to real value.

Above is shown a rail joint,—low, cupped and battered. There are two alternatives before you—either to repair it by one of several more or less common expedients—or to eliminate that joint as a source of trouble for good and all.

It's a little cheaper (the first time) merely to patch it up. It costs a little less—to start with. But experience shows it usually has to be done again in a few months. And then again!

At the left you see the job which may perhaps cost a trifle more at the start. A job which never needs to be done again during the life-time of the rail. A Thermit job!

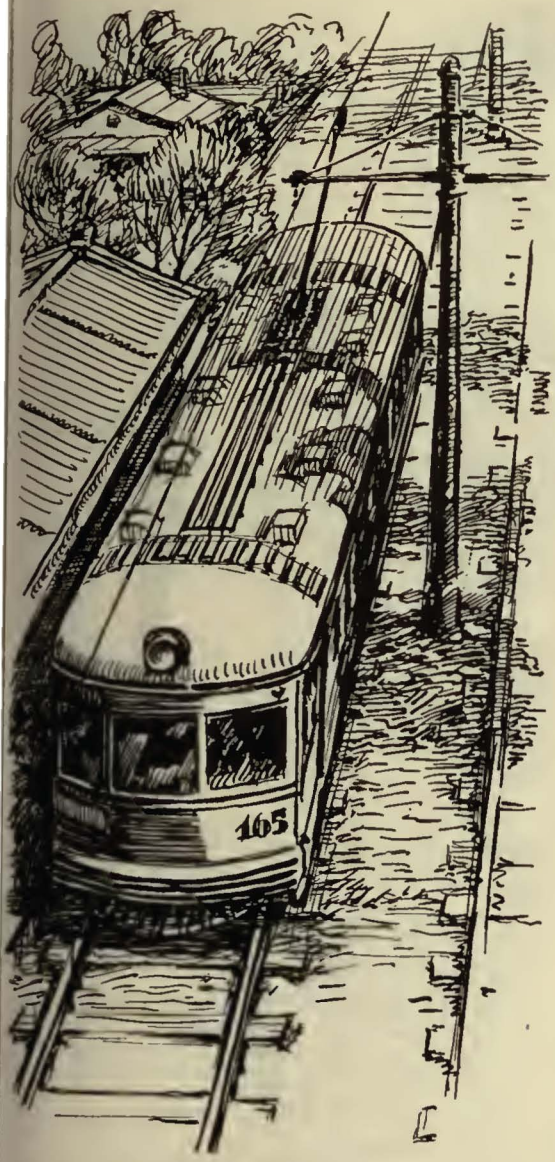
Ask yourself which policy is truly the "cheapest."

THERMIT

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO



FLAT WHEELS DON'T IMPROVE RIDER RELATIONS—

How about your wheels?

Passengers don't tolerate the miserable riding qualities of "flat," badly worn or inaccurate wheels.

Standard Wheels and Axles check O. K. from standpoints of passenger comfort and long, economical wear.

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

"FOR EVERY TYPE OF CAR

IN EVERY TYPE OF SERVICE"

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES:

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

WORKS: BURNHAM, PA.

Another 100 BELL SAFETY FARE BOXES

In Havana,-too!

600
~~500~~ **Bell Safety Fare Boxes are now giving 100% fare protection to the Havana Electric Railway Company**

add another hundred to the figure

It may be easy come and easy go in Havana, for some lines of business, but when it comes to revenue in street car operation, every fare must be protected.

That is why the Havana Electric Railway have recently installed 500 Bell Safety Fare Boxes—in line with their policy of Standardization on Bell Equipment.

Havana, too, recognizes not only the importance of fare protection, both to the fares and to the collectors, but the outstanding advantages in Bell Safety Fare Boxes.

The cash drawer is always locked

1. Non-rusting—made of Cast Aluminum and Bronze.
2. 100% Cash Protection—cash drawers are locked at all times. Impossible to remove while coins are on inspection plate. And when removed by the inspector, the cash drawer locks itself with a sliding cover, which seals the box before it is removed. A second key is needed to unlock the box to get at its content.
3. Takes all kinds of fares; nickels, dimes, quarters, passes, tokens or tickets.
4. Furnished with hand operated register as an integral part, or without register.
5. Smaller and lighter than any other fare box.
6. Standard finish, black and white Duco, or special colors to harmonize with interior of bus or car.

WRITE FOR FURTHER INFORMATION

Sold by

National Railway Appliance Co.
420 Lexington Ave., New York, N. Y.

Designed by
Bell Register, Inc.
Springfield, Mass.

Manufactured by
Smith and Wesson, Inc.
Springfield, Mass.

This is just another example of a satisfied customer. Wherever they have been tried, Bell Safety Fare Boxes demonstrate their ability to *protect and increase the revenue.*

Here's the record of Havana's orders—

Sample Box—Sept. 18, 1928	
Ordered 20	Oct. 4
30	Dec. 6
100	Dec. 17
140	Dec. 27
200	Jan. 3, 1929
100	Jan. 31

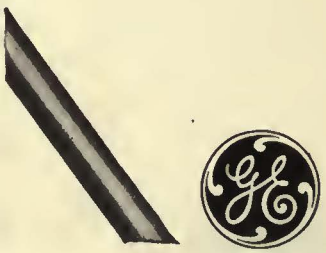
Sold by
National Railway Appliance Co.
420 Lexington Ave., New York, N. Y.
Designed by
Bell Register, Inc.
Springfield, Mass.
Manufactured by
Smith and Wesson, Inc.
Springfield, Mass.

~penetrates dirty surfaces

Welding on dirty surfaces is not recommended. Best welds are made on clean surfaces free from grease, mud, rust, and other forms of dirt and corrosion. However, if it is necessary to weld under such adverse conditions, G-E Type "F" electrode gives best results. This is why Type "F" commends itself to traction companies, whose welding frequently consists of repairing flanges, journal boxes, gear housings, and other exposed parts.

As a rule, such welding is not subject to subsequent machining. A smooth bead is, therefore, desirable, and Type "F" electrode, with its arc stability and free-flowing characteristics, makes this smooth bead possible.

For prompt service or additional information as to various types of G-E electrodes, get in touch with the G-E Welding Electrode Distributor near you or write to Section E-503, Merchandise Department, General Electric Company, Bridgeport, Connecticut.



In absolute reliability of operation and over-all efficiency, G-E arc-welding sets are unequalled. They are available in all sizes, all types—for either hand or automatic operation —for one or more operators.

550-505

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

McGraw-Hill Publishing Company, Inc.
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Malcolm Muir, *President*
H. C. Parmelee, *Editorial Director*

CHARLES GORDON, *Editor*

Louis F. Stoll,
Publishing Director

Volume 73 New York, Saturday, March 9, 1929 *Number 10*

Electric Railway Journal to Change Publishing Plan

EFFECTIVE with the last issue in March, Electric Railway Journal will change its plan of publication. Under the new program feature articles and display advertising will be concentrated into a bigger and stronger publication to be issued monthly instead of weekly as heretofore. The first appearance of the magazine in its new form will be the April number, which will also be the Annual Maintenance Number. Subsequent numbers will appear regularly on or about the first of each succeeding month.

The monthly publication will retain all of the best features of the present weekly, including news of the industry for the month, with the addition of many articles of broad research and survey types searching deeply into the fundamentals of the local transportation business.

RECOGNIZING the importance attached by the industry to the Journal's weekly news service, this feature will be continued as Electric Railway Journal News, to be issued each Saturday except in those weeks in which the monthly appears. In this way, up-to-the-minute news of transportation developments and events will be published in handy form for busy executives. Every effort will be made to condense all of the essential news to save the reader's time, consistent with a presentation of important facts. Particular attention will be directed toward those classes of news in which executives and department heads are most interested.

The Journal's special services at the time of the annual convention, which have long been recognized as outstanding features contributing toward the success of the annual meeting, will be retained and improved. These include the Annual Convention Number, the Convention Report Number and the Convention Dailies issued during convention week. In a full year there will be 13 issues of the monthly, the extra issue being either the Annual Convention Number or the Report Number, depending on the time of the month at which the annual convention is held. This year, the Convention Number will appear about Sept. 15, following the regular September issue earlier in the month. The Report Number this year will be the regular October issue.

THUS, in taking this important step, Electric Railway Journal is like its industry, meeting changed conditions with new and improved methods. Just as it has been the railway executive's duty to interpret and if possible to anticipate the public's demand for changed standards of transportation service, so has the Journal endeavored to meet the changing requirements of its readers and advertisers.

At this stage of the industry's development, in which great underlying questions of economics and policy overshadow in importance routine matters of operating practice, there is obviously less need for frequency of publication of feature material than of searching analysis, careful selection and thorough presentation. Nor does this hold true only of broad, fundamental questions of policy and management. In operation and maintenance as well, routine methods of various properties are quite widely and thoroughly disseminated. The average Journal reader is less interested in the

frequency with which operating and maintenance articles appear than in the thoroughness with which new practices and methods are analyzed and presented.

All of this makes the JOURNAL's new publishing plan both logical and desirable. Throughout the period of rapid technical changes and development of practices and methods, when timely publication was the important thing to its readers, the JOURNAL maintained its weekly basis. Now that the separation of current news from feature articles seems best suited to the needs of its readers, the JOURNAL, regardless of its long years of previous practice, does not hesitate to break with habit and precedent to meet changed conditions.

IN TAKING this step ELECTRIC RAILWAY JOURNAL pledges anew its faith in the basic soundness and broad possibilities of the local transportation industry. It will continue to point out the road toward improvement as it sees the light from careful study of many properties and consultation with the best minds in the industry. It will continue to attack fearlessly the competence of those who would write off the books this essential $6,000,000,000 industry which has made possible the development of modern cities as we know them today and which serves as the circulatory system vital to their existence.

It will continue to oppose visionary plans for the construction of multi-deck streets at public expense, while advocating intelligent allocation of present street space to maximum community usefulness. It will continue, likewise, to point out weaknesses within the industry and to criticize—constructively always—measures dictated by expediency rather than sound economics and forward-looking public policy. In short, the JOURNAL continues as its slogan those words applied to it not long ago by a prominent electric railway executive, himself one time a journalist—"A publication which lives for, not off, its industry."

The Country's Purpose Under Mr. Hoover

IT WAS not to be expected that President Hoover, in his inaugural address, would do more than suggest some of the subjects which will receive his attention first. As he said, the questions before the country are problems of progress to higher standards; they are not the problems of degeneration. The new administration is pledged among other things to the continuance of economy in public expenditure, the regulation of business to prevent domination in the community and the denial of ownership or operation of business by the government in competition with its citizens. He had quite a little to say about law enforcement. As for business, it has by co-operation made great progress in the advancement of service, in stability, in regularity of employment and in the correction of its own abuses. Such progress can continue only as long as business manifests its respect for law. Regulation of private enterprise and not government ownership or operation is the course rightly to be pursued in the relation of government to business. One passage in particular in his address looks to a great enlargement of manufacturing and commerce, probably in the hands of still bigger corporations, with which the government will not interfere, except to regulate the service and prices of public utilities, which are virtual monopolies. A special session of Congress is in prospect to deal with the agricultural relief and limited changes in the tariff.

As Edward N. Hurley, an astute observer but a Democrat, said, it is unfair continually to expect Mr. Hoover to pull rabbits out of hats. No matter what his earnest friends may say for him, Mr. Hoover is too well schooled to expect to attain the impossible. He knows that it is not possible so to arrange affairs that an incompetent man can continue in business and earn money. He knows that small businesses put together over night and sold to the public do not make big business enterprises. On the other hand, idle prosecution of business is less likely under him than it was even under Mr. Coolidge. In the Department of Commerce Mr. Hoover did a great deal to bring men together to work out their own problems. As President there is no reason why he should be any the less successful in work of this kind. Under him it is to be expected that public work will be carried out along engineering rather than political lines. As for the tariff there are few who know what they want and still fewer who would recognize what they wanted if they got it. This Mr. Hoover also knows, just as he knows that problems of economics are not settled by oratory. Mr. Hoover knows what his task means. He knows the responsibility it involves. He asks of his fellow citizens their tolerance, their aid and their co-operation. All of these he is entitled to receive.

Relieving Delay Caused by Traffic Signals

SELDOM has so clear a case against improperly arranged traffic signals been made out as is contained in the report prepared by Kelker, DeLeuw & Company on the operation of the Fourteenth Street line of the New York Railways. Though this report, abstracted elsewhere, treats particularly of street car movements the same principles are of equal force with respect to vehicles in general. The traffic signals in New York City were installed primarily to facilitate the movement of north-south traffic, which in general is considerably greater than the east-west traffic. However, all the signals on a single avenue are synchronized, the relative length of time allotted to the two directions presumably being determined by the proportion of movements at the maximum traffic point. Furthermore, in an effort to have a city-wide system, the movements on parallel north-south avenues have also been tied together, regardless of the fact that traffic conditions at many intersections differ from those at the maximum traffic point.

On Fourteenth Street the result has been to delay all traffic and cause traffic blockades throughout the entire day. For instance, the signal system limits the track capacity to 84 cars per hour, whereas to meet the demands in the maximum hour 103 cars are scheduled. Besides this, the cars must move across the intersections

in bunches of six or seven, precluding good service.

One of the primary causes of these delays is the extreme length of the cycle, 220 seconds, of which 160 seconds is devoted to north-south movement and the remaining 80 seconds to east-west movement. It is pointed out in the report that merely by reducing the length of the cycle to 150 seconds, keeping the relative proportions of time the same, the delays will be so reduced that the scheduled cars can be operated in the maximum hour. It is also shown that this reduction in the length of cycle will not reduce the capacity of the street for vehicles, and in fact will increase materially the schedule speed for all traffic.

Experience in other cities would indicate that for an area so great as that covered in New York, bounded by 45th Street, Second Avenue, Canal Street and Seventh Avenue, any universal signal cycle must result in great delay. Much shorter cycles than 150 seconds would be found advantageous at some locations. It is evident that an intensive study will show that each intersection of each group should be considered independently and a traffic control devised that will give to each street the maximum capacity, which obviously is impossible with a city-wide co-ordinated system.

Rigid Legal Code Adopted in New York

REAL good has come of the inquiry into ambulance chasing in New York City. The practice had grown to a point where it had become insufferable. Some lawyers have been recommended for discipline, others have actually been disciplined, and still others, sensing the handwriting on the wall, have chosen to eliminate themselves from the profession. Best of all, however, the Appellate Division of the Supreme Court, First Department, has adopted rules applying to practitioners in New York and Bronx Counties, designed to end ambulance chasing. In short, the court has drafted rules intended to clean up the bar. Ambulance chasing is forbidden, as is also the solicitation of retainers. Settlement terms are fixed. The code adopted is rigid and embraces reforms urged by Justice Wasservogel with the single exception of the recommendation that perjury and subornation of perjury be punished as misdemeanor. Only those rules have been omitted from the new code which are regarded as requiring legislative action. To effect these reforms, bills were introduced in the Legislature. Although they were lost in committee their proponents are determined not to give up the fight for them.

As has been pointed out before in ELECTRIC RAILWAY JOURNAL, one of the astounding things brought out by the inquiry was the lack on the part of those arraigned for ambulance chasing of any realization of a real code of professional ethics. Many of the practices followed in the accident cases were most nefarious. The important point, however, is that the bar has started to clean up. It is reasonable to expect that as a result of all the recent agitation the recommendations will be adopted that have been made by William D. Guthrie, president of the New York Bar Association, and reiterated recently by Prof. I. Morris Wormser and others. Among other things suggested is a thorough inquiry into the character, background and environment of applicants for admission to the law schools. There is, of course, no way that would prove wholly effectual in keeping out of the profession men who are undesirable, but the raising of the requirements for admission to the law schools and for graduation will certainly tend to better the general standard. By and large, the overcrowding of the profession so apparent in New York is merely a reflection of a condition only slightly less true in other large centers of population. The lure of the metropolis appears to be equally as strong for the lawyer as it is for men in other lines. Almost in direct proportion as competition for cases became keener the standards of practice appear to have deteriorated.

Meeting the New Conditions in the New Way

SAMUEL KAHN, president of the Market Street Railway, San Francisco, Cal., has every right to speak about the key to the solution of the problems of the street railway. Certainly, his company, operating at a 5-cent fare under conditions in some instances competitive, has done many progressive things toward making its service attractive. It would almost seem that the company has run the complete gamut of devices so far designed to achieve this end. Some of the things the company has done Mr. Kahn has reviewed in *Byllesby Management* for January, 1929, but it is the spirit manifested in his remarks that is most reassuring.

Industrial conditions were not so good in San Francisco last year. Despite this the decline in business on the Market Street lines was proportionately less than that in any other major city, excepting, of course, the comparatively few cities such as Chicago and Cincinnati, where increases were scored. This record was made because the company left no stone unturned in its efforts to increase patronage through increased good will and closer conformity to the wishes of the riding public.

It went after business wherever crowds assembled. In some cases it was successful in bringing to San Francisco events which would increase riding on its lines. It smoothed out pavements where intersecting streets cross its tracks to please those who ride in automobiles, the very people it desires to have ride in its cars. It laid new crossings quieter than the old ones. It continued to install soft leather upholstered seats for the greater comfort of its patrons. It speeded up its cars. It eliminated slat flooring, a menace to the women with the high-heel shoes. It kept its buildings attractive in appearance by painting and repainting them. It reminded the people of San Francisco of the company's mission by losing no opportunity prominently to display the company's shield. These are merely a few of the things it did. They are very important, particularly in that they reflect the firm conviction of the management that continued growth in automobile competition is not the whole story of declining street railway revenues.

To some street railway men, long engaged in a monopoly business, it came as a shock to have to relearn that the history of business all over the world is replete with instances of industry being faced with changing commercial conditions. But it did not come as a shock to the San Francisco management. It had no new lesson to learn or no old lesson to relearn. Mr. Kahn and the men under him have proved by their work that they know that those industries which have maintained leadership, despite changing social conditions, are industries that have found ways of altering their products and commercial methods to conform to the new age. Few street railway systems have had to contend with conditions more adverse than those which have confronted the Market Street Railway, and certainly few systems have risen to the occasion with a greater degree of success.

Long Traffic Cycles Cause Delays

Signals on Fourteenth Street, New York City, occasion serious interference with street car and vehicle movements and result in bunching of cars and poor service, according to report made by Kelker, DeLeuw & Company

DELETERIOUS effects of synchronized traffic signals with long cycles are shown in a recently released report to the New York Railways Corporation by Kelker, DeLeuw & Company, consulting engineers of Chicago, relative to the operation of the Fourteenth Street Line in New York City. The findings, which are based on a large number of observations, show that the running time of street cars in the zone between First Avenue and Eighth Avenue is increased by the existing system of traffic control from 32 per cent to 80 per cent, while individual trips required more than 100 per cent additional running time. By reason of the delays caused by traffic signals, a number of cars are detained or held in the zone between these streets, thereby being prevented from providing the service scheduled elsewhere on the line. The present operation and timing of traffic signals limits the track capacity to 84 cars per hour, whereas 103 cars are scheduled in the maximum hour. It is shown that by retaining the existing system of traffic control and simply reducing the signal cycle from 220 seconds to 150 seconds, the 103-car schedule can be operated through the signalled zone in an hour. Such a change in the signal cycle will not decrease the capacity of the north-south streets, nor will it reduce the distance which can now be travelled in an hour, nor diminish the over-all speed. It is also shown in the report that the existing method of traffic control could be replaced by other methods that would cause little or no delay to the crosstown street car traffic. Following is a resumé of the salient features of the report.

The major portion of the line is on Fourteenth Street, the route length being 3.33 miles, with a maximum running time of 53 minutes per round trip, and a minimum headway of 34 seconds. The movement of the cars between Second Avenue and Seventh Avenue is controlled by traffic signals at locations shown in the chart. All except the one on Second Avenue are operated on a signal cycle of north-south, 135 seconds and east-west, 75 seconds with dark periods of 5 seconds between each change. The total time is 220 seconds per cycle. Field observations showed that the average time allowed for north-south movements was 140 seconds, and for east-west movements, 80 seconds. The signal at Second Avenue has a 180-second cycle, 120 seconds north-south and 60 seconds east-west. The signals are all operated by hand from control towers and the timing is transferred by visual or audible signals to co-ordinate the various systems and their subdivisions.

All signals start at 8 a.m. and continue with the 220-second cycle until 7 p.m., when the time is changed to 120 seconds north-south and 55 seconds east-west.

Check of Traffic Shows Many Delays

Observations made at the various intersections of all vehicles entering at the principal corners showed that the maximum north-south traffic on any of the controlled avenues in any half-hour period was 729 vehicles at Seventh Avenue and 45th Street, with 260 vehicles east and west at the same point, or 35.7 per cent as many.

RANGE OF RUNNING TIME AND SIGNAL DELAYS ON FOURTEENTH STREET SURFACE CARS, NEW YORK CITY

Period	—Actual Running Time— Minutes Eastbound	Westbound	—Traffic Signal Delay— Minutes Eastbound	Westbound
6-8 a.m.	6½ – 8½	7 – 9½	None	None
*8-9:30 a.m.	9 – 16	12 – 17½	2 – 6½	2½ – 8
9:30 a.m.-5 p.m.	12 – 18	12 – 19	2 – 9½	3½ – 9½
*5-7 p.m.	14 – 18	15 – 19	4 – 7	6 – 9½
†7-10 p.m.	8 – 13	9½ – 15	1 – 5	2½ – 8

*Rush hour periods. †North-south and east-west traffic signal intervals reduced to 120 and 55 seconds, respectively, at 7 p.m.

On Fourteenth Street, the maximum north-south traffic was 635 vehicles at Fourth Avenue, with maximum east-west traffic of 159 vehicles. The maximum east-west traffic in a half-hour period was 235 vehicles at Fifth Avenue, with the maximum north-south traffic 525 vehicles. However, at Sixth Avenue 222 vehicles moved north and south, with 186 east and west. From the foregoing it is clear that a uniform cycle for the area from 45th Street and Second Avenue to Canal Street on Seventh Avenue must result in a vast amount of delay to traffic movement. The figures also show the unbalanced traffic control conditions with which the operation of street cars on Fourteenth Street have to contend.

Checks show that, in general, fewer vehicles moved in the first 20-second period of the cycle than in the second or third 20-second period. This can be attributed, in part, to the time lost in starting the vehicles in the first period, and, in part, to the fact that the count was timed with the signal lights when, in many cases, the vehicles did not move until signalled by the traffic officer a number of seconds after the green lights

came on. After the third and fourth 20-second period, the number of vehicles per 20-second period falls off somewhat, indicating that some of the time of the 140-second north-south signal interval is not being fully utilized because the volume of north or southbound traffic is not sufficient to utilize it.

A signal delay check was made by men riding the street cars and showed that the running time of cars closely approximated the schedule time before the traffic signals began to operate at 8 a.m. The schedule running time is seven minutes from 6 to 7 a.m., nine minutes from 7 a.m. to 7 p.m., and eight minutes after 7 p.m., and the range in the actual running time and total traffic signal delay was as shown in the table. The actual running time was as high as nineteen minutes, while the traffic signal delay was as high as 9½ minutes.

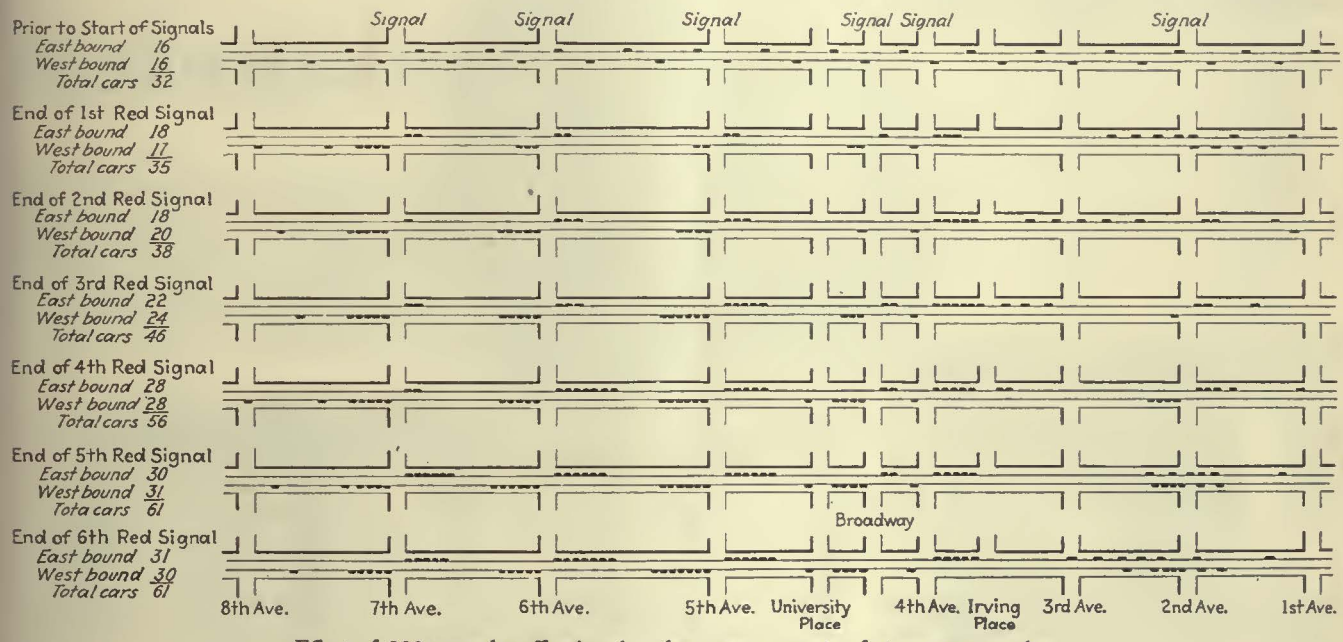
The actual number of cars in the zone closely approximated the number which should be there up to 8 a.m., after which the difference gradually became greater, until at 8:14 a.m. there were 26 cars on the westbound track between First and Seventh Avenues, whereas, based on the number entering the zone each half-hour period on the schedule running time, there should have been 13. On the eastbound track in the afternoon, there should have been 11 cars between Eighth and Second Avenues, while the check showed a total of 25.

The diagrams reproduced show the effect of the traffic signal cycles of 220 seconds on the operation of the street cars. With normal operation before the signals were put in use, there would be 32 cars on both tracks, or 16 on each track. The succeeding diagram showed the number and spacing of the cars at the end of each successive north-south (red) signal interval, until the maximum number has been accumulated. At the end of the sixth interval (22 minutes) operation is normal for signal control, at which time 61 cars are needed in the zone, or an increase of 29 cars. These diagrams also show the acute bunching of cars for meeting signal changes.

Counts made show that only 78 cars crossed Fourth Avenue eastbound in the maximum traffic hour, 5 to 6 p.m., and that the maximum number of cars moving on the signal cycle was eight, the average five, and the minimum, three. There were sixteen east-west signal intervals in the maximum hour. To operate 103 cars per hour with this number of signal intervals an average of slightly more than 6.4 cars would have to be moved in each signal interval in groups of six or seven each. Obviously, it is almost impossible to handle street car movements on the basis of six and seven-car berthing.

The first step to bring the track capacity up to the schedule or service requirements will be found in decreasing the average number of cars held by signals. A reduction of two cars per signal interval, 6.4 cars to an average of 4.4 cars, with the input of 103 cars per hour would give about 24 cycles per hour. Without changing the existing 2 to 1 ratio of north-south to east-west intervals the adoption of a 150-second cycle (24 per hour) recommends itself. The north-south traffic can be readily handled with the elimination of the "dark" signals, as there will be 40 additional seconds in each hour for north-south movements. With 95-second north-south intervals there would be more time in each hour for north-south traffic, and there would be 24 opportunities for vehicles to move and gain a fraction of a block while the north-south signal is red. On the present basis of sixteen cycles, a vehicle would travel 144 blocks per hour, and on the 24-cycle basis it would travel 168, an increase of about 16.7 per cent. The movement of all east and westbound traffic will likewise be facilitated, over-all speed will be increased, and delays diminished.

A more frequent movement of pedestrians across the avenue will be secured, and the serious reduction in the number of effective traffic lanes, due to pedestrians stepping out on roadways while awaiting signal change, will be diminished in a degree. The vehicular congestion on principal crosstown streets other than Fourteenth will be relieved, and the movement of street cars on the principal east-west streets will also be improved. The number of cars moving in a group will be reduced, so that there will be better loading conditions, better service given, and the number of cars operated through the zone in an hour can be increased about 15 per cent.

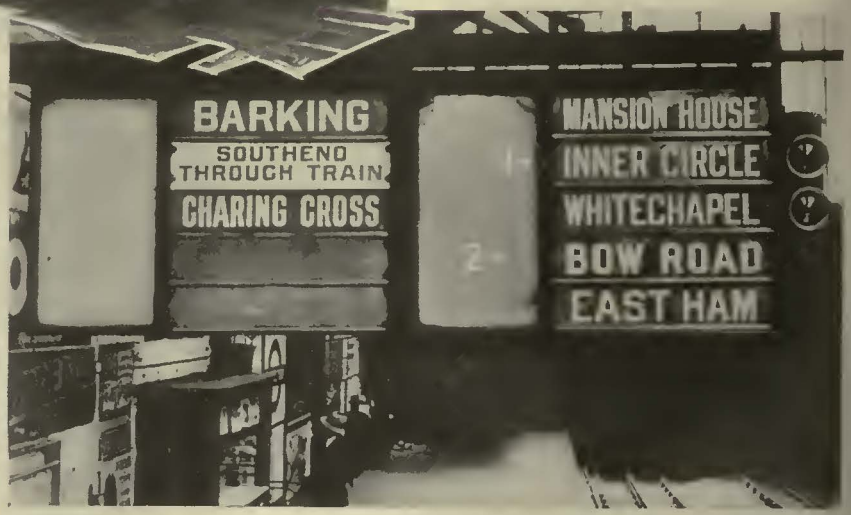


Effect of 220-second traffic signal cycles on movements of street cars on the Fourteenth Street line of the New York Railways

Helping the Patron on London's

MORE THAN three score escalators or moving stairways have helped to solve the problem of bodily transfer of passengers between various subway levels and the sidewalk. This escalator at Waterloo station benefits the many suburban passengers of the electrified Southern Railway.

DISTRICT RAILWAY (electrified open-cut) trains carry "Non-Stop" signs at the front when they are scheduled to skip a large number of stations.



DISTRICT RAILWAY non-stop trains carry alongside the center doors (on removable slats) a list of the stations at which these trains do *not* stop. Illuminated station boxes overhead have already given the passenger advance information as to the destination of the train.

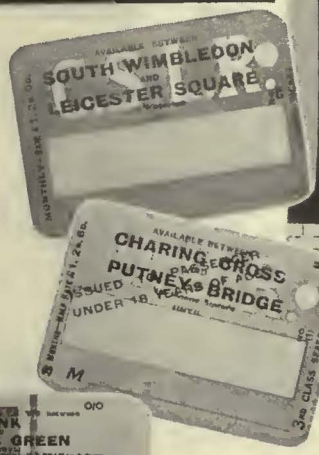
THIS TYPE of illuminated overhead sign at stations shows the order of incoming trains by means of number and arrow indications.

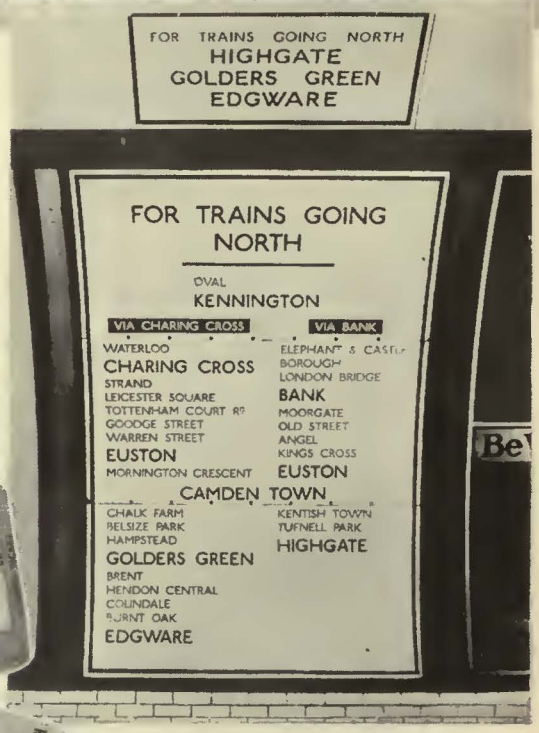
BEFORE DECIDING on his ride, the prospective passenger can survey this 9 ft.x12 ft. wall map at leisure.

Underground

THE ILLUMINATED MAP, formerly hung from the ceiling of "tube" cars, is now being superseded by varnished cards which are carried over the side ventilator sash. This later style of map is shown in this illustration. Note the care given to showing transfer points whether to the company's own or to *foreign* lines.

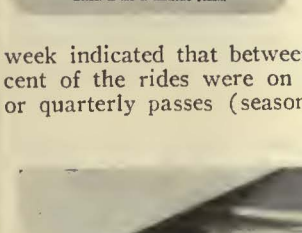
ELECTRICALLY-LIGHTED SIGNS are sunk in the station platforms and tell the passenger the direction of the train he wishes to take.





BEFORE A TRAIN obscures this 7 ft. x10 ft. sign which is attached to the wall of the station opposite the platform edge, the patron can satisfy himself that he is or is not on the right platform. Even if the train is in, he can see the main destinations on the higher 2 ft. 6 in.x5 ft. auxiliary sign.

THE CHANGE-MAKING delays associated with zone fares are reduced for pay-each-time passengers by the use of ticket-issuing machines. The later types also make change.



A ONE-WEEK traffic check made in a normal winter week indicated that between 15 and 16 per cent of the rides were on weekly, monthly or quarterly passes (seasons).

AT MANY STATIONS, the ticket-using passengers are counted through practically noiseless passimeters, but the season ticket or passholder, as shown at the left, merely shows his pass and goes on.

Freight Service

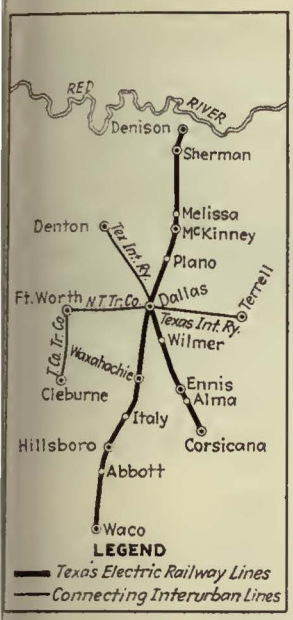
Instituted by Texas Electric Railway

Lines serving a rich agricultural and industrial section are carrying an increasing volume of freight. Equipment has been improved and terminal facilities added to accommodate shippers

Type of electric locomotive used by the Texas Electric Railway. Two are already in service while two more are under construction

ORIGINALLY chartered for giving passenger service only, the Texas Electric Railway, Dallas, Tex., saw the possibilities of handling freight in the rich district it serves and took steps early in 1928 to have the charter amended to permit it to engage in the freight business also. The amendment was made on April 11 and on May 1 the Texas Railroad Commission granted permission for the interurban to handle intrastate freight. The final move came on Nov. 17, when the Interstate Commerce Commission approved the company's rates on interstate shipments. By securing the co-operation of business men in the communities reached and arranging with five steam railroads for interchanging business, the railway had an immediate response when service was started. To accommodate the shippers the company added to and improved its physical facilities in many ways. Loading platforms were built at almost every town; passing tracks laid at several points; station facilities increased; two freight yards added; four new portable substations purchased, and two electric locomotives secured. The railway has benefited from the additions, for the volume of freight carried has increased steadily.

Since 1924 the passenger business of the Texas Electric Railway had been decreasing and losses in passenger revenue became so heavy that communities it served feared there would be a serious curtailment, or possible suspension, of the electric railway passenger service. Company officials, leading citizens of the communities served and numbers of security holders made a thorough analysis of the situation and decided that the company should enter the freight field. Traversing a busy agricultural and industrial section of north central Texas, the lines of the railway offered strategic freight connections for a number of railroads which had difficulty in gaining easy access to several of the larger cities. Because of this the steam railroads with which interchange business was possible, gave helpful assistance in furthering the plans to engage in the freight business.



Lines of the Texas Electric Railway, centering at Dallas, reach Sherman and Denison on the north and Waco and Corsicana on the south. The system also is interconnected with interurbans reaching Fort Worth, Cleburne, Denton and Terrell

The system, with a total of 230 miles of track, centers at Dallas, lines radiating to Denison and Sherman on the north and to Waco and Corsicana on the south. Dallas is the largest inland cotton market in this country and the entire territory served is an important cotton-producing section. The cities and towns along its lines also are the marketing centers for large trade territories, and many manufacturing plants are adjacent to or near the railway's tracks. A number of textile mills are being established in the district and most of these will be served by the railway.

Before plans for the operation of freight service were completed, company officials, community leaders and stockholders made contacts with the principal sources of freight business along its lines and found practically all interests eager to co-operate. In numerous instances it was found that the new arrangement offered material economies to the shipper and greatly decreased the time required to reach the larger centers by existing freight carriers.

Loading Platforms Built and Terminals Improved

Plans to carry freight were rushed so as to take advantage of the movement of the 1928 cotton crop, which started in September. In almost every town, team tracks and cotton loading platforms were built. Numerous passing tracks also were built and station facilities were furnished which were comparable to those maintained by the steam roads. At Waco a complete freight yard, to accommodate twenty freight cars, is under construction. It will have adequate switching tracks, as well as tracks for loading, unloading and storing the cars. At Dallas a new yard to accommodate twelve cars has been built. The Dallas terminal is located near the center of the city at a most accessible point. A large freight station with adequate docks makes the Dallas terminal convenient for business houses in the wholesale and jobbing district where it is located.

Loading cotton, the principal commodity carried by the railway, on a specially constructed platform at Abbott, Tex.

Front view of the Class A electric locomotive used on the system

To provide for the movement of heavy traffic four additional substations of portable type have been built. They are mounted on steel flat cars and have General Electric equipment. One other new substation was installed. Two electric locomotives were built for the company and two additional locomotives are now under construction. Other equipment is being added as required.

Freight interchange tracks have been arranged with five steam railroads at twelve points, as follows: The Missouri, Kansas & Texas Railway, at Denison, Hillsboro, Waco and Kipling, south of Waxahachie; the Southern Pacific, at Melissa, Plano, Wilmer and Alma; the St. Louis & Southwestern, at Plano and Hillsboro; the Trinity & Brazos Valley at Waxahachie; and the International & Great Northern at Italy. Additional interchange tracks are to be built in the larger terminals at Waco, Corsicana, Sherman and Dallas. Industrial tracks have been built to factories along the interurban tracks and others are being built as rapidly as possible. Freight facilities have already been made available to many cotton mills and warehouses, cotton oil mills, brick manufacturing plants and miscellaneous industries. Active efforts also are under way for the location of new manufacturing plants along the company's tracks.

Under the schedule of through rates recently granted by the Interstate Commerce Commission, the Texas

Electric Railway is in position to handle carload and l.c.l. shipments from the Middle West and Eastern states, moving by rail through St. Louis, Kansas City, Memphis, Shreveport and New Orleans. This business has been built up, since the rates were approved, to a point where a large proportion of the shipments now is interstate shipments of carload and l.c.l. lots.

The Electric Express & Baggage Company will continue to handle express service over the lines of the Texas Electric Railway, as in the past. This company also operates over the Texas Interurban Railway, serving Dallas, Terrell and Denton. Regular pick-up and store-door delivery service is maintained by this company.

The development of its freight business has not affected the Texas Electric Railway's passenger service. Regular hourly passenger service is maintained without interruption. A major portion of the freight movement is handled at night, thus causing a minimum of interference with the passenger cars.

The plans for engaging in freight business were inaugurated and carried out by the late Jack Beall, president of the company and J. P. Griffin, vice-president. A. E. Morris, formerly general freight and passenger agent Oklahoma Railway, has been named traffic manager, and M. R. Fewell, formerly general passenger agent Texas Electric Railway, has been made general passenger and freight agent. C. E. Lennon is the assistant general passenger and freight agent.

Employees of Augusta-Aiken Honored

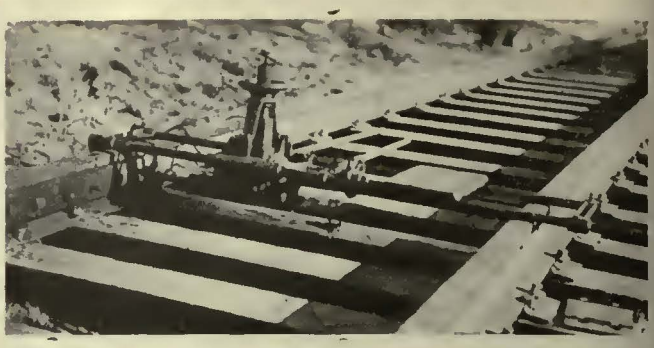
IN RECOGNITION of services rendered the public and the company and for long and faithful employment with the company, the Georgia Power Company, which recently acquired the properties of the Augusta-Aiken Railway & Electric Company, Augusta, Ga., has bestowed service badges upon 80 employees who have been with the Augusta company for ten years and upward. A banquet was tendered all employees at the Partridge Inn, attended by more than a score of prominent officials of the company.

Dresden Articulated Units

TWO articulated street car units have been built and are being tried at Dresden, Germany. They differ somewhat from each other, though each has three bodies. One of these was shown in an illustration appearing on page 23 of the Jan. 5 issue of this paper. One of the units consists of two end cars, each 29 ft. 6 in. over all and mounted on four wheels each, with a central compartment about 13 ft. 4 in. over all, supported by the end cars. The over-all length of this unit is 72 ft. 4 in.

The other design is 73 ft. 5½ in. over all, with the end cars 24 ft. 4 in., and the central car 24 ft. 9 in. in length. The method of support, however, is entirely different. In this second design the central unit is mounted on a single truck, and the outer end of each end unit is equipped with two wheels only, with a support swiveled from the central truck.

When empty each articulated unit weighs about 63,800 lb. It has a carrying capacity of 117 seated and standing passengers. In each train every axle is fitted with a motor, making four motors per articulated unit. They will be tried out first on heavy traffic interurban lines.



Bolt holes were reamed with an electric drill and 1⅛-in. reamer

Building City Track for Heavy Cars

By JOHN F. HUBENTHAL,
Roadmaster Chicago, South Shore & South Bend Railroad

HEAVY trains, such as employed by a number of interurban railways, require track construction designed to withstand severe abuse with reasonable maintenance cost. These requirements are doubly necessary where such lines run through paved city streets. The Chicago, South Shore & South Bend Railroad has installed track in Michigan City, Ind., which is believed to meet these requirements. This track is constructed with section 13025 rail in 66-ft. lengths. The joints are of the Chicago, Milwaukee, St. Paul & Pacific Railroad type, 38 in. long, punched for six 1⅛-in. bolts spaced 5½ in. on centers, bolts being 1⅛x6½ in. using 1⅛-in. Hi-Power lock washers. The tie plates are double shoulder inclined and the joint plates are shoulderless inclined, 40 in. long. Both are punched for screw spikes. The pavement used is Tarmac, penetration process, bituminous concrete.

Numerous construction obstacles were encountered on this installation. Due to lack of space all materials had to be unloaded beyond the curb line in places where permission to do so could be obtained, and then moved by truck to the locations needed. The work was performed by three separate crews. The large crew laying rail was followed by a smaller crew, to place and space the ties and the tie and joint plates, and by a surfacing crew, to surface and align the track.

Installation of a curb 4½ ft. on each side of the center of the track to a grade established by the city engineer was the first operation. This curb was 5x18 in., finished on the top, constructed in 20-ft. sections of concrete mixed in proportions of 1:2½: 5. About ¼ in. was allowed be-

Holes were drilled with an electric drill and the screw spikes placed with a spike driver

The track was surfaced and aligned by means of a Buff Railign instrument

The ties were tamped by the use of electric tamping machines

tween blocks for expansion. The joints were so constructed that one block would help support the adjacent block.

The large crew then laid the rail and installed the joints. As these joints were drive-fit it was necessary to have them in good surface and line, and drifted to equalize hole spacing, before attempting to install the bolts. If the holes did not line up so that the bolts could be driven without spoiling the threads the holes were reamed, an electric drill and $1\frac{1}{8}$ in. reamer being used for the purpose.

Immediately following this came the job of renewing and spacing the ties on 22-in. centers, or 36 ties to each 66-ft. section, with three joint supporting ties spaced slightly closer to give full bearing to the face plates. The tie and joint plates were spaced and temporarily spiked to gage with track spikes. The spike holes were then drilled and spikes driven by a No. 4 B spike driver. The same crew also tightened the bolts by tapping the head with a spike maul, while the nut was tightened with a wrench. This was done three times before the track was paved.

Then followed the crew which surfaced and aligned the track by using a Buff Railign instrument, operated by the foreman. The ties were tamped by the use of electric tamping machines. After the track was surfaced and aligned it was then backfilled with the gravel previously removed. This fill was installed in layers of 3 in. each and hand-rammed until it became thoroughly compact.

Joints were then cleaned with a wire brush in preparation for welding. The rails were heated with kerosene torches about 2 ft. on each side of the joints to close the expansion gap. If the rails failed to close with this heating an insert was made to fill the space and the joints seam-welded to the joint plates and ball of the rail. The rails were also electrically welded together and finished to a smooth surface with a grinder.

Because the rigidity of concrete paving was considered undesirable, macadam paving was used, and the Tarmac penetration process was selected. Four different grades of stone were used in this paving, namely, No. 4, No. 3, $\frac{1}{4}$-in. chips and screenings. They were installed in layers in the order mentioned, and between each layer Tarmac was applied under pressure.

The Tarmac was heated to a temperature varying from 280 deg. to 300 deg. After each layer was applied it was rolled with a gasoline driven roller. Precaution was taken to leave unrolled a strip approximately 4 in. inside of each rail, since this was to be tamped by the flange of the car wheels.

Stone for paving was unloaded from drop-bottom cars

Each layer of Tarmac which was spread under pressure was rolled to within 4 in. of the inside of each rail

Views of Electrical Equipment for Philadelphia Subway

The architecture of this substation, typical of all three, makes the building a distinct asset to the neighborhood in which it is located. Station noise is minimized by making the building entirely closed

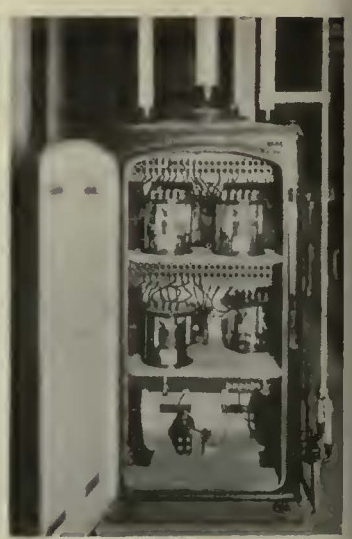
Main control switchboard of the Louden Street substation

Basement of the Cumberland substation. An individual converter switchboard may be seen at the left and a battery of high-speed circuit breakers at the right

Interior of the Cumberland substation, showing the large synchronous converters. The transformers are housed in the pits at the right of the converters

Double automatic stop layout and impedance bonds. Both automatic and semi-automatic train stops have been provided to operate in connection with every automatic block signal and interlocking home signal

Instrument case, showing typical piping to the stop-valve magnets



Electrical Equipment

Specially Designed for Philadelphia Subway

Two 3,000-kw., 60-cycle rotary converters have been installed in each of three soundproof substations. Distribution system utilizes a total of 75 miles of cable. Signals are electric color-light type and all switches are interlocked and electro-pneumatically operated

Signal location at Olney Avenue, showing the conduit run and the relative location of signals. Note the double case at the right and the method of running air line across track

In the Feb. 9 issue an article was published telling the relation of the Broad Street subway to the existing and the future transit facilities of the city, and giving operating and construction details. This was followed by an article in the Feb. 23 issue describing the 150 cars bought by the city. The last article of this series, giving details of the Fern Rock terminal and shops, will appear March 23.—EDITOR.

NUMEROUS noteworthy features have been included in the design of the power distribution system for the new Broad Street subway, constructed under the supervision of the Department of City Transit of Philadelphia and being operated by the Philadelphia Rapid Transit Company. Among these are the construction of the substations without windows; the scheme of natural ventilation for the removal of the air heated by the electrical equipment; the largest 60-cycle railway converters ever built; the remote manual control and interlocking of electric switches; the separation of high-voltage circuits and switching from the low-voltage direct-current circuits; location of all 600-volt circuits below the main floor; the bringing of underground cables directly to the switching equipment to which they connect; and the use of large oil cooled transformers within the buildings.

The signal system, too, has many interesting features. The salient ones are: Alternating current at 60 cycles for signals and interlockings, supplied by a system of duplicate feeders; the double-rail track circuits, except at interlockings and in the yard; overlap signal control; automatic three-position, color-light signals; electro-pneumatic automatic train stops; semi-automatic electrically-controlled block and interlocking signals; non-automatic electrically controlled dwarf and permissive signals; speed and time control signals; electro-pneumatic switch operating mechanism; impedance bonds and track connections; interlocking machines; and electro-pneumatic direct acting yard switches, operated from a control panel in a tower.

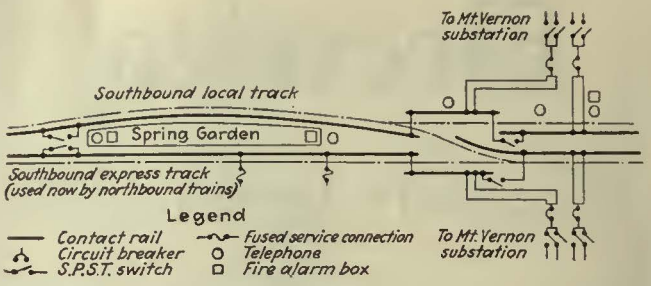
In the determination of substation capacities and locations, the ultimate power demand of the trains was used

Three substations, spaced approximately 2 miles apart, serve the Broad Street subway

as a basis. Rush-hour operation was assumed to consist of eight-car trains running on two-minute headway on all four tracks, with northbound trains carrying an average load of 150 passengers per car (72,000 per hour) and southbound trains loaded to an average of 35 passengers per car. As northbound trains run against the average grade, the evening rush hours were used in determining the maximum substation loads.

With the above train operation, including coasting, which provided a 5 per cent speed margin, a schedule was developed assuming a loaded car weighing 68 tons accelerating at an average rate of 1.6 m.p.h.p.s. and braking at an average of 2.0 m.p.h.p.s., and train curves were drawn for an average run using characteristic curves of standard motors of various sizes. The results of these calculations fixed the motor requirements at approximately 400 hp. per car, and because of the obvious advantages of large motors it was decided to use two motors only on each car. Having determined the proper motor size, continuous train curves for northbound and southbound local and express trains were then drawn, assuming an average potential of 575 volts at the cars. Studies of various numbers and locations of substations were made from the power requirements as shown by these curves.

Past experience with a four-track subway rapid transit line, similar to the Broad Street subway, indicated that



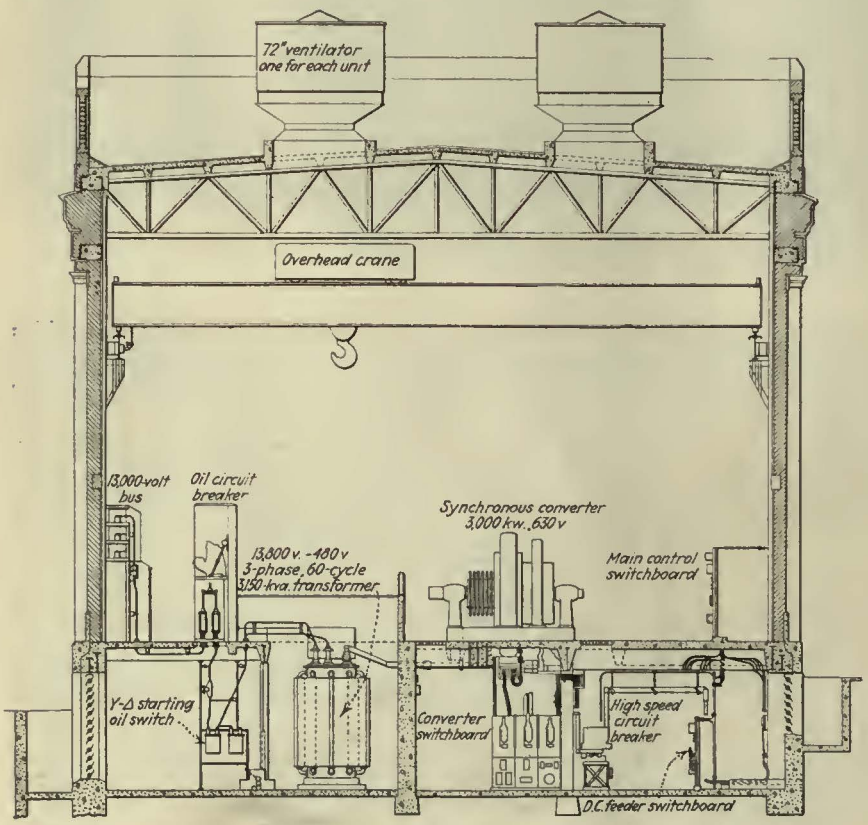
Typical layout of contact rails at a station, and how they are fed by the substation cables

the feeder capacities and voltage drops during peak loads are within satisfactory limits when substations are spaced about two miles apart. The results of the power requirement studies for the Broad Street subway agreed with this experience. Considering the first section of the Broad Street subway with a branch on Ridge Avenue, it appeared logical to locate a substation near this junction and the Mount Vernon Street site was chosen. This substation carries the load of two-track initial operation from City Hall, a distance of approximately 4,400 ft., south, to the first sectionalizing joint, about a mile north of the substation. By the time traffic requires four-track operation through City Hall, the subway will be extended to South Street and another substation will be located in that vicinity.

The next substation to the north is located on Cumberland Street, approximately 10,000 ft. from Mount Vernon Street, or approximately 10,600 ft. between substations. The most northerly substation is on Louden Street, approximately 13,000 ft. from Cumberland, or approximately 13,600 ft. between substations. This station feeds the north section of the subway and also supplies the Fern Rock yard. The method used in calculating the loads on the substations made it possible to determine not only the load on each substation during the maximum hour, but also the peak loads on each track during any five-second period, either assuming all trains to be exactly on schedule or assuming certain trains to be late. Various "off schedule" combinations were tried, but it was decided to assume all trains exactly on schedule, and also that the peaks occurred simultaneously on all tracks, the improbability of the occurrence of the latter condition giving sufficient margin over the calculated load to care for the possible higher peaks within the five-second period. The substation loads, as calculated by the above method, were as follows:

	Maximum Hourly Load, Kw.	Momentary Peak Load, Kw.
Mount Vernon	9,700	21,600
Cumberland	9,500	21,700
Louden	9,500	20,500

Since the momentary peak loads are more than twice the maximum hour loads, and since the two-hour rating of synchronous converters is generally 150 per cent of the continuous rating, it is evident that the requirements called for converters having at least a five-second

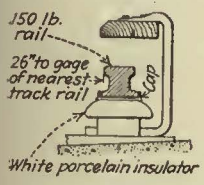


Substation cross-section, showing the arrangement of the synchronous converters, transformers and other electrical equipment

rating of 300 per cent of their continuous capacity. The converters installed have a continuous rating of 3,000 kw. with 150 per cent capacity for two hours, and 300 per cent for three minutes. The number of converters to be installed in each substation for the ultimate capacity of the subway will be four. This includes one spare in each station. For the initial two-track operation two converters have been installed in each substation. These will easily take care of the estimated loads for the year 1930, when the schedule has been assumed as six-car trains operating on a two-minute headway.

All Power Purchased

Power for the operation of the Broad Street subway is purchased from the Philadelphia Electric Company at 13,200 volts, three phase, 60 cycles. To minimize the danger of a complete shutdown of the subway due to loss of power, each substation is supplied directly from a different generating station and, since any two substations are sufficient to enable trains to continue in operation at reduced speed, the chances of a complete shutdown from this cause are extremely remote.

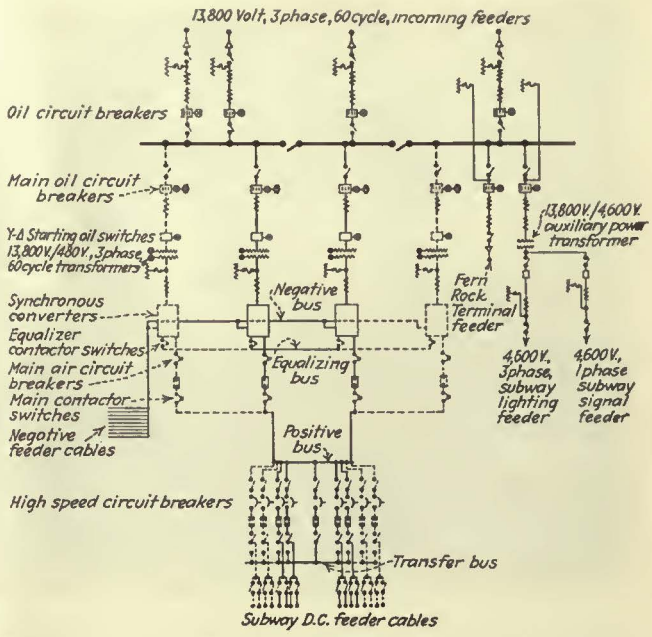


Cross-section of the 150-lb. over-running type of contact rail and the horizontal protecting board

The Louden substation is fed from the Richmond generating station; the Cumberland substation from the Hunting Park substation of the Philadelphia Electric Company, which is now supplied from Conowingo; and the Mount Vernon substation from the Delaware generating station. The power cables, both incoming and outgoing, are all in underground conduit, and the alternating current is, in every instance, carried over duplicate three-phase cables, either one of which is capable of carrying the normal two-track load.

On account of the location of the substations in residential districts, their architecture was given special attention. Noise is minimized by making the buildings entirely closed, except for the cold air louvers, and providing air spaces in the walls.

In the arrangement of the equipment in the substations, safety and ease of operation were sought, and, consequently, all power circuits were located below the level of the main floor. Each incoming alternating-current feeder is carried directly to disconnecting switches, then through an oil circuit breaker to other disconnecting switches, and then to the 13,200-volt alternating-current bus. Each converter transformer is fed from this bus through disconnecting switches, a main oil circuit breaker and star-delta starting switches. Copper bars from the transformer secondaries lead directly to the alternating-current ends of the synchronous converters. At the direct-current end of the converters, the negative is tied solid to the negative bus. The positive and equalizer connections are carried through circuit breakers or contactors on the converter switchboard, which is in the basement below, thence to their respective buses located adjacent to this switchboard. From the positive bus the contact rail feeder circuits are carried through high speed circuit breakers, then through disconnecting switch panels to the feeder cables which leave the building on the side opposite to the incoming alternating-current cables. All control and switching equipment was supplied by the General Electric Company, with the exception of the main direct-current circuit breakers, which were built by the I. T. E. Circuit Breaker Company.



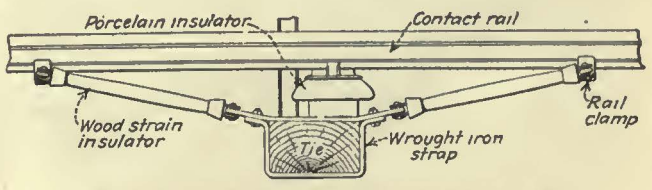
Wiring diagram for one of the stations. The solid lines show the present installation, while the broken lines represent equipment to be added later

The converters, built by the Allis-Chalmers Manufacturing Company, are compound-wound, 60-cycle, interpole machines and are the largest of this type ever built. These converters are started by star-delta switching of the high-tension windings of the transformers. All switching and starting operations are so interlocked as to make improper sequence impossible. In addition to their size, they have another unusual feature in the armature windings. These windings are of the so-called "frog-leg" type, which consists of a combination of lap and wave windings, thus eliminating the necessity for cross connections. The transformers supplying the converters are rated at 3,150 kva. at 13,800 volts and are three-phase, 60-cycle oil-cooled, the latter feature being a departure from the usual practice of using air-cooled transformers in similar installations. They were furnished by Allis-Chalmers Manufacturing Co.

Another unusual feature is the remote control of all switches in the power circuits. The operators do not handle any switches carrying train power current, as these switches are all located in the basement and controlled from the switchboard on the main floor.

Power Distribution Through Underground Conduits

Power is carried from the three substations to the subway in underground conduits. For initial two-track operation there are eight 2,000,000-circ.mil cables on the positive side and six 2,000,000-circ.mil cables on the negative side of the circuit from each substation. For the ultimate four-track operation the number of these cables will be doubled. When the subway structure was built, provision was made for these duplicate underground con-



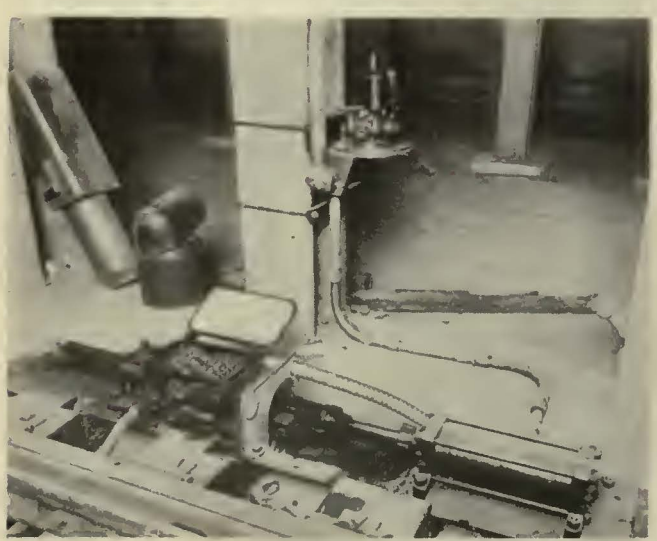
The contact rails are anchored in 1,000-ft. sections with this type of anchor

Interlocking machine at yard portal for switches on the main track. Note the control panel at each end for controlling yard switches, the track model showing the main track layout and framed charts on each end showing the respective yard layouts

duit lines with manholes communicating with the inside of the subway. Each section of this duplicate system is entirely isolated from the other, and for important services like lighting and signals, duplicate feeder cables have been installed. Paper-insulated, lead sheath protected cables, thoroughly fireproofed in the manholes, are used for all of the underground circuits. In the 6½ miles of subway, there are thirteen kinds of cable with an aggregate length of approximately 75 miles.

Switching rooms are provided in Broad Street at the streets on which the substations are located, and the positive cables from the substations are tied in with the contact rail through remote controlled circuit breakers located in these rooms in the subway retaining walls.

From the switching rooms two 2,000,000-circ.mil cables are run to each contact rail section. The contact rail is of the over-running type, in 39-ft. lengths, weighs 150 lb. per yard, is of special section and is made of soft steel composition having high conductivity, the ratio of steel to copper being 7 to 1. No cable feeders parallel



Switch operating mechanisms are of the electro-pneumatic type with electrically-operated cut-off valves

to rails are used in either positive or negative circuits. The rail is carried on Ohio Brass white porcelain insulators mounted on long ties located at 9-ft. 9½-in. intervals and anchored in approximately 1,000-ft. sections, with expansion joints separating the sections. White glaze was adopted as an aid in checking foreign deposits on the insulators, which are a common cause of leaks. It was thought that this glaze would encourage maintainers to keep the insulators clean. The bonding of the contact rail is accomplished by bolting on two O-B solid copper fish-plates at each joint and by welding adjoining rail heads. The copper fish-plates are then soldered to the webs of the adjoining rails.

The return circuit in the subway is through 62-ft., 100-lb. running rails. Each joint is bonded with two Ohio Brass 250,000-circ.mil. gas-welded bonds, 13½ in. long. Due to the short lengths of the running and contact rail bonds and the high electrical efficiency of the welded and soldered connections to the rails, the conductivity of the entire circuit approximates that of continuous rail, thereby reducing to a minimum the voltage drop. The tracks are cross-bonded at each passenger station, and at the yard portals. In normal operation all sectionalizing and equalizing switches will be kept closed, thus tying the three substations solidly together through the contact rails. Sectionalizing switches are located at substation feed-ins, while equalizing switching points are midway between substations, at the portal and at City Hall. The breakers located at feed-in points are automatic opening, remote control closing, 3,000-amp. rating. Thus they will open on an overload or short circuit, but cannot be closed except by a substation operator.

Signal System of Latest Design

Electrical energy for the operation of the signal system is supplied from the Mount Vernon and Louden substations. The supply from the Louden Street substation may be considered an emergency source of energy. Normally the energy is taken from one set of feeders, but duplicate distribution cables are installed on either side of the subway structure and may be sectionalized at each substation. Sectionalizing switches are provided at each 4,600/110 volt distribution transformer location along the line and 110-volt automatic selector switches are installed so that, in event of failure of a feeder or local transformer, the signal load for that section will be automatically thrown over to the duplicate service and automatically restored to the original source when that line is again energized. The signal power requirements for the ultimate four-track installation total about 65 kva.

Studies were made of roadway, signal equipment and train-operating characteristics, so that signals might be located to provide maximum train capacity of tracks. These elements included profile and alignment of roadway, location of stations and interlocking plants, acceleration and braking rates, speed-time and time-distance curves, and the normal and maximum attainable speeds for each run for the equipment to be

operated, as well as the visibility of the signals and the simplicity of the scheme of aspects displayed by them.

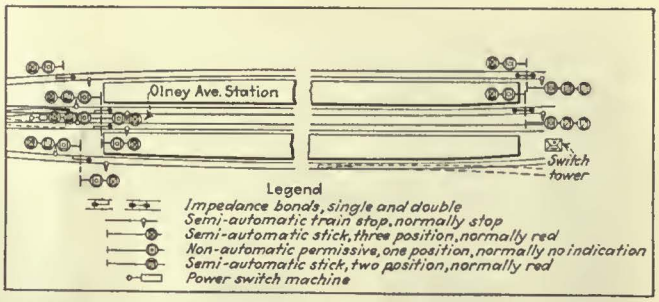
The signal locations or block spacings are laid out for eight-car trains operating on a two-minute headway, although the majority of spacings allow for somewhat less than 1½-minute headway, thus providing for a normal single-track capacity of approximately 23 eight-car trains on the line, operating at a round trip scheduled speed of 16½ m.p.h. In every instance the length of a block is 150 per cent of the emergency braking distance required by the train, at the maximum speed which can be obtained at that point.

Types of Signals and Track Equipment Installed

The automatic signals are from the Union Switch & Signal Company, and are the three-indication, color-light type, equipped with 5⅜-in. lenses of green yellow and red, and 14-volt, 5-watt lamps in duplicate. Home signals at interlocking plants are of the two and three-indication subway style, color-light type, with the same lens and lamp equipment, and displaying two or three lights in a vertical row to indicate which route is set up, and whether or not the track ahead is occupied. In all cases the caution control of a signal is carried in the two blocks in advance, so as to obtain "overlap control," providing for two red signals protecting the rear of a train at all times. A double-arm, interlocking signal, with a yellow permissive signal is used in locations where operation is in both directions.

Speed control signals have been placed on the southbound track south of Olney Avenue, where a long 3-per cent down grade is encountered, on the southbound track leading off the upper deck at Erie Avenue to take care of a 3½-per cent grade, and at several other locations where curves make automatic speed control desirable.

Automatic and semi-automatic train stops have been installed to operate in connection with every automatic block signal and with interlocking home signals. The stops are of the trip type and are located on the left side of the track approximately opposite the signal with which it operates. A trip arm extends 2½ in. above the top of the running rail when in the engaging position, which is when the signal is displaying its most restrictive aspect. When in this position the trip arm will engage a trip cock located on the main air line on the cars, thus causing an emergency application of the brakes of the train which passes the stop. A push-button switch within reach of the motorman's cab is provided at each automatic stop, which is used to clear the trip arm when it is necessary for a train to pass a stop signal.



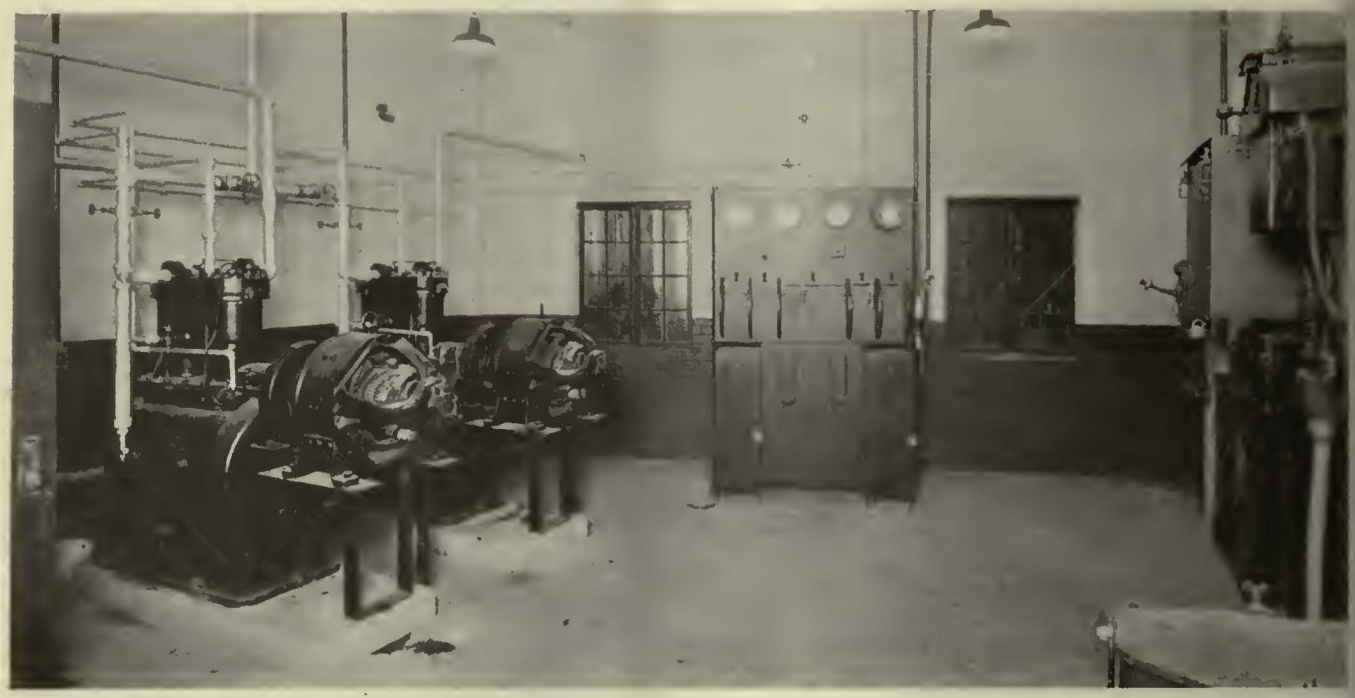
Layout of signals, train stops, power switch machines and other controlling equipment at a typical station

The automatic stop is of the electro-pneumatic type, controlled by an electrically-operated valve. Its operation is positive and in event of failure of electric or pneumatic power the trip arm assumes the engaging position, thus making the signal system safe.

All track circuits are a full block long except where cut sections are required and within interlocking plant limits. Alternating current is supplied at one end of each track circuit, the limits of which are established by insulated joints in the rails, by a 14-volt air-cooled transformer equipped with taps to permit fine voltage adjustment. The track relay is of the two-element, two-position vane type. Track connections are made through parkway type cables buried in the concrete with leads connected to the rail lugs of impedance bonds or the rail.

On double-rail track circuit sections of the system, impedance bonds with an iron core are provided to carry the propulsion current around the insulated rail joints. These bonds have a continuous carrying capacity per rail of 750 amp., 2,000 amp. for ten minutes, or 5,000 amp. for one minute. To avoid the use of a large number of impedance bonds on short track circuits at the large interlocking plants and in the terminal yard,

South portal at the terminal yard, showing the types of signals governing momevents into the subway proper



One of the six compressor rooms located on the system. This view shows the automatic transfer panel, the oil switches, transformers, control board for compressors, the governors immediately below the switches, the automatic starters at each end of the control board and the compressor piping

only one rail is used for the propulsion current and the other is bonded and insulated for the signal track circuit.

Signal control apparatus is housed in cast-iron boxes of 2, 4, 6, or 12-relay capacity located in the vicinity of the signal, controlled and connected to it by conductor cable in galvanized conduit. Signal control cables are run in a three-way duct bench on both sides of the subway.

The switch operating mechanisms are the Union Switch & Signal Company electro-pneumatic type with electrically-operated cut-off valves. Their operation is positive and a movement from normal to reverse can be made in 1½ seconds with air pressure as low as 75 per cent of normal. A means of operating them by hand is provided for emergency.

Compressor plants are located at Fairmount Avenue, Erie Avenue, Olney Avenue, and the terminal yard portal, each having a capacity of 75 cu.ft. of air per minute, excepting the one at the yard, which has a capacity of 100 cu.ft. per minute. All of these compressors are in duplicate and are driven by direct-current series-wound motors designed to operate from the 630-volt contact rail circuit. Each plant is equipped with condensers, main reservoir, and switch panel containing a watthour meter, ammeter, volmeter, air-pressure gage and various switches.

A 2-in. galvanized extra heavy wrought iron pipe is used for the main air line in the subway and yard. Suitable bends for expansion, auxiliary reservoirs for drainage, ¾-in. taps for switches at interlockings, etc., ½-in. taps for automatic train stops, and service taps for track repairs are included.

Six Interlocking Stations

The interlocking plants are located at six points on the system: at the City Hall, Spring Garden, Girard, Erie and Olney stations, and at the yard portal. The plants are pneumatically operated and electrically controlled. The power interlocking machines, built by the Union Switch & Signal Company, range in size from 7 to 75 levers. All of the machines, with the exception of that at City Hall which is temporary, have been provided with sufficient spare space for ultimate four-track operation. The levers are equipped with circuit controllers, indication magnets, electric locks, mechanical locking, and lever lights. The interlocking machine is inclosed in a metal case having separate removable panels for each section.

The position of trains is indicated to the tower man on a track model board, located above the machine, by means of spot lights marking the sections of track within the plant limits and adjacent thereto. A steel relay cabinet with glass-paneled doors is provided in each interlocking station for the purpose of housing such relays, transformers, etc., as may be required for each interlocking plant.

Mechanical locking is used in the interlocking machines, the levers operating in a predetermined order so as to prevent the setting up of conflicting routes or the clearing of opposing signals, and the switches are locked electrically by the presence of a train upon a given track circuit. The electro-pneumatic interlocking is so arranged that with normal operation it is not possible for the operator to set up routes and signals which will permit trains to come together.

In the terminal yard the track switches are electro-pneumatically operated and controlled from a tower in the yard entrance building. The switch mechanisms are not interlocked and depend upon air pressure to keep them in position. They are positive in operation and very rapid in movement, only one second being required for a movement from normal to reverse, or vice-versa. The control panel is equipped with spotlight indicators above each lever. Electrically lighted switch signals are provided to indicate the position of the switch and are controlled by a circuit controller which operates with the switch points. The wiring for the various controls is carried throughout the yard in treated trunking, supported every 7 ft. on concrete piers which also carry the 2-in. main air line.

Loud speaking stationary post telephones are located at

Three tiers of tower relay cabinets installed at the Olney station interlocking plant

each switch in the yard so that direct communication can be obtained between the motorman and the tower operator for the rapid movement and dispatching of trains.

Telephone and Fire Alarm Systems

Two telephone systems are installed in the subway, one for general purposes and another for operating the road. The general system consists of a 50-pair and a 110-pair telephone cable extending the length of the subway and terminating in a machine switching board at the administration building. The telephones in the cashier's booths at the stations, those in the shops and some of the telephones located on station platforms are connected to the general system.

The operating system consists of a 50-pair cable running the full length of the subway and terminating at a manually operated switchboard in the administration building. These telephones are located on station platforms, in interlocking towers, emergency exits, shop offices and in the dispatcher's office at the administration building. This system is used by the dispatchers for conveying the necessary information for operating the road.

The fire alarm cable forms a loop extending the full length of the subway and is tapped at all station areas. At each station there is a master box which is operated from any one of several auxiliary boxes in that area. Operation of the master box sounds the alarm by direct connection to the electrical bureau in City Hall. At the same time this information is relayed from the electrical bureau back to the administration building by another line in the fire alarm cable. In addition to these lines the fire alarm cable contains a direct line from the dispatcher's office in the administration building to the electrical bureau. Fire alarm boxes are installed at all emergency exits as well as at the stations.

Advertising Public Transportation

MANY electric railways in Massachusetts for some time past have been carrying on persistent campaigns looking toward increased patronage. The Worcester Consolidated Street Railway has completed an unusually successful year of advertising in the newspapers in its territory. Moreover, its publicity department provided news and the papers responded with editorials which, whether commendatory or not, attracted the attention of the public to riding—swiftly, cheaply and safely. The Eastern Massachusetts Street Railway has been running advertisements that are attractive, catchy and substantial. One of these reads: "This is the man from our town who is so wondrous wise; he rides electric cars to and from business. Thus—to work on time;—home on time; no hot words from the boss; no cold meals from the wife; a carefree, happy, thrifty life is his."

One company, the Massachusetts Northeastern Street Railway, specializes in advertisements mainly for its amusement park at Canobie Lake, N. H. The Fitchburg & Leominster Street Railway, which emerged from its second year of reorganization under its own resources on Jan. 1, has taken up the advertising program and has just finished its first year. Any change in running time or routes of electric cars is advertised before, during and after the change. The company sends its messages through the vicinity papers, through its Whalom Park Theater, through the amusement park at Whalom, and by means of other good-will advertising.

Many of the companies have made effective use of the advertising suggestions furnished to them by the American Electric Railway Association.

Transferable Pass in Vienna

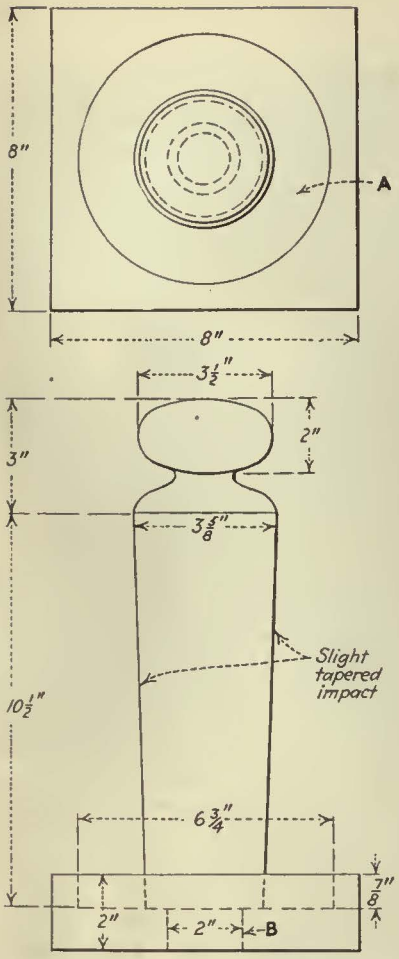
Vienna four-day system pass developed for tourists

LIKE other European systems, the Vienna Municipal Tramways has a wide variety of fares, including passes. Hitherto these passes have been issued only with the picture of the purchaser and have been non-transferable. Last year, however, the management added a four-day, transferable pass which proved of particular value to visitors to the Schubert centenary. It proved so popular with the visitors that about 28,000 were sold during July, while ordinary sales run in hundreds each month.

The pass is good for four days and was sold at the low cost of 5 schillings (70 cents). This is the equivalent of eighteen standard fares (28 groschen or 3.92 cents). Buyers average about 30 trips per pass. This includes rides that would be considered "transfers" under American flat-fare systems. While Vienna is largely on a flat-fare basis, the management uses fare receipts which also serve as transfers.

With wider publicity, the four-day pass may prove popular with tourists because it insures them against the cost of mistakes in taking the wrong car.

Maintenance Helps That Have Proved



Babbitting mold with self-aligning feature

Self-Aligning Armature Bearing Babbitt Mold

PRODUCTION has been increased and costs reduced in the shops of the Staten Island Rapid Transit Railway, Staten Island, N. Y., by the use of the self-aligning armature bearing babbitt mold shown in the accompanying illustration. The mold consists of a steel base 8 in. square and 2 in. thick. It is counterbored ⅞ in. deep and of such a diameter as to fit the bearing flange exactly. A hole is bored through the center of this counterbore of a diameter to permit the entrance of the core projection.

The core is made of steel and is 14⅝ in. over all. The 1⅛-in. projection is of a diameter to enter the hole in the base. The core has a diameter of 3⅝ in., 3 in. from the top. The sides are machined with a small taper for a distance of 10½ in. This taper permits easy removal from the bearing after the babbitt has been poured. The top has a semi-ball handle with a diameter of 3½ in. and is 2 in. high. The close fits prevent any lateral motion of the bearing or core. The bearing is placed in the mold with the flange in the counterbore of the base; then the core is placed inside with its projection in the bore. A galvanized iron plate designed to fit the bearing window accurately is equipped with two semicircular springs for snapping over the bearing. With the window closed, no further work is required and the bearing is ready for the babbitt.

Adjustable Armature Winding Stand*

By R. T. Chiles

Master Mechanic Cumberland County Power & Light Company, Portland, Me.

RAILWAYS that have armatures of different sizes find an adjustable winding stand to be a great convenience. Such a stand has been constructed in the shop of the Cumberland County Power & Light Company to accommodate armatures from the smallest air compressor type to the largest railway motor type used on the system. Two supporting brackets are fastened to a small work bench in such a manner that they can be moved back and forth quickly. The stand is equipped with casters so that it can be moved easily to any desired position in the winding room. Armatures are carried on their centers, with cone-pointed screws, which work through the end supports.

Axle Tongs Solve Lifting Problem*

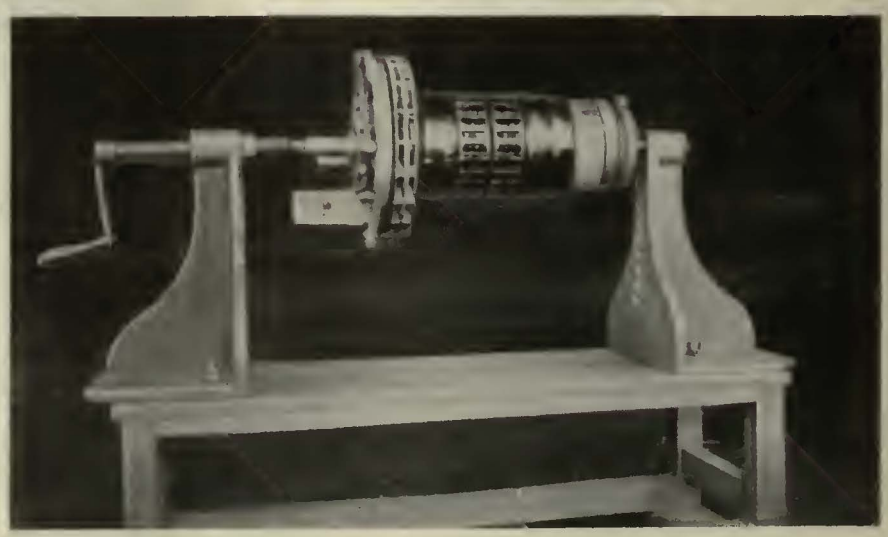
By Charles Herms

General Foreman San Diego Electric Railway, San Diego, Cal.

VARIOUS methods for lifting axles have been tried in the shops of the San Diego Electric Railway. Chains, hooks and rope slings were found unsatisfactory, inefficient and dangerous. The chain had a tendency to slip if the work was not balanced accurately, and required additional time of workmen to make certain that the work was balanced. Hooks had the same tendencies as the chains with the additional danger of losing the work altogether in case of a slip. Rope slings also required balancing of the work and had to be renewed at frequent intervals to safeguard them against breakage.

The problem has been solved quite effectively through the use of a special type of tongs. These are constructed so that they receive the largest diameter axle used, although on this system axles are of quite uniform diameter. The jaws are made long enough, so that should the axle be slightly less in diameter than the

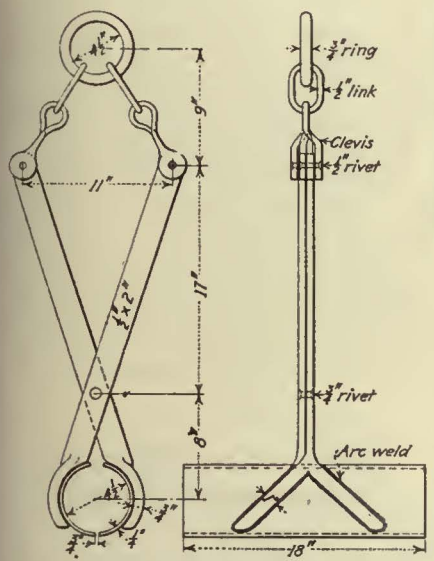
**Submitted in* Electric Railway Journal *Prize Contest.*



Armature winding stand as used in the shops of the Cumberland County Power & Light Company

maximum for which the tongs have been designed, it will remain balanced, due to the length of the jaws and the side clamping effect. Clearance of ¾ in. is provided at the bottom of the jaws, so that the tongs can be placed several inches out of balance and still maintain equilibrium, and there is no possibility of slippage, due to the enormous leverage ratio provided.

Each arm of the tongs has a swivel clevis at the top and these are connected to a ring through links. The circular portion which surrounds the axle is 18 in. long.



Type of axle tongs used in the shops of the San Diego Electric Railway

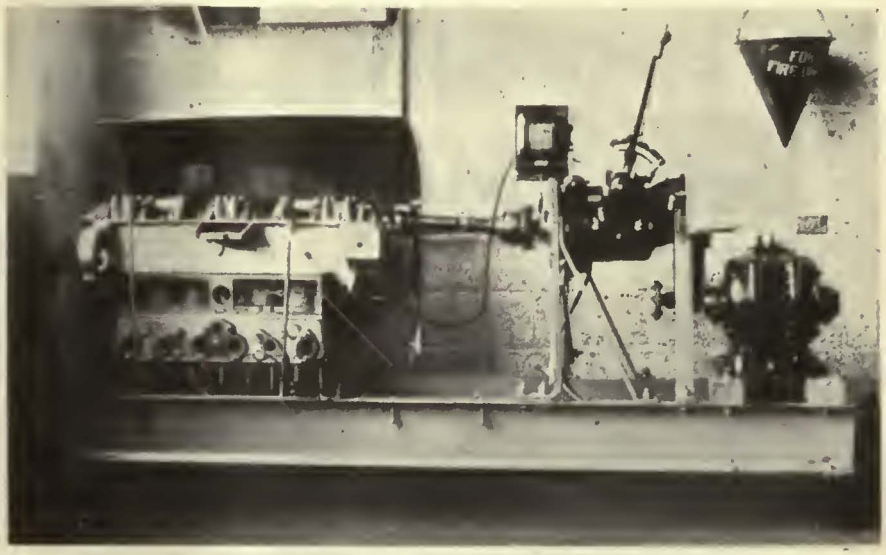
Limbering Up Bus Engines*

By C. B. Hall
Chief Clerk Mechanical Department Virginia Electric & Power Company, Norfolk, Va.

FOR burnishing and limbering up main and connecting rod bearings in assembled bus motors and air compressors, following general overhauling work of those units in the bus shops, the Virginia Electric & Power Company, Norfolk, Va,, has built a convenient machine. A four-speed transmission was taken from a retired model 15 White bus and geared to a 5-hp. 220-volt alternating-current motor, which had previously been used in operating a ticket cutting machine in the cashier's office. These units, with a gear ratio of 7 to 1, were mounted and bolted to a frame made of 8-in. channel iron and 1x2-in. iron straps. An I-beam was cut to serve as blocks necessary to give the variation in height for accommodating different types of motor blocks.

A starter box was placed on top of the frame and a piece of No. 20 gage sheet iron was made into a hood to protect the shop walls and windows from flying oil and grease when the machine was in operation. The labor cost for the completed machine was $25. It has enabled the bus shop to do this kind of maintenance work in a most satisfactory manner.

Submitted in Electric Railway Journal Prize Contest.



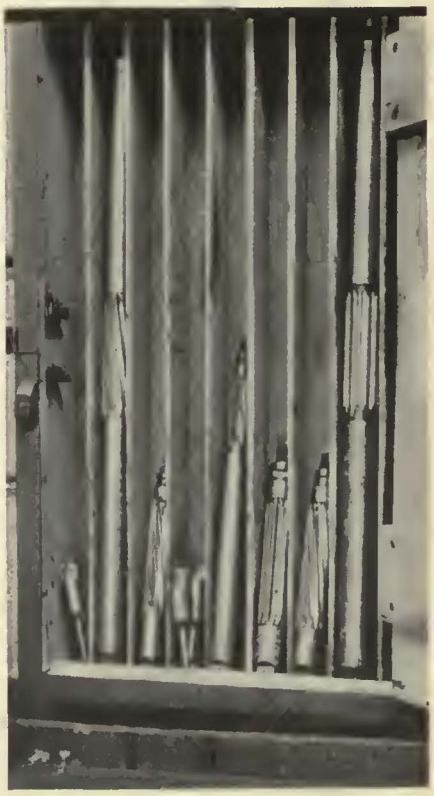
Tuning up a model 53 White bus motor with the burnishing machine made in the shop of the Virginia Electric & Power Company

Air Compressor Bearings Reamed

AIR compressor bearings formerly were fitted by the scraping and filing method in the shop of the Richmond Railways, Staten Island, N. Y., until it was found that compressor maintenance expense was increasing because the bearings were fitted improperly. Often shaft distortion also caused considerable trouble. This resulted in serious road delays. A complete set of Pratt & Whitney reamers was purchased for reaming all bearings and wristpin bushings to a standard size in order to overcome this trouble.

The crankshaft bearings are now reamed to the exact size and are not provided with any adjustment. The connecting rod bearings are provided with seven 0.017-in. shims on either side and reamed to fit the shaft under those conditions. The general appearance of the reamers is shown in the accompanying illustration. The reamers are stored under lock and key in a special cabinet 24 in. wide, 41 in. high and 6 in. deep.

Since this method of fitting bearings has been adopted the usual bearing troubles have been eliminated. This has resulted in lowered maintenance costs, and the saving effected in fitting the bearings very soon paid for the cost of reamers.



Wooden cabinet for storing reamers in shop of Richmond Railways

New Equipment for

Better Maintenance

Test Bench for Bus Equipment

EQUIPPED for testing all electrical apparatus of buses, a heavy-duty test bench is now being manufactured by the Burton & Rogers Manufacturing Company, Boston, Mass. This bench has a 3½-hp. variable speed main driving motor, an adjustable vise for holding all types of bus generators, a rotary spark

Heavy-duty test bench for bus electrical equipment

gap, a magneto testing fixture, a growler, a voltage regulator testing bracket, a tool for turning and undercutting commutators, a coil testing bracket, attachment for making starter torque tests, a control panel and an instrument panel on which are mounted a voltmeter, ammeter, and electrical tachometer, switches and an adjustable spark gap.

The main driving motor is of the reversible brush shifting type and has a speed range of from 100 to 4,000 r.p.m. It has sufficient power for a complete driving test over all speed ranges for any type of bus generator up to 1,000 watts. The generator under test is held in the vise directly in line with the driving motor and attachments are provided for the straight line drive of any type.

The voltage regulator bracket will mount all types of regulators. It is so constructed that the voltage regulator can be held in a horizontal position when it is necessary to make adjustments and turned quickly to the vertical position for testing without disconnecting any leads. The vise for holding magnetos is provided with speed adjusting pulleys and twelve built-in, high tension leads. The magnetos under test can be driven at any desired speed down to 20 r.p.m.

A coil testing bracket is furnished, equipped with an attachment for testing magneto armatures. A set of breaker points is built in for duplicating car operating conditions when making coil tests. A condenser is also built in this same circuit and can be used or not at the option of the operator according to the style of coil to be tested. Separate condenser tests are provided for by substitution of outside condensers for the panel condenser. A resistance is also furnished in the coil circuit to control battery voltage while coils are being tested.

Leads for all tests except the high tension leads are terminated in the terminal panel which is constructed in the front of the bench just under the holding vise. By this construction, possibility of leads being tangled up in moving parts is eliminated, and simplicity and convenience of operation is obtained.. On the terminal panel there are positive and negative starter test leads through an 800-amp. shunt to the ammeter; positive and negative battery leads through a 40-amp. shunt to ammeter; positive and negative voltmeter leads direct to the voltmeter; positive and negative 80-amp. leads through an adjustable rheostat to ammeter; switch controlling battery current and switch for cutting in or out the condenser. The starter and carbon resistance leads are of screw type, while on the others lighter "rajah" connectors are used. On this terminal or control panel are also located the control knobs for coil and generator rheostats and the control for adjusting the speed of the driving motor.

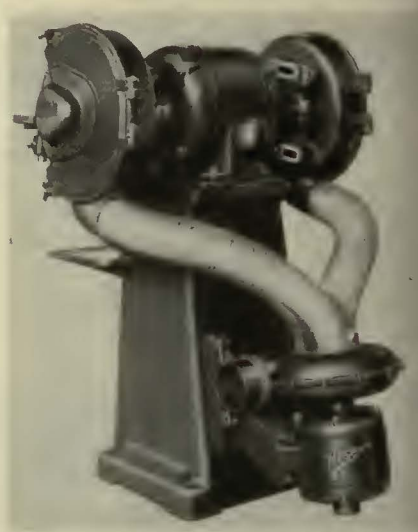
A 9-in. rotary spark gap is furnished for making operating tests on distributors. This gap has an adjustable setting for its zero. It is also equipped with an additional scale over one quarter the circumference that reads twice the distributor degrees. The bench is also equipped with a distributor holding attachment.

The armature reconditioning tool driven from the main driving motor will handle all types of armatures and can be used for turning down the commutator and undercutting the mica. A scroll chuck and steadyrest are supplied for handling centerless armatures. A torque arm and spring balance are used for testing starting motors, the current for this operation being supplied from the battery.

The growler has a double winding, is equipped with test prods, a meter for recording the flow of current in the windings of the armature and a double pole, double throw switch. The double winding makes it possible to test starting motor armatures as well as generator armatures.

Exhauster for Grinders, Buffers and Polishing

TO PROVIDE for efficient removal of dust from grinding, buffing and polishing operations, the Hisey-Wolf Machine Company, Cincinnati, Ohio, has announced an exhauster equipment which can be supplied for this company's machines. It is designed for grinders of 10-in., 12-in. and 14-in. wheel capacity and for buffing and polishing machines of 8-in., 10-in., 12-in. and 14-in. wheel capacity. The exhauster equipment is motor driven and the same automatic starter that provides for operating the tool controls the exhauster motor.



Grinder equipped with exhaust attachment

News *of the* Industry

Fare Discussed in Milwaukee

Company would like to see rate structure adopted that would give promise of making railway self sustaining

AS THE result of a request made by Mayor Hoan, of Milwaukee, Wis., that the Milwaukee Electric Railway & Light Company extend its single-fare area to apply on all railway travel within the city limits, particularly the former city of North Milwaukee, recently annexed, a hearing was held before the Wisconsin Railroad Commission on Feb. 25 at which the company asked the commission to fix boundaries of a single-fare area, and fix rates which would put the city and suburban transportation system on a self-supporting basis.

The company stated that the investment in the railway has increased from $16,694,409 in 1920 to $28,263,980 in 1928. The deficit below the amount necessary for 7½ per cent return on the investment was stated to be $529,369 in 1920, $552,651 in 1921, $343,838 in 1922, $295,865 in 1923, $521,908 in 1924, $536,340 in 1925, $585,666 in 1926, $835,817 in 1927 and $691,089 in 1928.

Actual rate of return on the railway through the same period, the petition stated, ranged from 4.32 per cent in 1920 and 1927, the two lowest years, to 6.09 per cent in 1923, the highest year. In 1928 the rate of return was 5.05 per cent.

The deficit has been made up from electric department revenues. The company promises that, if standards of service and rates of fare to be prescribed are calculated to yield an increased return upon its railway and bus service, it will reduce electric rates by an amount not less than the estimated increase in railway revenues.

William A. Jackson, vice-president of the company, testified that under present rates regular riders are discriminated against, that the occasional rider should pay an increased fare, and that regular riders should pay the minimum rate possible. Statistics were submitted showing that, due to inclement weather in January of this year, from 50,000 to 70,000 more casual riders were carried on certain days than in the similar month last year.

The company holds the zone system of fares to be the most fair and equitable. If the demand for an extension of the single-fare limits to include former North Milwaukee was granted, this would eliminate the zone fares on that line, approximately $30,000 a year.

R. E. Moody, research engineer of the company, said that Detroit is one of the very few large cities having a lower cash fare than Milwaukee, its rate being 6 cents without a transfer, 7 cents with transfer. Milwaukee has a 7-cent cash fare with transfer, and eight tokens for 50 cents.

All suburbs, towns and townships surrounding Milwaukee and served by the company were represented at the hearing, which was adjourned to permit the legal representatives of the city and suburbs to study the figures presented. At the request of the commission, the company will present its recommendation for a method of putting into effect an increase of fares so designed and arranged that it will fall principally upon the occasional rider.

Bus Considered by Steam Railroads

Motor transport divisions to meet again in fall at call of general committee. Logical demand seen for bus and motor truck auxiliaries

MORE than 100 representatives from 80 railroads attended a four-day conference of the motor transport division of the American Railway Association at the Hotel Jefferson, St. Louis, Mo., February 26, 27, 28 and March 1. Until the final day the sessions were all executive, and the reporters for the daily and trade press were excluded with the exception of a special writer for one railway publication.

The gathering on March 1 was in the nature of a joint conference for all interested in automotive transportation. Its purpose was to discuss matters of mutual interest.

The program for this joint conference was as follows:

1. Depreciation of motor coach equipment.
2. Heavy fuels versus gasoline as fuel.
3. Rail cars versus motor coaches on feeder lines.
4. American Electric Railway Association classification of motor coach accounts.
5. Uniform cost-accounting for the railroad company; for the electric railway; and for the motor coach operator.
6. Method of classifying operations—for example, city, intercity and the like—so that cost comparisons will be useful in each class.
7. Rates of fare necessary for profitable operation.
8. How the motor truck and the motor coach help to meet competition.
9. The motor truck in modern business.
10. Highways to reach distant markets.

A. P. Russell, chairman of the motor transport division, presided at the executive sessions and he also read the report of the general committee of which he was the chairman.

The consensus of the railroad men attending the conference was that the American railroads are the logical agency to develop the motor transport field because they are charged with the responsibility of maintaining stability of the nation's transport. Speakers in the executive gatherings contended that this ideal cannot be attained unless the railroads are protected against the independent agencies which are alleged to milk the revenues of the steam railroads.

Some of the discussions in the executive sessions are understood to have been rather frank and it was apparent some of the railroads now realize they probably waited too long to enter the motor transportation field, permitting independent lines to build up close to their rails, so that it will be very difficult to combat this competition. Virtually all of the important railroads of the country were represented. Some have not yet entered the bus field and their representatives came to the gathering to get the inside facts from railroad men who have had experience with bus operations.

While a majority of those who spoke on the subject maintained that rail transportation still is and will continue to be the backbone of our national transportation scheme, they were ready to admit there is a logical demand for buses and motor truck lines and a legitimate field in which they can be operated successfully. That the railroads should supply the public's demand for automotive transportation agencies because of preferential right and considerations of public welfare was discussed.

It was also contended that federal regulation of buses would prove beneficial to the general public as it should weed out the undesirable and irresponsible operators and eliminate the present evasion of state control in many sections of the country.

It was brought out in the discussions that the competing bus lines have eaten heavily into revenues logically belonging to the railroads, in most instances taking the cream of the passenger business. It was contended that the buses can never supplant the railroads but, unless properly controlled, may injure the national transportation system by forcing some railroads into bankruptcy. The only way to solve this very serious problem is to direct bus development along proper lines with the consideration in mind of not impairing railroad prosperity. The Interstate Commerce Commission with its voluminous records and its vast

knowledge of transportation needs would be an ideal agency to handle the entire bus situation, it was said. Chairman Russell is quoted:

One reason that railroads more logically and more serviceably can develop the bus field is that sometimes they can combine bus and rail transportation in such a way as to turn a loss in rail transportation into a profit in bus operation, while independent bus operators could not do so. Another very important reason is that reliability of service is the first consideration of the railroads.

A surprising fact brought out in the discussions of the subject was that the bus lines of the country now cover more aggregate mileage than the railroads. The total in 1928 was 270,000 miles covered by 86,000 buses or 13,000 more miles than the railroads now serve. However, it was said the railroad systems are more comprehensive, serving vast areas not penetrated by the bus lines. The bus lines are generally confined to the relatively congested metropolitan areas, not attempting a comprehensive national system except in a few isolated instances.

The general purpose of the conference was to bring together the railroads interested in the development of bus transportation, to study the problems that arise therefrom, and through the coordination of rail carriers to devise the most effective means possible in the development of combined rail and bus transportation systems.

The next meeting of the motor transport division will be held in November of this year at Toronto, if the general committee's recommendation is accepted. The by-laws of the organization were amended to provide for but two meetings annually instead of three. June and November were the months selected for these meetings, but there will be no session this June because of the sessions held in St. Louis.

A special nomination committee of seven was named to recommend candidates for the various offices. The election will be held in November. This nominating committee is composed of: M. F. Steinberger, manager of highway transportation Baltimore & Ohio Railroad; L. B. Burns, assistant to the general manager Seaboard Air Line Railway; E. Wanamaker, electrical engineer Chicago, Rock Island & Pacific Railway; G. L. Whipple, general superintendent transportation Union Pacific System; George McCormick, general superintendent motive power Southern Pacific Company; F. S. Hobbs, general manager New England Transportation Company; and E. A. Cunningham, efficiency engineer Canadian Pacific Railway.

The delegates were guests at a banquet given by the Missouri Pacific Lines at the Hotel Jefferson at 6:30 p.m. on Feb. 27. Samuel O. Dunn, Editor of *Railway Age*, Chicago, was the speaker of the evening. His subject was "Modern Transportation." On the morning of Feb. 27, E. F. Bisbee, vice-president East St. Louis Junction Railroad, was host at breakfast at the National Hotel, National Stock Yards, Ill.

Franchise Proposal Revived in Jacksonville

Definite announcement was made before the Council of Jacksonville, Fla., on Feb. 22 that a new franchise for the Jacksonville Traction Company would be submitted at an early meeting of the City Council. At the suggestion of Perry Atkins, president, the Council adopted a resolution requesting Mayor John T. Alsop, Jr., to veto the ordinance requiring the company to double-track Main Street, thereby opening the way for bus service.

Mr. Atkins made his promise that the new franchise would be submitted to the Council after J. P. Ingle, railway manager, made his proposal for the establishment of bus service to Norwood, Brentwood, Panama Park, Northshore Beach and Panama Gardens sections.

Mr. Ingle quoted figures gathered in a poll of the sections on the north side of the city on the question of preference for bus service. He said 70 per cent of the residents interviewed on Main Street favored buses, 72 per cent off Main Street in the section served by the Brentwood car line favored buses, and 95 per cent in Norwood, Panama Park and Northshore Beach desired bus service.

Mr. Atkins intimated the new franchise would leave the City Council as the body to determine the need for extentions and to say whenever and where such extensions would be needed. The company would be relieved of paving the strip occupied by tracks and extensions would be paid for from rentals to the company. He said he believed the Council would grant bus permits to the company under an agreement which would provide for adequate and continuous service.

A resolution by residents in the territory that would be affected by the extension of the railway and believed to represent public opinion in the territory was concluded as follows.

We, the citizens of North Springfield, Norwood, Panama Gardens, Panama Park, Brentwood, Pearl Court and North Shore Beach do hereby ask Mayor John T. Alsop, Jr., to veto City Council's ordinance ordering the Jacksonville Traction Company to double-track Main Street and do hereby petition City Council to reconsider its ordinance in respect to the wishes of the majority of the voters in these communities who want bus service instead of street car service, and we further ask that the City Council do authorize the Jacksonville Traction Company to remove its tracks on Main Street north of Twelfth Street, and also relieve the Jacksonville Traction Company from payment of Main Street paving charges north of Twelfth Street to enable the Jacksonville Traction Company to provide the bus service these communities want.

Paving Relief Bill Reported in Pennsylvania

The Senate committee on public roads and highways on March 5 vetoed by a scant majority to report the bill relieving electric railways in Pennsylvania from repaving the portions of streets and highways between their tracks which are torn up by municipalities. A contest among the members developed over the measure, it was understood. The vote was 14 to 11.

Free Rides to "Economy" Sale in Atlanta

Monday, March 4, was the date of the opening of the Spring Economy Sale at W. T. Grant Company's store, on Whitehall Street, in Atlanta, Ga., and the store gave away free, two car tickets to all persons who purchased as much as a dollar's worth of merchandise in any one department of the store. The following suggestion was made to passengers on the transportation lines of the Georgia Power Company:

When you pay your fare on your way to town in the morning just request the conductor or operator to give you a coupon, and when you have finished your shopping at Grant's the management of the store will give you two street car tickets, the cost of your transportation to the store and back home.

This is the second time Grant's has offered the free car ticket plan. Last October, under similar circumstances, several thousand Atlantians took advantage of the similar offer to add to the saving in bargains offered at the store.

Delay Asked in Wheeling Fare Case

A delay of 60 days in the rate hearing of the Wheeling Traction Company, which was scheduled for Feb. 28 at Charleston, was asked by representatives of the Wheeling Chamber of Commerce, the Merchants' Co-operative Association and the City Council following a joint meeting. The motion for the extension was made by a representative of the Merchants' Association.

Ambulance-Chasing Forbidden in New York

New rules to regulate the conduct of lawyers, especially in negligence cases, and designed to end "ambulance-chasing" or soliciting of retainers for any other branch of litigation were announced on Feb. 26 by the Appellate Division of the Supreme Court, First Department. The rules apply only to the attorneys in New York and Bronx Counties.

The new code, which also deals with the terms and with the settlement of litigation, is the response of Presiding Justice Dowling and Associate Justices Merrell, Finch, McAvoy, Martin, O'Malley and Proskauer to the recommendations made by Supreme Court Justice Wasservogel in his report last October on his investigation for the Appellate Division.

The new rules prescribe many of the requirements which Justice Wasservogel recommended as necessary to

stop ambulance-chasing, the only important features of the Wasservogel report omitted from the rules being those regarded as requiring legislative action. Bills have already been introduced to effect these reforms.

The recommendations of Justice Wasservogel's report not included in the new rules because of the necessity of amending existing laws relate to declaring 33 1-3 per cent a maximum share of any recovery to be paid to an attorney for his services when a contingent retainer is made with a client, and also deal with an extension of the power of the courts to punish perjury and criminal contempt.

Justice Wasservogel recommended the addition to a judiciary law of a clause describing the power of the court to punish for a criminal contempt the following: "Willful disobedience to its lawful mandate: or the doing willfully and knowingly of an act without the mandate or authority of the court, where a statute requires such mandate or authority to be procured before such act may be done."

The corrective legislation has since been lost in committee.

"As-U-Go" Name of New Denver Publication

Mrs. C. E. Marks, 1660 Logan Street, Denver, won the $25 reward of the Denver Tramway Corporation for suggesting "As-U-Go" as the name for the new 4-page bulletin published by the company "that those who ride may read." More than 20,000 suggestions were received and considered, but Mrs. Marks was the only contributor who suggested this name.

In a statement the company said:

Now that it's all over, and the bulletin is named, what do you think of it? From now on, we hope to make this little paper increasingly interesting. In this connection, we beg to call your attention to page 2, where you will find a time-plan of morning week-day inbound car service for Route 11. Time-plans of this kind for various routes will be published from time to time. Is information of this kind interesting to street car riders? We hope it will prove a service convenience and will be the means of expediting street car service. So read As-U-Go. Read as you ride, or take As-U-Go with you when you leave the car.

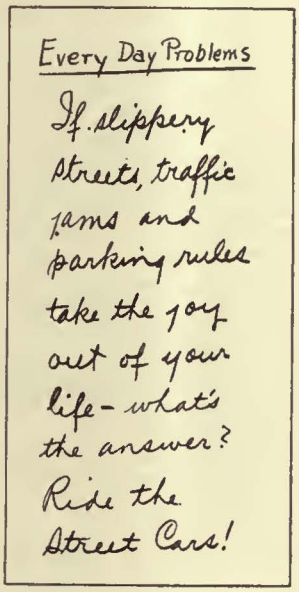
Safety Tunnels for Seattle

George B. Avery, superintendent of utilities at Seattle, Wash., in charge of the street railways, is backing a move to obtain from the City Council an appropriation for underground crossings for pedestrians at the intersections of Pike Street with First, Second and Third Avenues. The project would cost approximately $50,000 and is entirely separate from the proposed plan to construct seventeen new safety tunnels at Seattle schools, which would also cost $50,000.

Tacoma Mayor Resigns After Dispute

Mayor Melvin G. Tennent, of Tacoma, Wash., following a dispute with the corporation counsel's office, has resigned his position, and Ira S. Davisson, commissioner of light and water, has become temporary Mayor. Mayor Tennent is the principal owner of the Tennent Steel & Casting Company. He has been extremely active in an effort to adjust the transportation problems in Tacoma, co-operating with the Tacoma Railway & Power Company.

Appealing for Patronage in Salt Lake



One of a series run by the Utah Power & Light Company during January which won favorable comment. Two ads were run each week—on Tuesdays and Fridays in the three Salt Lake City papers, *The Tribune*, *Deseret News* and *The Telegram*.

Would Speed Up Kansas City Cars

Plans are being made by the Kansas City Public Service Company, Kansas City, Mo., to speed up service, in the belief that to cut off several minutes on the average trip from the residential sections to the downtown district will attract additional patronage. Although they are not ready to put their plan before the City Council, officers of the company propose to use three methods:

A skip-stop plan to reduce the number of stops to something like a stop for every two long blocks and for every three short blocks.

All principal street car streets to be arterial thoroughfares.

Street cars to have right-of-way and a clear path on their own tracks.

According to Powell C. Groner, the company will be ready to present its plan to the Council after two more weeks of study. Either a trial on three or four important lines, or an offer of a complete skip-stop and arterial plan for the entire city may be made. A tentative study shows how the number of stops can be reduced from 124 to 82 in one case on the round trip, and from 159 to 105 in another.

Work on Milwaukee Rapid Transit Line Being Pushed

Work began on Dec. 3 on the rapid transit line of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., is being continued with vigor. By means of a subway terminal now contemplated and 2.8 miles of new line on private right-of-way, this project will provide high speed local service between Milwaukee and the rapidly growing urban district to the west.

To the south, work is well under way on the relocation of 6 miles of track of the Milwaukee-Racine-Kenosha Rapid Transit line to provide faster schedules and greater freedom from traffic interference. This job is scheduled for completion late this summer.

Grade separation is planned for 2½ miles of double track of the Milwaukee Northern division Rapid Transit line immediately north of the city. A program of necessary reconstruction of tracks will also be undertaken.

Committee on Movement of the Vehicle Meets in Chicago

With four subcommittees meeting on Feb. 23 and the main committee session occupying all of March 1, two crowded days of intensive consideration were devoted to ways and means of expediting the travel of all types of vehicles through city streets.

Both sessions were indebted to the Chicago Surface Lines for the privilege of including E. J. McIlraith and two of his traffic engineers in the discussions.

Subcommittee reports were presented by C. H. Evenson, E. D. Merrill, Joe R. Ong, and R. H. Pinkley on specific phases of the vehicular movement problem, as outlined in the ELECTRIC RAILWAY JOURNAL for Dec. 22, page 1091.

The main committee with Paul E. Wilson as sponsor and D. L. Fennell, chairman, will hold its final meeting in New York on April 26.

Opposition Develops on Highway Use

Democratic assembly district leaders are on record as opposed to the taking over by the county of the Erie County Traction Company's line from Buffalo, N. Y., to Hamburg and other nearby towns for the purpose of making a 40-ft. main traffic highway out of the Abbott Road and several other highways along the route of the railway. A bill to permit the county to acquire the railway's right-of-way has been prepared for introduction into the Legislature.

Higher Fares in Columbus Postponed

The city of Columbus, Ohio, has succeeded in securing a postponement until April 1 of the plan of the Columbus Railway, Power & Light Company to increase cash fares from 6 cents to 10 cents, and from 25 cents to 35 cents for five tickets.

Councilman Fred Zimpfer, chairman Council utilities committee, has proposed that a utility engineer be appointed to assist the city in adjusting the fare controversy. He wants to start franchise negotiations with the company immediately after April 1.

The company is now operating without a franchise.

Election of Commissioners in Maryland Voted Down

Efforts to have the members of the Maryland Public Service Commission elected by the people rather than appointed by the Governor have failed. A bill providing for the change was introduced in the General Assembly, now in session at Annapolis, but has been defeated.

Drivers' Creed in Grand Rapids

The Commercial Drivers' Club, Grand Rapids, Mich., organized several years ago to promote safety, assist in reducing traffic congestion and assist the Grand Rapids Railroad in maintaining unobstructed right-of-way, has again established a precedent by adopting an official drivers' creed. In the cab of every member a printed creed card is hung so that the safety message is in sight at all times. The text of the creed:

As a member of the Grand Rapids Commercial Drivers' Club I pledge allegiance to the following safety creed:

To keep the vehicle I drive in proper mechanical condition at all times.

To inspect carefully and keep under careful supervision my load, insuring safety from falling articles.

To keep my machine under perfect control.

To keep off the Grand Rapids Railroad Company right-of-way as far as possible, avoiding interference with operation of its cars.

To obey all traffic regulations and drive in accordance with street signal light dictation; to use special care when driving in school zones.

To keep constant vigil for children wherever I am driving.

To be courteous to all officers of the law and to do my part in case of unavoidable accidents.

To all this I gladly subscribe, in an effort to make Grand Rapids a safer and better place to live.

Since the Grand Rapids club was organized, which organization was mentioned in the ELECTRIC RAILWAY JOURNAL, President Harry Bowles has sent copies of the by-laws to many cities organizing similar clubs designed to put into effect the accident reduction features of the Grand Rapids Code.

COMING MEETINGS OF *Electric Railway and Allied Associations*

March 12-14—Oklahoma Utilities Association, annual meeting, Oklahoma City, Okla.

March 14-15—Illinois Electric Railway Association, Hotel Abraham Lincoln, Springfield, Ill.

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

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

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

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

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

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

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

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

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

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

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

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

Employee Education Subject of Detailed Study

At its second meeting, held in Chicago on March 4, the committee on the employee, of the Transportation and Traffic Association, continued its consideration of outstanding problems of railway personnel from the transportation standpoint. Subcommittees, under Chairman H. H. Fenton, Chairman C. S. Slocombe, and Chairman W. Frank Persons, dealing respectively with employee information, accident-proneness and selection and follow-up, reported progress on the specific phases of the study assigned them.

Excursion Rates Popular on Kentucky Line

Week-end excursions to points in the tri-state territory by electric railways are increasing travel greatly, according to G. M. Millican, general manager Evansville & Ohio Valley Railway, Evansville, Ind., operating a railway line to Grandview, Ind., and bus lines to Mt. Vernon, Ind., and Henderson, Ky. By special tariff for the week-ends, passengers are afforded transportation at reduced rates. Tickets purchased at Evansville on Saturday or Sunday for any points along the railway and bus lines are good until Sunday night. The Rockport line between Evansville and Owensboro, Ky., in particular, is carrying heavy passenger lists at the week-ends.

According to excursion schedule of prices, the round-trip fare to Owensboro, Ky., is $1.50; Troy, Ind., $2; Tell City, $2.25; Cannelton, $2.25. These figures represent reductions of from 75 cents to $1 on each trip. Saturday-Sunday rates to Newburgh are 40 cents and to Mt. Vernon by the company's bus line, 85 cents.

The heavy haulage of coal by this company's lines this winter has greatly increased the freight end of the business.

Rolling Stock Committee Program for Cincinnati Meeting

Arrangements for the meeting of the standing and special committee of the rolling stock section, American Electric Railway Association, which is to be held at the Gibson Hotel, Cincinnati, Ohio, on March 11-12, are being completed, according to E. J. Jonas, superintendent of equipment Cincinnati Street Railway, local chairman of the committee. The program at present is:

MONDAY, MARCH 11, 1929

9:30 A.M. Meeting of standing committee of rolling stock division.
Meeting of each special committee.
12:00 Noon. Adjourn for lunch. All to lunch together in some convenient room.
1:00 P.M. Resume committee meetings. It is expected by this time one or more of the special committees will have finished its report and wish to discuss it before the standing committee.
6:00 P.M. Adjourn.
7:30 P.M. Informal dinner or banquet with a special speaker to be announced later.

TUESDAY, MARCH 12, 1929

9:30 A.M. Meeting of standing committee with special committees.
It is expected by this time that the committee work will have been completed so that special discussion of operating matters such as "pull-ins," etc., can be fully discussed.
12:00 Noon. Adjourn for lunch. All to lunch together in some convenient room.
1:00 P.M. Inspection of new shops, Cincinnati Street Railway, Cincinnati Car Company, and other places of interest.

A. F. Clark, Baltimore, chairman standing committee, has sent out 125 invitations and anticipates an attendance of 75 or more.

Mayor Opposed to $50,000,000 Boston "L" Bill

Mayor Nichols, of Boston, appearing recently before the legislative committee on metropolitan affairs, expressed strong opposition to the $50,000,000 elevated rapid transit bill, suggesting that the measure be returned to the special commission which reported it to be redrafted. He said the bill as it stands is at variance with the special commissioner's report.

The Mayor opposed any plan for actual public ownership of the Boston Elevated Railway system, declaring for extension of public control. At the outset he admitted that he felt it impossible to draft a bill at this time which would receive the approval of the committee and the Legislature. In outlining his objections to the bill before the committee, he said he felt that parts one and two of the bill deprive the districts affected of any control.

Cars Speeded Up by Elimination of Parking in St. Louis

The St. Louis Public Service Company, St. Louis, Mo., reports a saving of eleven minutes a round trip has been effected on its Olive Street divisions through the elimination of downtown parking, the use of the skip-stop plan between Twelfth Boulevard and Channing Avenue, and a general speeding up of the entire system. The operations in January of this year and last year were the basis for the report. In January, 1929, the Olive Street cars traveled 42,661 more miles than in January, 1928.

Riders Receive "Transit News" in St. Louis

"Transit News" has been selected by the St. Louis Public Service Company, St. Louis, Mo., as the name of the miniature newspaper distributed on the street cars for patrons. A prize of $50 was paid to William Voderberg, of 4540 Claxton Avenue, for suggesting the title.

Hearings Soon on $22,000,000 Project for Baltimore

Electrification of the Pennsylvania Railroad lines in Baltimore has struck a serious obstacle. The railroad plans a $22,000,000 improvement project in the city, including tunnels and electrification, but the city is opposed to the railroad's plan to use overhead high-tension wires in Baltimore. The advisory committee appointed by the Mayor, which has been considering a series of ordinances providing for the improvements, has refused to agree to the overhead high-tension feature. The ordinances will be introduced in the City Council on March 11, and after they are referred to the proper committee public hearings will be held to consider the subject.

Recent Bus Developments

Pick-up and Delivery Service Started by Pacific Electric

T. J. Day, freight traffic manager Pacific Electric Railway, Los Angeles, Cal., recently announced the entry of the Pacific Electric Railway into the trucking field in southern California on March 11.

The new company will serve as a feeder to the parent company's rail lines, its trucks maintaining a store-door pick-up and delivery service throughout southern California. In general the truck subsidiary will be an express company and will not, at least for the present, operate trucks on the highways.

As explained by D. W. Pontius, vice-president and general manager of the Pacific Electric Railway, "the motor transport company will perform a complete service from the shipper's store-door to consignee's store-door under a through rate that will cover the entire service."

It will pick up shipments at the shipper's door and haul them to Pacific Electric's rail stations, where they will be transferred to rail cars. Under a contractural arrangement the Pacific Electric Railway will make the line haul to the station of destination, where the load again will be transferred to the Motor Transport Company's trucks for delivery to the consignee's place of business.

The transfer may be effected either by passing the entire truck body intact from the truck chassis to specially equipped rail cars, as in the case of bulk freight, or by the usual method of handling in case of miscellaneous package freight. Such co-ordination creates a greater and more efficient use for both utilities than are in existence or available.

The operation will be conducted by the Pacific Electric Motor Transport Company, a subsidiary, with Los Angeles as the principal place of business and capital stock of 5,000 shares with a par value of $100 a share. Present station agents will act as agents as well for the new company, although entirely separate tariffs and billing documents will govern the subsidiary's operations. Contracts will be made with present truck companies.

Tax Relief Measure in Ohio

A bill introduced in the General Assembly of Ohio by Joseph C. Dinsmore, of Hamilton County, proposes to exempt electric railways which operate buses from paying the excise tax of 1.2 mills on their gross receipts. Under the Ohio law these companies are also required to pay a flat tax each year.

At a committee hearing on the Dinsmore bill, S. L. Lipp, representing the Cincinnati Street Railway, said the existing laws were unfair to companies operating both electric cars and buses, inasmuch as others engaged only in the operation of buses pay only a single flat rate.

C. E. Lewis, Jr., of the New York Central Railroad, representing the steam lines of the state, urged that the committee also consider steam railroads. He said that, while no railroad operating in the state now was engaged in the bus business, he knew of at least two roads which contemplated augmenting their business with buses.

Buses for 13-Mile River Route

A report was made to the City Council of Cincinnati on March 6 by its traffic committee, recommending bus rather than street railway service to Fernbank and other downriver communities on a 13-mile route. Residents of the communities affected presented their views at a hearing held by the committee on Feb. 26, the decision ending a long-standing difference of opinions.

The committee's report contains no reference to fare, although it is known that Murray Seasongood, Mayor, personally favors a 10-cent rate in keeping with stipulations in an annexation agreement with the communities to be served. The fare, however, probably will be 20 cents cash or three tickets for 50 cents, with provision for "Sunday passes," as recommended by E. D. Gilman, utilities director, who pointed out that even with this charge the Cincinnati Street Railway, in operating the buses, would lose about $26,000 yearly.

Advocates of bus service at the hearing included Walter A. Draper, president of the Cincinnati Street Railway.

Railway Co-operates to Stop Cruising Taxis in Providence

Alonzo R. Williams, of the United Electric Railways, Providence, R. I., recently instructed inspectors of his company to co-operate with the police in checking up the activities of cruising taxicabs.

Inspectors have been "spotting" the license numbers of taxicabs whose drivers were soliciting fares. Many of the offenses occurred at street car stops where persons waiting for trolleys decided to avail themselves of taxi transportation. The taxis, he said, travelled repeatedly over an "S" shaped course.

A new city ordinance went into effect Jan. 1 to prohibit cruising cabs in Providence and the police have determined to enforce the measure rigidly. Already drivers have been caught violating the no-cruising rule, which would limit the use of cabs by the public to those called by phone, to those travelling back to their stand

from trips, and to those standing at places which are to be designated.

General stands have recently been designated at which cabs may be parked in turn as fares are taken on. Special stands are designated in favor of companies and individual operators of cabs. At general stands all cars other than the hire vehicles are barred from parking. At special stands taxicabs not included in the company permits are prohibited from parking.

Bus Plea Made in Baltimore

Two applications to operate buses in Baltimore have been filed with the Maryland Public Service Commission. S. W. Mann, president Monumental Motor Tours, Inc., Baltimore, has asked the commission for authority to operate a line of modern 25-passenger buses from Belvedere and Park Heights Avenue to and from the center of the city. The fare, the petitioner states, will be 8 cents with two rides for 15 cents. Eight buses would be operated daily. The schedule would be every five minutes between 8 and 9 a. m. and 5 and 8 p. m. Between 7 a. m. and 11.45 p. m. service would be on the ten-minute basis.

The Conway Motor Company, Westminster, Md., has applied for a permit to establish a service between the Union Bus Terminal, in the downtown section, and Pikesville. The fare would be 10 cents to Park Circle, 15 cents to Arlington and 20 cents to Pikesville.

Harold E. West, chairman Maryland Public Service Commission, has replied to officials of the National Housewives, Inc., who wrote to the commission recently and asked if that body would permit a financially responsible company to operate buses in competition with the system of the United Railways & Electric Company. Mr. West said that installation of such a system would mean the elimination of the present system of railway transportation. The commission would grant permission to the company to operate the buses, he said, only if it could be conclusively proved:

That the substitution of a system of bus transportation for the present railway would be for the best interests of the public.

That the bus system would give a service as frequent and as comprehensive as the railway system and with a capacity as great as that of the railways, reaching all sections of the city and suburbs, and operating unprofitable as well as profitable lines.

That the rates of fare would be lower than the rates now charged by the railway.

That free transfers from one line to another would be given to the extent that such transfers are now given by the railway.

That the financial resources of the suggested bus company be sufficient to guarantee the permanence of the suggested operation.

That the suggested bus company contribute to the city and state an amount in taxes equal to that paid by the railway, including a sum of more than $1,000,000 annually for the maintenance of the city parks.

Right Sought in Delaware River Territory

Application has been made to the Public Service Commission of Pennsylvania by the Delaware River Coach Company for permission to operate buses between Torresdale and the New Jersey State line in Morrisville, and between the Pennsylvania Railroad station in Croydon and the junction of Pond Street and Wilson Avenue in Bristol. The application covers territory already served by the Trenton, Briston & Philadelphia Street Railway and the Pennsylvania Railroad. The local electric railway system reaches Trenton through an affiliated company, the New Jersey-Pennsylvania Railway, and by connection with the Philadelphia Rapid Transit Company's line at Torresdale passengers are taken into Philadelphia. Thus from Trenton to Philadelphia the electric railway parallels the Pennsylvania Railroad, which lately entered the bus business through acquiring an interest in several bus companies formerly owned by the Philadelphia Rapid Transit Company. It is understood that the new coach company has the backing of the officers of the present trolley line.

Complaints Aired on Revere Service

Mayor Cassassa, of Revere, Mass., has asked the committee on street railways to authorize the city to operate bus lines. In his assertion that transportation conditions in the city are "desperate," he is supported by a Senator and two Representatives from the city who add that the attitude of the Eastern Massachusetts is "unreasonable," and that complaints made in the past have been futile. On the other hand representatives of the street railway declare that any such legislation as proposed by the Mayor would cause the railway to meet unfair competition. Mayor Cassassa asserts that the Chelsea division of the street railway, which serves Revere, is the most profitable division. He says he is opposed to the principle of municipal ownership but in this case he sees it as the only means of relief.

The Mayor believes the city can operate buses to give Revere residents a 3 or 4-cent fare to Maverick Square, which with the 10-cent fare to Boston on the Elevated would provide rapid transit at reduced rates.

The street railway contends that it is obvious that the purpose of the bill is to ruin the Eastern Massachussetts in that district; that it would be a strange turn of events if the Legislature, which gave public control to the railway, would now proceed to cripple it by granting the request in this bill. P. G. Carleton, of the road, says he realizes the evil of the double fare, but he thinks the action on it may well await the disposal of the report of the special commission with respect to rapid transit. On the whole, transportation conditions in Revere are good. He has suggested to the Mayor that he take his complaints to the company trustees and they will be given attention. Another point made by Mr. Carleton was that the bill meant a reversal of the state's policy regarding municipal ownership, which provides that municipalities must first purchase private companies before entering into public ownership of a similar business.

The matter is still under advisement.

Adverse Report on Berkshire Bill

The Massachusetts Senate has accepted an adverse report from the street railway committee on the bill to authorize the Berkshire Street Railway to operate buses on the highways of Berkshire County. Had this bill been enacted the company would have been relieved from going to cities and towns for bus permits. This was opposed as vesting too much power in the State House and establishing a precedent as regards the situation in other parts of the state. Concurrence by the House in the action of the upper body was forecast.

Substitution Proposed in Sedalia

The City Light & Traction Company, Sedalia, Mo., has substituted buses for street cars and, if it is found that the buses meet all the needs, the present railway system will be abandoned.

Terms of Equitable Grant Made Bankers Wary

Chairman John J. Delaney of the Board of Transportation, New York, on March 6 attributed the reluctancy of the J. G. White interests to finance the Equitable Coach Company's proposed bus operation to the opposition of the city's railway interests, as exerted through their banking and investment connections and by pressure of litigation. Mr. Delaney declared that the Board of Transportation relied upon it in recommending the granting of the franchise to that company. He is reported to have said:

When it is known that the Chase Bank is the financial agent of the B.-M. T., that Blair & Company, Hayden Stone & Company, and other leading financial houses that deal in public utilities securities have been revealed in investigations as being large holders of the securities of the existing New York City railroad companies, it is not difficult to understand that a community of interests hostile to the introduction of any competitive element in the local transportation field was encountered by the Equitable. This community of interests did not want anyone but the present companies in complete possession of the local transit field.

On the other hand, a representative of one of the railways was quoted as saying that the pending litigation, the various forfeiture clauses, the short-term and the 5-cent fare feature of the franchise were all "red flags" to bankers, making financial houses reluctant to supply funds.

Financial *and* Corporate

Reorganization of Second Avenue Railroad Approved

Chairman William G. Fullen, of the New York Transit Commission, has informally approved a plan for operation of the Second Avenue Railroad by a corporation formed from members of the protective committee of certificate holders under a reorganization set-up. Acting on Mr. Fullen's suggestion, the Commission on March 7 approved the plan of reorganization, thus ending the receivership.

For twenty years the company's lines have been run by receivers, three of them dying while in service. Clarence J. Shearn, counsel for the certificate holders' committee, told the commission on March 1 that the operation of the lines during the past ten years by Charles E. Chalmers, the fourth receiver, was deserving of special commendation. The company today is "in excellent shape," he said, having been built up by Mr. Chalmers from a state amounting almost to complete demoralization. In his argument for taking the lines out of receivership, Mr. Shearn declared that the move would be a forward step in the progress of transportation in New York City.

The plan provides for formation of a corporation by certificate holders. It will take title by foreclosure and certificates will be exchanged for shares of stock in the new corporation on the basis of ten shares of no par value for every $1,000 certificate. A bookkeeping set-up of about $3,000,000 was agreed on as representing physical value of the property, with the understanding that it was not to be made the basis for any future rate-making case.

Offer Made for 500,000 Shares of United Gas Improvement

The United Corporation, formed early this year as a public utility holding company by the Morgan-Drexel-Bonbrigat group, on March 1 addressed an offer to the stockholders of the United Gas Improvement Company to exchange their shares for those of the United Corporation.

Not more than 500,000 of the shares will be accepted by the United Corporation, which is offering 1½ shares of its $3 cumulative preference stock and 2¼ shares of its common stock in exchange for each U. G. I. share. This represents a value of about $200 for each $50 per share of United Gas Improvement.

Almost simultaneously it was announced that George H. Howard had been elected president and a director of the United Corporation. Mr. Howard has been identified with the public utility industry for nineteen years, and in the last ten years has devoted his time almost exclusively to legal and business matters relating to various public utility companies, particularly matters regarding their operations, financial structure and consolidation.

$49,222 Net Income on Duluth-Superior

The total operating revenue and non-operating revenue of the Duluth-Superior Traction Company and its subsidiaries for the year 1928 were $1,907,125. This represents a decrease of 4.84 per cent compared with the previous year. Operating expenses, including taxes, were $1,688,731, or a decrease of $38,369. In the annual report submitted to the stockholders it is said that the amount of paving claims against the company by the city of Duluth had been reduced during the year by satisfactory settlements to an amount not exceeding $2,500.

Depreciation has been accrued and charged monthly into operating expenses at the rate of 2½ per cent upon the undepreciated original cost of the depreciable street railway property and at appropriate rates on the depreciable property of a subsidiary, the Duluth-Superior Coach Company. The total amount accrued to the credit of depreciation reserve during the year 1928 was $166,999. The net amount charged against depreciation reserve during the year for renewals and retirements was $81,769. Net additions to property during the year amounted to $114,032.

A. M. Robertson, the president, states that the experience of the company during the past two years demonstrates the necessity of a readjustment of rates of fare, operating conditions and character of the equipment to be used, in all of which the city authorities and public must assist, if a reasonable return on the fair value of the property is to be earned and a satisfactory service given.

A subsidiary, the Duluth Street Railway, made substantial progress during the year in converting its two-man cars for one-man operation. This program is to be continued during 1929.

Bus service operated as feeders to the street car lines was extended during 1928 but was not satisfactory as respects earnings. This was due largely to the additional bus-miles necessarily operated.

General mortgage bonds, par value $26,000, were retired under the sinking fund provision of the mortgage.

One piece of construction work, namely, rebuilding a double track in Duluth, cost $45,252 and another improvement, the removal of a mile of track in Superior, cost $17,190.

The accompanying statements show income accounts for 1928 compared with 1927 and some statistical data on bus and railway operation.

CONSOLIDATED INCOME STATEMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

	1928	1927
Operating revenues:		
Revenue from transportation	$1,855,677	$1,948,393
Reveoue from other operations	17,653	17,095
Total operating revenues	$1,873,330	$1,965,489
Operating expenses:		
Way and structures	$190,491	$191,529
Equipment	209,561	194,023
Power	172,895	176,830
Conducting transportation	738,024	772,140
Traffic	4,543	2,263
General and miscellaneous	228,449	241,928
Transportation for investment-credit	—8,796	—8,275
Total operating expenses	$1,535,169	$1,570,441
Net revenue from operations	$338,160	$395,047
Taxes assignable to operations	$153,561	$156,659
Operating income	$184,599	$238,388
Non-operating income:		
Income from funded securities including interest on re-acquired bonds issued by The Duluth Street Railway	$19,216	$22,613
Income from unfunded securities and accounts	1,218	2,043
Income from sinking fund and other reserves including interest on reacquired bonds issued by The Duluth Street Railway	13,354	14,035
Miscellaneous income	6	31
Total non-operating income	$33,794	$38,723
Gross income	$218,393	$277,112
Deductions from gross income:		
Interest on funded debt	$167,186	$168,175
Interest on unfunded debt	1,390	692
Miscellaneous debits	595	598
Total deductions from gross income	$169,171	$169,466
Net income transferred to profit and loss	$49,222	$107,645

NET ADDITIONS—ROAD AND EQUIPMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

Way and structures:		
Land	$4,724	
Track and paving	53,790	
Machinery and tools	15,215	
Distribution system	8,701	
Buildings and structures	868	$83,301
Equipment:		
Street cars and buses	$47,604	
Miscellaneous equipment	2,031	49,635
		$132,936
Less Credits:		
Property retired:		
Track and paving	15,857	
Distribution system	1,877	
Street cars and buses	655	
Cost of selling preferred stock	514	18,904
Net additions to road and equipment during year		$114,032

STATISTICAL STATEMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

STREET RAILWAY AND BUS OPERATIONS

Total miles, all track reduced to single	113.36
Total miles of street and right-of-way occupied by tracks	61.83
Total miles of bus routes	34.75
Revenue from transportation, per mile single track including miles of bus routes	$12,529.05
Revenue from transportation	$1,855,677

Short Abandonment in Fresno

The Fresno Traction Company, Fresno, Cal., has applied to the Railroad Commission for permission to abandon passenger service on that por-

tion of its Sunnyside line on Ventura Avenue from Recreation Park easterly to the end of the company's line in Fresno County.

Net Income in Brooklyn Lower

Total operating revenues of the Brooklyn-Manhattan Transit system, Brooklyn, N. Y., for the seven months' period ended Jan. 31, 1929, were $28,112,915 compared with $27,586,215 for the seven months' period ended Jan. 31, 1928. Operating expenses increased from $17,930,308 to $18,306,475 for the 1929 period. After the consideration of income deductions, the net income was $3,545,949 for the seven months ended January this year and $3,647,033 for the seven months' period ended Jan. 31 of last year.

Petersburg Acquisition Under Discussion

Negotiations looking to the acquisition of the Petersburg, Hopewell & City Point Electric Railway, Petersburg, Va., are still in progress, although no definite action has resulted. Representatives of the Chicago interests involved went to Petersburg several weeks ago and inspected the property. A deal for the purchase of the line by Chicagoans has been considered since that time.

Stockholders of the company discussed the pending negotiations at the recent annual meeting, it was stated, but no definite action resulted. Reports made to the annual meeting showed that the past year had been a successful one for the company from a financial standpoint.

Receiver for Evansville & Ohio Valley Reports

A partial report in the receivership of the Evansville & Ohio Valley Railway, operating railway and bus lines, was filed by the receiver, William A. Carson, in the Vanderburgh County Probate Court at Evansville, Ind.

Cash receipts up to Dec. 31, 1928, totaled $73,266. Cash disbursements were $72,153, leaving a balance on hand of $1,113, with outstanding accounts totaling $9,568. The court approved the report and authorized the receiver to continue in charge of operating the company.

Another court entry authorized the railway to sell two small strips of land along the right-of-way in Spencer County, Ind., to the Indiana State Highway Commission to be used in improvement of State Highway No. 66. The receiver also was permitted to sell the company's interest in real estate, including towers, poles and other equipment along the Mt. Vernon line, which has been abandoned, to the Southern Indiana Gas & Electric Company. The company now operates buses along the Mt. Vernon highway between Evansville and Mt. Vernon, Ind.

Traffic, Fare and Wage Figures

The total number of revenue passengers, including bus passengers, reported by 223 companies to the American Electric Railway Association for the month of January, 1929, compared with January, 1928, is as follows:

January, 1929	788,065,646
January, 1928	800,254,229
Decrease, per cent	1.52

The decrease shown above is about the normal rate of decrease which has been prevailing in recent months and indicates that the decrease of nearly 4 per cent reported for the month of December was abnormal and due to the peculiar temporary conditions prevailing in that month, as was suggested in the comment in last month's service letter.

Average cash fare in cities of 25,000 population:

	Cents
Jan. 31, 1929	8.3227
Dec. 31, 1928	8.3032
Jan. 31, 1928	8.1274

The rise in the average fare during January was due to the following increases in fares granted during the month: In Minneapolis and St. Paul, Minn., the fare was increased from 8 cents cash with six tokens for 40 cents to 10 cents cash with six tokens for 45 cents. In Rochester, N. Y., the fare was increased from 9 cents cash with six tickets for 50 cents and twelve for $1 to 10 cents cash and the same ticket rates.

The average maximum hourly rates paid motormen and conductors in two-man service by companies operating 100 or more miles of single track:

	Average Hourly Rate Cents	Index Number 1913 = 100 Per Cent
Jan. 31, 1929	57.56	211.23
Dec. 31, 1928	57.55	211.19
Jan. 31, 1928	57.39	210.61

The increase in the average was caused by an increase of 2½ cents per hour granted to the motormen and conductors on the Illinois Terminal Railroad System at Springfield, Ill.

Election on Underliers in Philadelphia in Fall

Facing possibilities of legal delays that may consume many weeks or months, city officials and others interested in the plan to purchase the underlying companies of the Philadelphia Rapid Transit Company, Philadelphia, Pa., for $139,000,000 are reshaping their course toward a special election next fall on the proposition. Original plans called for submission of the question this spring to the voters. Now it is likely to go over to a special election after the general election next November. City Controller Hadley has persistently refused to join in the proceedings, originally because matters set forth in the city's petition were not and cannot, for extraneous reasons, be within his knowledge.

Puget Sound Interurban Right-of-Way Sought by Power Company

The Puget Sound Power & Light Company submitted the highest bid, $348,208, for the Seattle-Tacoma interurban property to Receiver Scott Z. Henderson, at the sale under foreclosure. The bid was for right-of-way and operating property. A. W. Leonard, president of the company, denied reports that the power company plans to restore railway operation. He said his company desired the right-of-way because its main transmission lines between Seattle and Tacoma are on it, and declared that, if his company is awarded the property, the tracks will probably be taken up.

Service over the interurban was discontinued by Judge E. E. Cushman, of the federal court, on recommendation of Attorney Henderson, who showed that it was not paying operating expenses and that it would be costly to rehabilitate the line. A physical valuation of $489,541 was placed on the outfit by Appraiser Henry L. Gray.

Rails Being Removed at Valdosta

The tracks of the Valdosta Street Railway, Valdosta, Ga., long in disuse, are being removed from the streets. Five years ago the cars ceased to operate and about two years ago the wires were taken down, but the rails remained. Recently a deal was closed whereby it was possible to get the tracks taken up and the street restored to its original condition for the price paid for the rail. The railway consisted of 5.25 miles of line.

Revenue in Quincy Falls Off

Although bus revenue in Quincy, Ill., showed a marked increase last year over 1927, the Illinois Power & Light Corporation reported total revenue from street cars and buses during the year of $208,201, as against $244,771 in 1927 and $263,722 in 1926. The 2 per cent franchise tax, payable to the municipality, amounted to $4,364, the smallest check the city had received from the transportation system in three years. Detailed revenue report included: Receipts from street cars and buses, cash fares, $25,262 and $3,780, respectively; from tokens used on street cars and buses, $70,172 and $86,650; chartered street cars, $81 and buses, $307.

Haverhill-Salem Service to Stop

The Massachusetts Northeastern Street Railway, Haverhill, Mass., is to discontinue service between Haverhill and Salem, N. H., on March 17. Cars will operate to Ayers Village. The Salem carhouse will be sold and tracks beyond the New Hampshire line removed.

Book Reviews

Black on Rescission and Cancellation

Henry C. Black and Hon. Jay M. Lee. Published by Vernon Law Book Company, Kansas City. Three volumes (second edition). Price $30.

The first edition, published in 1916, became an outstanding legal text. The steady development of this branch of the law rendered a fuller treatise necessary. Part One deals with the discussion of rules and principles and contains a detailed examination of the various causes or grounds which justify the rescission or repudiation of a contract by one of the parties to it, or which warrant a court in ordering its annulment or cancellation. A valuable feature of the new edition is the greatly enlarged index.

Standards Yearbook—1929

Compiled by the National Bureau of Standards, George K. Burgess, director. Published by superintendent of documents, government printing office, Washington, D. C. Price $1.

Suggestions and data for all engaged in standardization will be found in the "Standards Yearbook for 1929." The many aspects of the subject call for a concise summary for busy men who most need to keep in touch with the latest advance in the standards field. The yearbook is designed to meet this need. It consists of eleven chapters, covering standardization of commercial weights and measures; standardizing the calendar; international standardizing agencies; national standardizing agencies; federal standardizing agencies; National Bureau of Standards; municipal, county and state agencies; general standardizing agencies; standardizing activities of technical societies and trade associations; bibliography on standardization for 1928, and an index.

It is the third issue of an annual which has proved indispensable to all interested in any phase of standardization in America and abroad. It summarizes and brings up to date current standardization activities and accomplishments in this country and elsewhere for the past year.

Steel Masts and Towers

"Mäste und Türme in Stahl." By P. Sturzenegger. 219 pages, 362 illustrations. Published by Wilhelm Ernst & Sohn. Berlin W 8, Wilhelmstrasse 90. Paper. 23 Reichsmarks; linen, 25 Rm.

Due to the need of steel structures for the support of wires in carrying electric current for lighting, power and railway purposes, there has arisen a demand for information relative to the design of poles and towers for this intention. This book gives details of the design and construction of many of the types used in European installations. An entire section of 30 pages is devoted to structures for railway purposes, including special towers for substations. Other sections include the principles and development of transmission structures, high-tension power transmission, anchoring and grounding of towers, protection against corrosion and erection.

Budget Control—What It Does and How to Do It

Issued by Ernst & Ernst, public accountants, New York. 40 pages.

How each part of the business budget should be prepared and the principles of its effective operation, together with a summary of benefits, are set forth in this revised edition of a work published by the authors four years ago. It has been widely used for informative and reference purposes by business executives, engineers and various students of business methods.

The book begins by defining the budget as a plan for co-ordinating all forces and directing them toward the attainment of a definite objective. According to the book, the budget estimates in advance the factors of time, volume and value necessary to produce a definite amount of sales and profit in a given period. It forecasts production, income, expenditures, financing, profit and financial position.

The procedure in preparing the master budget and its preliminary essentials represented by the budgets for sales, production and purchases, expense, plant additions and plant changes, and for cash proceeds, disbursements, balances and financing, is discussed concisely. The pages given to the classification of expense for budget purposes treat the subject in relation to manufacturing, wholesale and retail establishments.

Labor Management

By Gordon S. Watkins, Professor of Economics, University of California. A. W. Shaw Company, Chicago. 720 pages, price, $5 net.

In an analysis and interpretation of the principles of labor management whatever solutions are forthcoming will be born of three important conditions, namely: (1) An intelligent understanding and scientific interpretation of the forces of evolution which have produced modern industrialism; (2) a scientific investigation of employment conditions, which appear to be the basic causes of working-class revolt; and (3) the application of workable methods of improving employment relations. With this outline as a basis, the author proceeds to develop the subject matter, setting forth the basic assumptions of enlightened personnel administration. Next he points out that, if we would understand the intricate maladjustments in current industrial relations, we must have a clear perception of the economic antecedents strewn along the pathway of history.

In Part III, such topics as instincts, repression, acquisitiveness, gregariousness, sex and parental bent, fear and reason are discussed. In Part IV is an outline of the general principles of administrative science and a summary of the task and qualifications of the personnel manager. Part V takes up the selection and placement of workers, and job analysis and specifications. Part VI deals with education and training of employees.

Commerce Yearbook—1928

Published by the Department of Commerce, Bureau of Foreign and Domestic Commerce. Vol. 2, 750 pages. Price $1.25.

This volume gives in abbreviated form the same type of information on foreign countries as Vol. 1 presented on the United States. Vol. 1 is now available and Vol. 2 is expected to be off the press by Sept. 1. The two volumes constitute a complete and authentic picture of the trade and industry of the world during 1927.

Electric Drive Practice

By Gordon Fox. Published by McGraw-Hill Book Company, New York City, 1928. 421 pages; illustrated. Price $3.50.

"Electric Drive Practice" is a companion book to "Principles of Electric Motors and Control" by the same author. The present volume deals with classes of driven machinery which are in common use in many industries. Particular attention is given to the factors governing selection and application of motors and control equipment. Other general topics include mechanical and electrical features of motor installations. Separate chapters are taken up with consideration of motor drive for various special types of machinery such as centrifugal fans, blowers and compressors, air compressors, pumps, traveling cranes, conveying and elevating machinery and machine tools. Another separate chapter is given to industrial electric traction. To make the book more useful a bibliography is included at the end of nearly every chapter which gives the latest references.

The Engineering Index Service

This Engineering Index Service, instituted in January, 1928, is to be found in the public libraries of Newark, Cleveland, Bridgeport, Baltimore and the John Crerar Library, Chicago. Engineers in any field who live or work in New Jersey will find this mammoth index to the latest engineering literature, in the Public Library of Newark, N. J. The library is open daily from 9:00 to 9:30 and is convenient to all railroad stations. It answers inquiries by mail or by telephone.

Personal Items

James P. Griffin Succeeds Jack Beall at Dallas

James P. Griffin was elected president of the Texas Electric Railway, Dallas, Tex., on March 5, succeeding the late Jack Beall. For the present Mr. Griffin will continue to be executive in charge of operations.

Continuously since 1905 with the Dallis outfit, Mr. Griffin has, since July 1, 1926, been serving as active vice-president in charge of operations. His first railway experience was at Waxahachie in the general freight and passenger office of a subsidiary of the Southern Pacific. Prior to his going to Dallas in July, 1905, he was secretary

James P. Griffin

to Jack Beall for one year during 1904 and 1905 while Mr. Beall was in Congress. With J. F. Strickland he was engaged in the project to build an interurban railway from Dallas to Sherman. This project was successful and that line was put in operation on July 1, 1908. Later he served as secretary and general passenger agent and auditor of these lines. On April 1, 1912, Mr. Griffin became also secretary of the Southern Traction Company, then building the interurban lines from Dallas to Waco and Dallas to Corsicana. These lines were put in operation in October, 1913. He also served as general passenger agent for these lines. On Jan. 1, 1917, the Texas Traction Company and the Southern Traction Company were consolidated under the name of the Texas Electric Railway and he was elected secretary and appointed general passenger agent of that company. Nearly six years ago he was elected vice-president of the Texas Electric Railway.

Mr. Griffin was born in Waxahachie, Tex., on Jan. 28, 1881. He attended the University of Texas after being graduated from the Waxahachie High School in 1900. He inaugurated the Bluebonnet Limiteds, operating from Waco, Corsicana and Denison and made this service a popular one. He is also credited with conceiving the plan of converting the interurban passanger lines into joint passenger and freight hauling lines, and, with the late Jack Beall, secured an amendment to the company's charter and permit from the Railroad Commission to enter this field in May, 1928. He is a vice-president of the Southwestern Public Service Association.

F. W. Bacon Heads Bus Company Taken Over by Railway

F. W. Bacon, New York City, vice-president Kentucky Securities Company, holding company of the Kentucky Traction & Terminal Company, which recently purchased a majority interest in the Consolidated Coach Corporation, has been elected president of the coach corporation. He succeeds Guy H. Hughlet, Lexington, who was elected vice-president and general manager. As indicated in the item in the ELECTRIC RAILWAY JOURNAL for Feb. 16, page 300, the Coach Company operates a large network of bus lines over the state and into several adjoining states.

W. J. Harvie With Omaha & Council Bluffs Company

William J. Harvie, employed by the United Traction Company, Albany, N. Y., for two years as safety director, will become efficiency engineer of the Omaha & Council Bluffs Street Railways, Omaha, Neb.

Many safety measures adopted by the company in Albany in the last two years, instrumental in reducing accident rates considerably, were suggested by him for use on the Albany system.

Mr. Harvie was formerly vice-president Auburn & Syracuse Railway, general manager of the Syracuse & Suburban Railway and chief engineer Syracuse Rapid Transit and the Oneida Railway and the Utica lines. He was also chief engineer in charge of the electrification of the West Shore between Utica and Syracuse.

FRANK H. WARREN, who recently announced his candidacy for the Republican nomination for city judge of South Bend, Ind., has resigned his position as claim agent for the Chicago, South Bend & Northern Indiana Railway. His resignation coincides with the railroad's policy of non-participation in politics, Mr. Warren said. In his letter of resignation, he expresses his appreciation of his relations with the electric line.

R. L. LONGSHORE has been appointed general manager of the Toledo & Western Railway, at Toledo. He succeeds H. O. Kelly, who has been appointed superintendent of the Springfield, Ill., division of the Wabash Railway.

W. H. Harton—President of Kentucky Association

W. H. Harton, general manager Cincinnati, Newport & Covington Railway, Covington, Ky., was elected president of the Kentucky Association of Public Utilities at the recent meeting of the organization held at Louisville. Mr. Harton is well-known for his work in directing the Green Line street cars, and is one of the few general managers concerned with the problem of giving interstate transportation to the public for a 5-cent fare.

He served his apprenticeship in the office of a civil engineer who represented various satellite communities around Cincinnati in an engineering capacity. In August, 1892, Mr. Harton entered the employ of the Cincinnati, Newport & Covington Railway as a levelman in the engineering corps. The local horse car lines were then being

W. H. Harton

consolidated and the motive power was being changed over from old dobbin to electricity. It was at a time when the then existing trackage was being reconstructed, preparatory to operating the heavier units, and new construction work was in progress on all parts of the system. This gave the young levelman work to do that took him to all parts of this northern Kentucky system.

He helped rehabilitate this system and, when the new trackage was completed, he became chief clerk to the superintendent. In 1898 he was appointed superintendent maintenanceg of way. On June 2, 1915, he stepped up to general superintendent and was promoted to general manager in December, 1919. As the man who keeps the Green Line moving, he is expected to make many improvements in the road if communities served heed the request of H. C. Blackwell, president, for a higher fare.

J. L. Fritsch Elected Vice-President of West Penn Railways

J. L. Fritsch of Pittsburgh was recently elected vice-president of West Penn Railways and Wheeling Traction Company in charge of engineering and promotional work. Mr. Fritsch has been

chief engineer of the West Penn Railways since its organization.

Early in his career he was employed by the Cincinnati Water Works Commission on the design and construction of their new plant located at California, Ohio. On March 17, 1902, he went to Connellsville with the original Pittsburgh, McKeesport & Connellsville Railway, when the various small, isolated railway lines were being connected up to make a completed system. In October, 1903, Mr. Fritsch became chief engineer of that road, and has continued in that capacity with the West Penn Railways to date. In June, 1915, he went to Pittsburgh in charge of supervision of the track and roadway departments of the Wheeling Traction Company as well as of the lines in Pennsylvania.

Mr. Fritsch was born in Cincinnati, Ohio. He was graduated from that city's university in civil engineering in 1897. His most recent promotion was announced by H. L. Mitchell, president of the West Penn Railways.

Rolla Wells Honored in Bank Designation

Rolla Wells, who was receiver for the United Railways Company, St. Louis, prior to the purchase of the St. Louis street car system by the St. Louis Public Service Company, effective on Dec. 1, 1927, has been designated by the Federal Reserve Board at Washington as chairman of the board for the St. Louis Federal Reserve Bank, succeeding William McMartin, resigned. A former Mayor of St. Louis, Mr. Wells had been governor of the bank from its organization in November, 1914, to February, 1919, following which he was elected a Class B director, representing the group of agriculture, industry and commerce. He continued in that capacity until his appointment as chairman, which changes his status to that of a Class C director, a direct representative of the government. He was receiver for the United Railways from April, 1919, to Dec. 1, 1927.

FRANK H. MILLER, vice-president and general manager of the Louisville Railway, Louisville, Ky., was elected president of the Louisville Safety Council to succeed William L. Hoge at a recent meeting of the twelve directors.

JOHN ALDWORTH, who recently retired as general manager of the Nottingham Corporation Tramways, England, after a service of 30 years, has been retained by the City Council as consultant. He has also been elected an honorary member of the Municipal Tramways & Transport Association in recognition of his service to the association, of which he was president in 1907-1908.

WALTER O. RANDLETT, for many years secretary to the general manager of the electric department, Virginia Electric & Power Company, Richmond, Va., and recently promoted to the position of statistician, has now become a member of the comptroller's staff.

B. A. Hegeman, Jr., Dies Suddenly

Head of National Railway Appliance Company a leader in electric railway, bus and steam railroad transportation

BENJAMIN ARROWSMITH HEGEMAN, JR., well known in electric railway, bus and steam railroad transportation circles, died suddenly of heart attack at his home in New York on March 6. He was president of the National Railway Appliance Company of New York, president of the Hegeman-Castle Corporation of Chicago, president of the Anglo-American Varnish Company of Newark, N. J., and of the Genesco Corporation of Rochester, N. Y., and director of the Excelsior Savings Bank of New York. He was president of the Railway Supply Manufacturers Association in 1914 and a member of the American Electric Railway Association.

Photo by Blank and Stoller

B. A. Hegeman, Jr.

Few men in electric railway work, certainly very few men engaged in manufacturing and sales activities, gave of their time more freely to the work of the American Electric Railway Association than did Mr. Hegeman. His record of committee activities stretches down the years in a long unbroken line, containing many assignments quite arduous in the tasks they imposed. Still Mr. Hegeman was never known to falter when the desire was expressed in association councils that the weight of his experience might prove helpful. This year found him serving on the convention location, the manufacturers' contact and the exhibit committees, while last year he was a member of the exhibit committee and the year before that—1926-1927—he was a member of the American executive committee and the committee on finance. In 1925-1926 he served on three committees, executive, exhibit and finance. In 1924-1925 he served on two committees, the American executive and the finance. In 1923-1924 he was a member of the American executive committee and the convention location body. And so the record goes. It is a partial list, but there appears to be no need to expatiate for the benefit of men in the electric railway industry on what all this has meant to the railways. Both in manufacturing circles and in the railway industry Mr. Hegeman's record is so outstanding that no encomium on the work of the man would serve to enhance that record or mitigate the loss to the industry and the men actively engaged in it suffer by his death.

A son of Benjamin Arrowsmith Hegeman and Jane Roome, Mr. Hegeman was born in New York City on July 14, 1860. He was descended from Holland Dutch and English Colonial ancestry. He attended the public schools and was graduated from the Mount Washington Collegiate Institute in 1877. After eight years in the freight, passenger and treasurer's offices of the Delaware, Lackawanna & Western Railroad, he went to the Citizen's Mutual Life Insurance Company as cashier and assistant secretary. Eighteen months later he became general manager of the Lackawanna Live Stock Transportation Company, a position which he held for eleven years, until he became Eastern sales agent for the American Car and Foundry Company. In 1901 he was elected president and director of the United States Metal & Manufacturing Company.

On Oct. 23, 1883, Mr. Hegeman married Miss Kate Greenough Matthews, a daughter of Charles Matthews. He took an active interest in Republican politics, having been a Councilman and then Mayor of North Plainfield, N. J. For many years he was a member of the Republican Executive Committee.

His clubs included the Lotus, Automobile of America, Sleepy Hollow Country, Railroad, Baltusrol Golf, Apwamis, New York Athletic and the Lyres. Besides his son, daughter and wife he left five grandchildren.

THOMAS ANDREW TURNER, the first motorman to take a north side elevated train around the union "loop" in downtown Chicago, died on Jan. 18. He was also the first motorman to take an elevated train into the city of Evanston in 1905. Mr. Turner was born in 1853.

GEORGE LEE ESTABROOK, with the banking firm of E. W. Clark & Company for 41 years, died on Feb. 14 in Philadelphia, Pa. At the time of his death, as a firm representative, he was president of the Crystal Oil Refining Corporation, Shreveport, and secretary and treasurer of the Portland Electric Power Company, Portland, Ore. Mr. Estabrook was born at Athens, Pa. After being graduated from the Eastman Business College, Poughkeepsie, N. Y., he became a stenographer with E. W. Clark & Company and was quickly advanced.

Construction Programs Planned

One million dollar improvements to be made by the Omaha & Council Bluffs Street Railway. Illinois Power Company plans extensive improvements. Chicago Orders Cars. Cincinnati starts track construction

MORE than $1,000,000 will be spent for improvements by the Omaha & Council Bluffs Street Railway, Omaha, Neb., during the coming year, according to announcement made by Chester D. Porter, vice-president in charge of operation. Half of the sum will be spent for the changing of routes and the improvement of track equipment and cars, and the other half will be used for the expansion and relocation of substations for the better conservation of power. W. J. Harvie, of Albany, N. Y., a consulting engineer experienced in street railway problems, has been called to Omaha by John M. Shannahan, president of the Omaha & Council Bluffs Street Railway, to aid in the suggested improvements. The special points to be studied by Mr. Harvie are the power requirements of the system, the car equipment and the shop facilities.

Improvements in Springfield

Ten new street cars and five new buses are included in the equipment which the Illinois Power Company, Springfield, Ill., will add to its railway system this summer. Final plans have also been completed for the construction of a $114,500 garage, work on which is now awaiting the selection of a suitable site. The new cars will be slightly smaller than the cars now employed on the Fifth Street line in the downtown district. When the new cars are received ten of the old cars will be destroyed.

The Illinois Power Company has a budget of $616,989 for construction work in its various departments in the city and, according to A. D. Mackie, general manager, it is expected that $200,000 more will be added before the final plans are completed. At present the railway's share in the budget is $178,117.

In Lynchburg an agreement has been reached between officials of the Lynchburg Traction & Light Company and City Manager W. B. Hart under which the street work to be done by the railway in street car track areas of the city is not to exceed $8,500 a year.

Plans for expansion of its facilities in the East and the Mid-West, involving the establishment of three new dispatching centers, were announced recently by the Piedmont & Northern Railway, Charlotte, N. C. Two freight offices at Charlotte and one in Cincinnati, Ohio, will be opened this month. The company now has offices at New York, Atlanta, and Dallas.

The Jamestown, Westfield & Northwestern Railroad, Jamestown, N. Y., operating an electric interurban service between Jamestown and Westfield, has completed a program of improving the interior seating arrangement of its cars. The new seats installed are the Pullman parlor-car type, single seats being installed on swivels on one side and stationary double seats on the other.

Cincinnati Starts Trackwork

The Cincinnati Street Railway, Cincinnati, Ohio, has started relaying track from Broadway to Smith Street, on Fourth Street, a total distance of 4,482 ft. The tracks will be laid in the center of Fourth Street and will be single tracks to replace the double trackage formerly existing in that street, which has become a one-way thoroughfare.

Work will be commenced from both terminals and a temporary track system will be used for street car operation, thus facilitating the work. One hundred and twenty-two-pound grooved rail will be laid and the city will resurface the street following the completion of the new track and a new water main. This Fourth Street track renewal is the second major downtown track improvement of the Cincinnati Street Railway under its extensive program for rehabilitation.

The Public Service Co-ordinated Transport, Newark, N. J., will install for trial purposes on some of its cars, air-operated automatic gong ringers. The devices will be first installed on the parlor cars now being put into service on the Central Avenue and Orange lines in the Essex division.

Seattle Improvements

An immediate appropriation for new construction work, necessary for the rerunning of West Seattle Street cars on the Spokane Street elevated down to First Avenue south, is requested of the Seattle City Council. Approximately $100,000 will be needed for this construction. According to the superintendent of utilities, the rerunning plans contemplate elimination of the Elevated Street Railway on Whatcom Avenue between Spokane and Washington Streets. The cost of repairing this strip of railway structure and making it safe for continued use is said to be almost prohibitive.

According to Commissioner Ira S. Davisson, the seven used street cars for the municipal belt line, recently ordered by the city, will probably be rejected. It is claimed that a city inspection has revealed that it will cost at least $1,000 per car to recondition the cars if accepted. The cars were to replace those now rented from the Tacoma Railway & Power Company.

Syracuse Railway Co-ordinated Bus Lines, Syracuse, N. Y., which is controlled by the New York State Railways, has ordered five model AB four-cylinder Mack bus chassis and four 233-in. Mack model BK six-cylinder bus chassis. The Los Angeles Railway, Los Angeles, Cal., has placed orders for four urban type Twin Coaches. The Chicago & West Towns Railways, Chicago, Ill., has received five Mack model AB 225-in. bus chassis and one Mack model AB 29-passenger city type bus.

Chicago Orders Cars

Chicago Surface Lines, Chicago, Ill., has placed an order for 33 cars with the Cummings Car & Coach Company and another order for 33 cars with the J. G. Brill Company. The remaining 34 of the lot of 100 will be built in the company's own shops.. As mentioned in the Feb. 9 issue of the JOURNAL, these cars are of the large front-entrance, center-exit type. They are for two-man operation and are equipped with sufficient motor power to give quick acceleration and high running speed. Each car seats 60 passengers. Loading and unloading are facilitated by double and single folding entrance doors and double and single sliding exit doors.

Materials Ordered

The Capitol Traction Company, Washington, D. C., has recently placed orders for 275 gross tons of 7-in. 103-lb. A.E.R.E.A. grooved girder rail. This company has also ordered 530 International Steel twin ties, 300 Thermit rail welding portions, 35 gross tons of cast-iron track yokes and manhole castings for underground conduit track construction, 22 tons of malleable iron special track castings for underground conduit track, one carload of track bolts, special hook head bolts, washers, etc.

The Dallas Railway & Terminal Company, Dallas, Tex., has placed orders for one carload of creosoted pine poles and 150 21-in. rolled-steel wheels. The Portland Electric Power Company, Portland, Ore., has ordered three buses costing $35,713.

Ten tons of 500,000-circular mill cable and 6,000 No. 00 bronze trolley ears have recently been ordered by the Toronto Transportation Commission, Toronto, Ont. This railway has also ordered 300 33-in. motor wheels, 200 30-in. motor wheels, 200 26-in. motor wheels, 100 22-in. motor wheels and two sightseeing launches of 29-passenger seating capacity. The Washington Railway & Electric Company, Washington, D. C., has placed orders for 200 cedar poles, 500 ft. of 9-in. road

rail, 500 ft. of 6-in. road rail, 700 cast-iron track yokes, and 3 surface branch offs. This company also has placed orders for one Greenfield threading machine, one Westinghouse air compressor and 36 sets of Westinghouse vacuum brakes for type Z coaches.

United Railways Electric Company, Baltimore, Md., plans a motor bus service and repair building to cost approximately $275,000. The Wisconsin Power & Light Company, Madison, Wis., will soon take bids for an addition to the power plant to cost $50,000.

Buses for Public Service to Have New Features

In placing an order for 267 new buses with the Yellow Coach & Manufacturing Company, the motor coach division of General Motors Truck Corporation, it is announced by Public Service Co-ordinated Transport, Newark, N. J., that the buses will have the best system of heating and ventilation that has yet been placed in service by the company. In addition, the most modern braking equipment and engines of considerable more power than have so far been used will be installed.

The heating and ventilation will be accomplished by means of an improved hot-air system by which air is blown by electrically-operated fans over coils of hot water from the radiator. This uniformly heats the bus throughout and makes for better ventilation.

All the chassis and a few of the bodies will be built at the Pontiac, Mich., shops of General Motors but the majority of the bodies will be built at the Public Service shops in Newark. When these buses have been placed in service, Public Service will have a fleet of 2,000 buses actually in operation. The entire electrical equipment will be furnished by the General Electric Company.

The new buses will be of both the gas-electric and gas-mechanical types, the gas-electrics being used in city service and the gas-mechanics on suburban and long distance lines.

The engines will be the sleeve-valve, silent Knight type, with six cylinders. They will have higher compression and more power than those now in service.

The buses will be equipped with balloon tires, something new on the so-called city service type of bus, and will have leather seats, both of these features designed to give the greatest possible comfort to the passengers.

On the gas-eleectric drive buses there will be three sets of brakes as follows:

Westinghouse service brakes with brake shoes on rear wheels.

Independent emergency brakes on electric motor shafts operated by a hand lever.

Another set of independent electric brakes operated by the controller.

The first delivery on the order is expected sometime in May. In the meantime the bodies are already being built at the Newark shops and, as fast as the chassis arrive, they will be attached to the bodies.

Specifications on Northwestern Pacific Cars

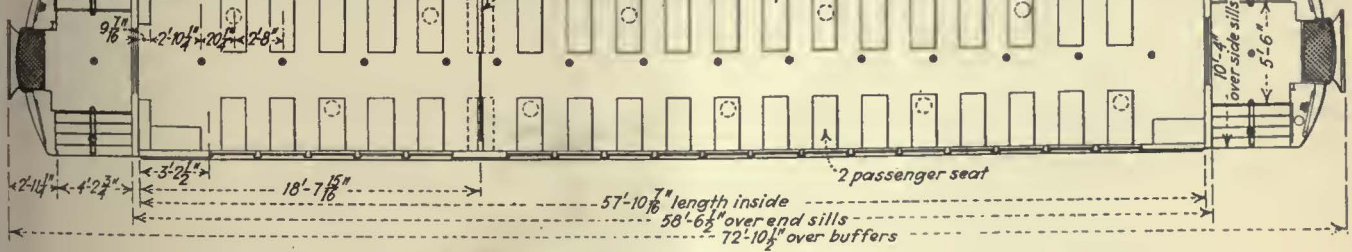
Five motor cars and five trail cars have recently been ordered by the Northwestern Pacific Railroad, San Francisco, Cal., from the St. Louis Car Company, as mentioned in the Dec. 8 issue of ELECTRIC RAILWAY JOURNAL. The motor passenger cars are of the two-man, interurban type of double-end, double-truck construction. Each car is 72 ft., 10½ in. long, 10 ft. 6 in. wide and seats 98 passengers. The bodies are of all-steel construction with aluminum arch type roofs. They are heat insulated with balsam wool, the interior having aluminum trimming. The seats are leather upholstered, being of three-passenger size on one side of the car and two-passenger on the other. Each motor car is equipped with an 18-ft., 8-in. smoking compartment and is also provided with a folding operating cab in each end. The smoking compartment seats 29 passengers.

The motor trucks have a 7-ft., 3-in. wheelbase and are equipped with inside-hung motors, 33-in. rolled steel wheels and plain type journal bearings. No trolleys are provided as power is collected through third-rail devices.

The trail cars are exact duplicates of the motor cars except that they have no smoking compartments and have a seating capacity of 103 passengers, two seats replacing the partition. These trailers are also equipped with controllers and have a truck wheelbase of 6 ft. Additional details are given in the accompanying specifications.

J. G. White Rebuys British Firms

J. G. White & Company, Inc., has announced the repurchase by them of J. G. White & Company, Ltd., of London, and in the forthcoming annual report will disclose the sale of the J. G. White Management Corporation to J. H. Pardee and J. I. Mange, president and vice-president, respectively, of the J. G. White Management Corporation. The latter company, it is now disclosed, was sold early in 1928, although no



Floor plan of the cars being built for the Northwestern Pacific Railroad by the St. Louis Car Company

Length over all	72 ft. 10½ in.
Length over body posts	58 ft. 6½ in.
Truck wheelbase	7 ft. 3 in.
Width over all	10 ft. 6 in.
Height, rail to top of roof	13 ft. ½ in.
Window post spacing	2 ft. 8 in.
Body	All steel
Roof	Aluminum arch
Air brakes	Westinghouse
Axles	Forged steel tempered and quenched
Conduit	Metal
Control	Westinghouse multiple unit
Couplers	Westinghouse automatic car air and electric
Curtain fixtures	Adams & Westlake
Curtain material	Pantasote J-86-M
Door mechanism	National Pneumatic operating interlocking and signal for sliding gates
Doors	Sliding, partition end type
Floor covering	Flexolith
Glass	Plate in doors and ends-DSAA in side sash
Hand brakes	Miner
Heat insulating material	Balsam wool
Heaters	Railway Utility single unit truss plank
Headlining	Agasote
Interior trim	Aluminum
Journal bearings	Plain
Journal boxes	Malleable iron
Motors	Westinghouse No. 557-E-7, inside hung
Registers	Ohmer
Sash fixtures	O. M. Edwards
Seats	Hale & Kilburn
Seat spacing	2 ft. 8 in.
Seating material	Leather
Steps	Stationary
Step treads	Kass
Trucks	St. Louis-Commonwealth
Ventilators	Globe
Wheels, type	Rolled steel 33 in. diameter
Wheelguards or fenders	Plain

formal announcement has heretofore been made. These changes leave J. G. White & Company, Inc., with two subsidiaries, namely, the J. G. White Engineering Corporation and J. G. White & Company, Ltd., of London.

The British company, organized more than twenty years ago by J. G. White, was sold to their interests at the outbreak of the World War. Increasing foreign business of J. G. White & Company, Inc., and the J. G. White Engineering Corporation is the reason given for the recent repurchase, arrangements for which were made by J. Dugald White, vice-president of the New York company. The British subsidiary, which until this time has been engaged chiefly in engineering activities, will have facilities for acting in the investment banking field as well.

Railway Construction in Italy

The only means of communication with the Republic of San Marino, in the heart of Italy, is by carriage or motor from Rimini, the nearest Italian city having railway connection, a distance of 15 miles, according to Consul Joseph Emerson Haven, Florence. Direct railway connection with the capital of the republic has long been desired by the San Marinese, and on March 26, 1927, a convention between the Kingdom of Italy and the Republic of San Marino was signed, with regard to the erection of an electric railway line, the construction of which was assigned to an Italian company. Work was commenced on Dec. 2, 1928, and it was announced at that time that the line would be completed and in operation in two years. Ten tunnels will be necessary, and near the town of Serraville a bridge will be required across the Ausa River. It is thought that there may be opportunity for American business, although rolling stock, electrical material, etc., will be of Italian production in so far as possible.

Weekly Business Conditions

The volume of trade during the week ended March 2, as reflected by check payments, was smaller than in the preceding week but greater than a year ago, according to the weekly statement of the Department of Commerce. Industrial activity, as indicated by operations in steel plants, was also greater than during either comparative period. The production of bituminous coal during the latest reported week, while somewhat lower than during the preceding week, was substantially larger than in the similar week of 1928. The output of lumber showed a gain over the preceding week but a decline from a year ago. Petroleum production was running considerably in excess of last year. Freight-car loadings covering the latest week showed a gain over the corresponding period of 1928.

Prices for copper, cotton, iron and steel were generally higher than in either prior comparative period. Loans and discounts of federal reserve member banks showed only slight change from the preceding week but were higher than a year ago. Interest rates on call loans averaged higher than in either the preceding week or the similar week of last year. Bond prices averaged lower than in either period. Prices for stocks showed gains over both periods.

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

	March 5, 1929
Metals—New York	
Copper electrolytic, cents per lb.	19.275
Copper wire, cents per lb.	21.375
Lead, cents per lb.	7.25
Zinc, cents per lb.	6.7
Tin, Straits, cents per lb.	48.875
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.425
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago, net tons	1.425
Central, Ill., screenings, Chicago, net tons	1.075
Kansas screenings, Kansas City, net tons	1.70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.35
Weatherproof wire base, N. Y., cents per lb.	22.375
Cement, Chicago net prices, without bags	2.05
Linseed oil (5-bbl. lots) N. Y., cents per lb.	11
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.5
Turpentine (bbl. lots), N. Y., cents per gal.	61.5

Improvements to Be Made in London

Extensive improvements are to be made during this year by the Underground Electric Railway, London, England, according to a recent announcement by that company. Escalators are to be installed at Highgate and Camden Town stations, and the Charing Cross station improvements will be completed. A number of stations will be rebuilt and improved, and the new Underground Building at St. James Park station will be completed. An automatic ticket system will also be introduced at this station.

Three hundred and seventy-two additional cars were put into service on the Hampstead and City, Bakerloo and Piccadilly tubes. Ninety-one new motor cars will be placed in service on the District Railway. Many additional improvements will be made including the installation of a 15,000-kw. set, new boilers and new switchgear at the Lots Road Carhouse.

More than 1,000 omnibuses will be equipped with pneumatic tires. The Elmers End garage will be completed and two new garages will be constructed in north and west London. New motor coaches will be introduced for private hire service. Two new cars of the modern type will be added and the uncovered topped cars will be converted into covered cars. Additional cars in the South Metropolitan Electric Tramways will be remodelled.

Weekly Business Indicators

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

	1929				1928			
	Mar. 2	Feb. 23	Feb. 16	Feb. 9	Mar. 3	Feb. 25	Feb. 18	Feb. 11
Steel operations	.....	117.1	114.5	113.2	109.0	111.0	112.0	111.0
Bituminous coal production	.....	120.7	122.5	124.1	103.0	104.4	96.2	100.0
Lumber production	.....	96.4	84.1	81.8	101.4	108.6	106.4	104.5
Petroleum production (daily aver.)	.....	.....	128.4	129.3	113.2	112.8	113.4	113.3
Bldg. contracts 37 states (daily av.)	124.5	93.1	85.1	79.8	111.0	122.2	114.9	117.3
Price iron and steel, composite	87.9	87.6	87.6	87.6	86.5	86.0	86.0	86.0
Copper, electolytic, price	.....	129.0	129.0	129.0	100.0	100.0	100.0	100.7
Bank loans and discounts	.....	129.5	129.9	130.1	121.2	120.4	121.1	121.3
Interest rates, call money	187.9	169.7	169.7	163.6	109.1	103.0	109.1	112.1
Business failures	131.9	101.0	117.0	135.1	126.8	118.7	127.8	134.2
Interest rates, time money	177.1	177.1	177.1	171.4	105.7	105.7	105.7	102.9
Federal reserve ratio	90.2	91.4	90.1	89.4	95.6	96.4	95.5	95.6

TRADE NOTES

NACHMAN SPRING-FILLED CORPORATION, Chicago, Ill., recently purchased the plants and business of the National Spring & Wire Company and the Marshall Company, Grand Rapids, Mich. The Grand Rapids plants will operate as the automotive division of the Nachman Spring-Filled Corporation under the name of the National-Marshall Spring Corporation by Mr. James L. McInerney, former president. In addition to assuming the presidency and direction of the National-Marshall Spring Corporation, Mr. McInerney will be retained as an executive of the Nachman Spring-Filled Corporation. The Nachman factory at Los Angeles, Cal., will continue to serve the Pacific coast enterprises as it has in the past.

H. A. BAKER, of Schenectady, N. Y., has been appointed service manager of the International General Electric Company, with headquarters in New York City. Mr. Baker succeeds C. F. Neave, who has been named manager of the newly organized refrigeration department of the company.

GEORGE H. SCRAGG is once more actively associated with the Mack International Motor Truck Corporation, New York, N. Y. Mr. Scragg has only recently returned from an extended trip which took him to the West Indies and Europe.

CUTLER-HAMMER Manufacturing Company, Milwaukee, Wis., announces that it has acquired the business of the Trumbull Vanderpoel Electric Manufacturing Company, Bantam, Conn., which will be operated as a subsidiary of the Cutler-Hammer company under its present name. This purchase will add a complete line of meter service and safety switches to the present Cutler-Hammer line of motor control, wiring devices and allied electrical items.

Smooth starting . . . rapid pickups . . . quiet operation . . . power savings . . . riding comfort . . . when car journals are equipped with . . .

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

The operating economies and better riding qualities made possible by the application of Hyatts are well known to many city and interurban car companies through actual service.

Hundreds of Hyatt equipped cars in various parts of the country today are evidence of Hyatt acceptance and faithful performance.

To those who may not be acquainted with Hyatt contributions to increased public good will and patronage, we welcome the opportunity of presenting facts and figures on anti-friction bearing journals.

The changeover to existing equipment, or their adoption to new cars, is made easy through Hyatt conformance to A. E. R. A. standards.

From whatever angle you look at it, the Hyattway is the Saving Way . . . the Right Way.

Hyatt Roller Bearing Journal Boxes fit A. E. R. A. pedestals, size for size. Existing equipment can be modernized by their adoption just as easily as they are applied to new equipment.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Oakland

The Preferred Truck and Bus Rim of the Future—

Goodyear Type "K" Rim

BECAUSE the Goodyear Type "K" Rim is mechanically right, strong, light, and easy to operate, the truck user prefers them. Bus and truck manufacturers are rapidly adopting the Type "K" Rim.

Fleet owners find these rims a real economy because they provide a quick, easy tire change —cool running—minimum weight with truck rim strength at no extra cost.

The 18° single bevel mounting gives a rim that will stay tight on the wheel whether mounted as singles or duals. This exclusive feature, together with the amazingly easy tire application and removal regardless of the size of the tire or how badly the tire may be rusted to the rim, makes Goodyear Type "K" Rims popular with "the man who changes the tires."

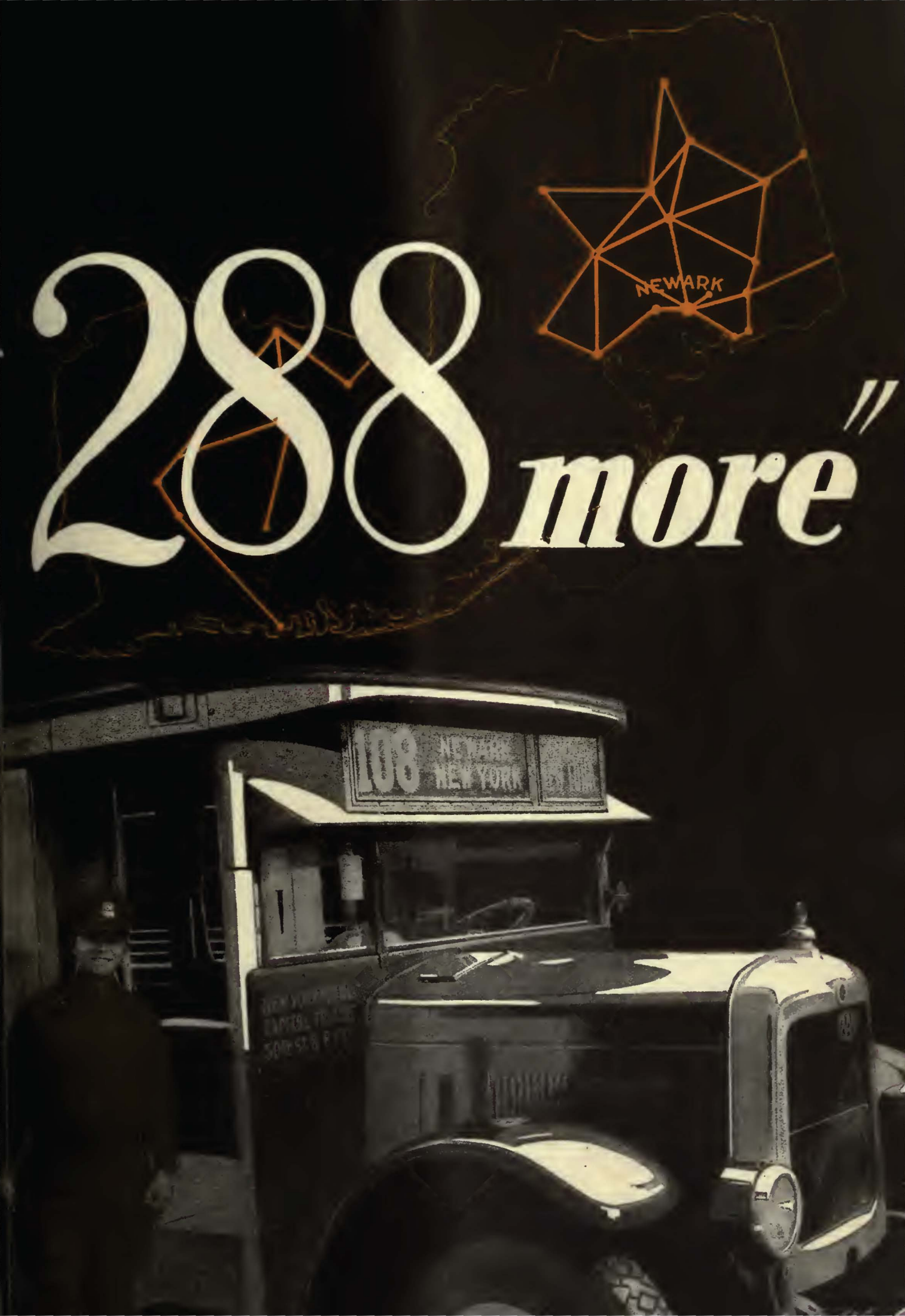
Modernizing solid-tire-equipped trucks is conveniently and economically accomplished through the use of Goodyear Type "K" single or dual felloe equipment, or Type "K" spider wheel equipment which fits the same hubs as Budd disc wheels.

Type "K" Rim, felloe and spider wheel equipment available through Rim Distributors throughout the country.

Write today to Akron, Ohio, or Los Angeles, California, for detailed information. Goodyear offers truck and bus manufacturers the fullest co-operation of its engineering staff.

GOODYEAR

Type "K" Truck & Bus Rim Equipment


NEWARK
288 more"
108
NEWARK
NEW YORK

Another *big order*, another *repeat* order, the *10th repeat order* has been placed by America's largest Coach operator for

288 more

YELLOW COACHES

Public Service
Co-ordinated Transport

Interesting Facts About Public Service

Total Buses Owned, Over 2000

Yellow Coaches Owned, 1203

Miles Operated, 64,000,000

Passengers Carried, 400,000,000

Miles of Bus Route, Over 1500

Number of Operating Garages, 33

Municipalities Served, Over 300

FIVE years ago, in January, 1924, the Public Service Co-ordinated Transport owned and were operating in the city of Newark, N. J., a total of 27 motor coaches.

Today this same company ranks first in America in number of coaches owned, in number of coach miles operated, in number of passengers carried, and its system of motor coach transportation now covers the greater part of the State of New Jersey.

Public Service Co-ordinated Transport is by far the largest bus operation in this country, and one of the most successful.

If the real inside history of the successful bus operating experience of this company could be written, it would begin with the story of a progressive management that foresaw the great economies that could be effected through co-ordination and standardization, and were not lacking in the necessary courage

and perseverance to achieve their ideals.

The economic results made possible by the adoption of this far-sighted policy is now conspicuously apparent.

The reduction in operating and maintenance costs effected through the standardization of operating equipment, supplemented by a well-planned system of co-ordinated operation, and of decentralized service, has dramatically confirmed the soundness of the early forecasts made for it.

And when a company is operating 60 million miles a year, a material saving on each mile operated quickly runs into worthwhile figures.

That this progressive company should now be operating over 10 million dollars' worth of Yellow equipment is no mere coincidence.

That there were sound dollars and cents reasons, based on progressive operating-cost experience, that influenced the placing of each of the eleven successive orders for Yellow equipment, is equally obvious.

The first order for Yellow equipment, placed in January, 1924, was for 2 coaches. The next order was for 24. The next for 50. Then came an order in December, 1925, for 333—the largest single coach order ever placed, although in January, 1928, an order was placed for 331.

Each year more and more Yellow equipment has been added. The last order just placed for 288 Gas-Mechanical and Gas-Electric Yellow Coaches brings the grand total of Yellow Coaches owned to over 1200.

And of this number not one Yellow Coach has been withdrawn from active service.

It is with honest pride that we again repeat—

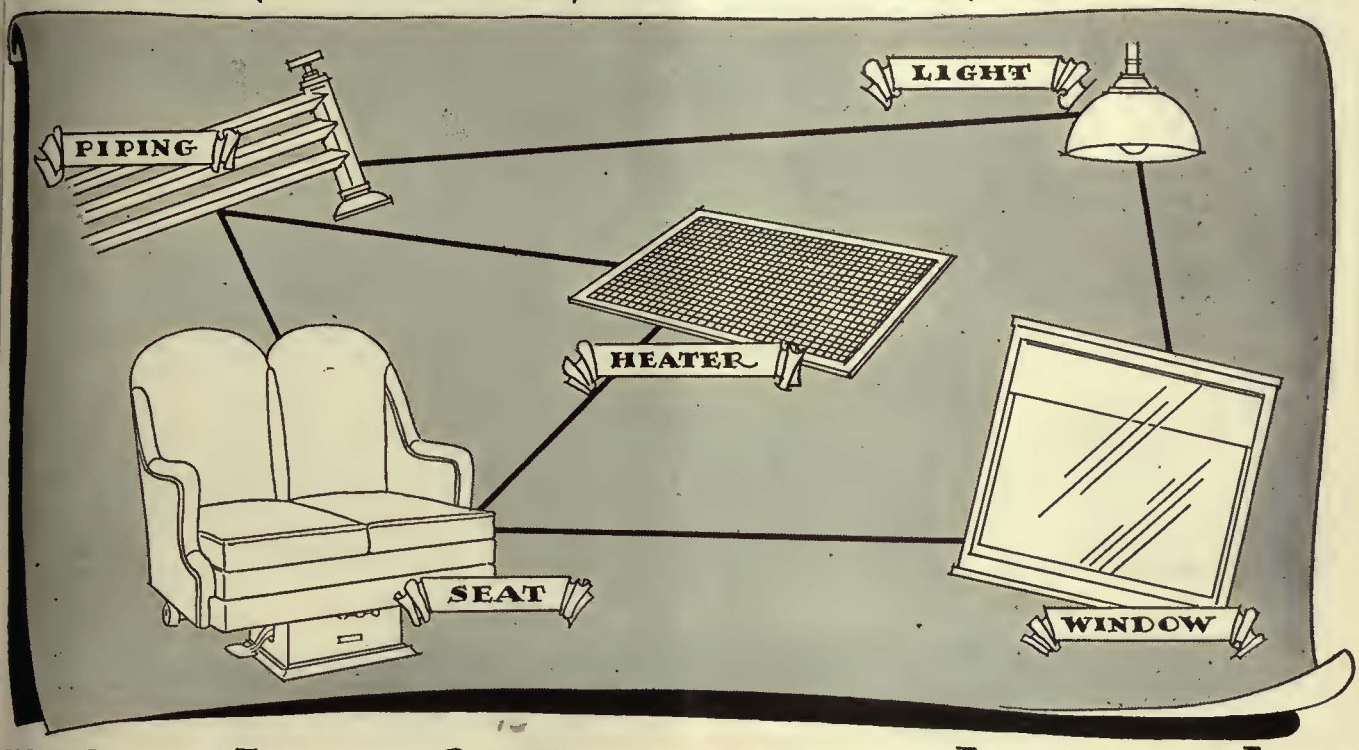
"Salesmanship may play a part in the initial purchase—but repeat orders are placed on the strength of performance and knowledge gained by experience."

The last order for 288 Yellow Coaches brings the grand total of Yellow equipment owned and operated by Public Service Co-ordinated Transport to over 1200, *and of this fleet not one Yellow Coach has been withdrawn from active service.*

YELLOW COACHES

General Motors Truck Company, Pontiac, Michigan

A PROBLEM *in* SEATING



Bring these factors properly together

A STREET railway car is primarily designed for movement but an equally important purpose is to seat your passengers and seat them *comfortably*.

When the trucks and motors have been taken care of, therefore, the important issue becomes a problem of seats and seat arrangement. If the car is built without this consideration, the seats must be fitted in somewhat as an afterthought. They must be accommodated *to the car* and they cannot, in this way, be arranged for greatest comfort and convenience.

A Hale & Kilburn seating engineer can, therefore, render his most valuable service if called in while the car is still but a project in mind. He can, at this time, consider not only the arrangement of the seats with respect to spacing but in relation to the windows, lights and heaters, mode of boarding and alighting and all other comfort and convenience factors in the car.

If, in other words, these comfort and convenience factors are brought into proper relation at the very outset, the car can be built to *accommodate* such an arrangement rather than the seats arranged, as best they can be, to accommodate the car. The completed car thus best fulfills its most important function—that of pleasing and attracting riders.

HALE & KILBURN SEATS

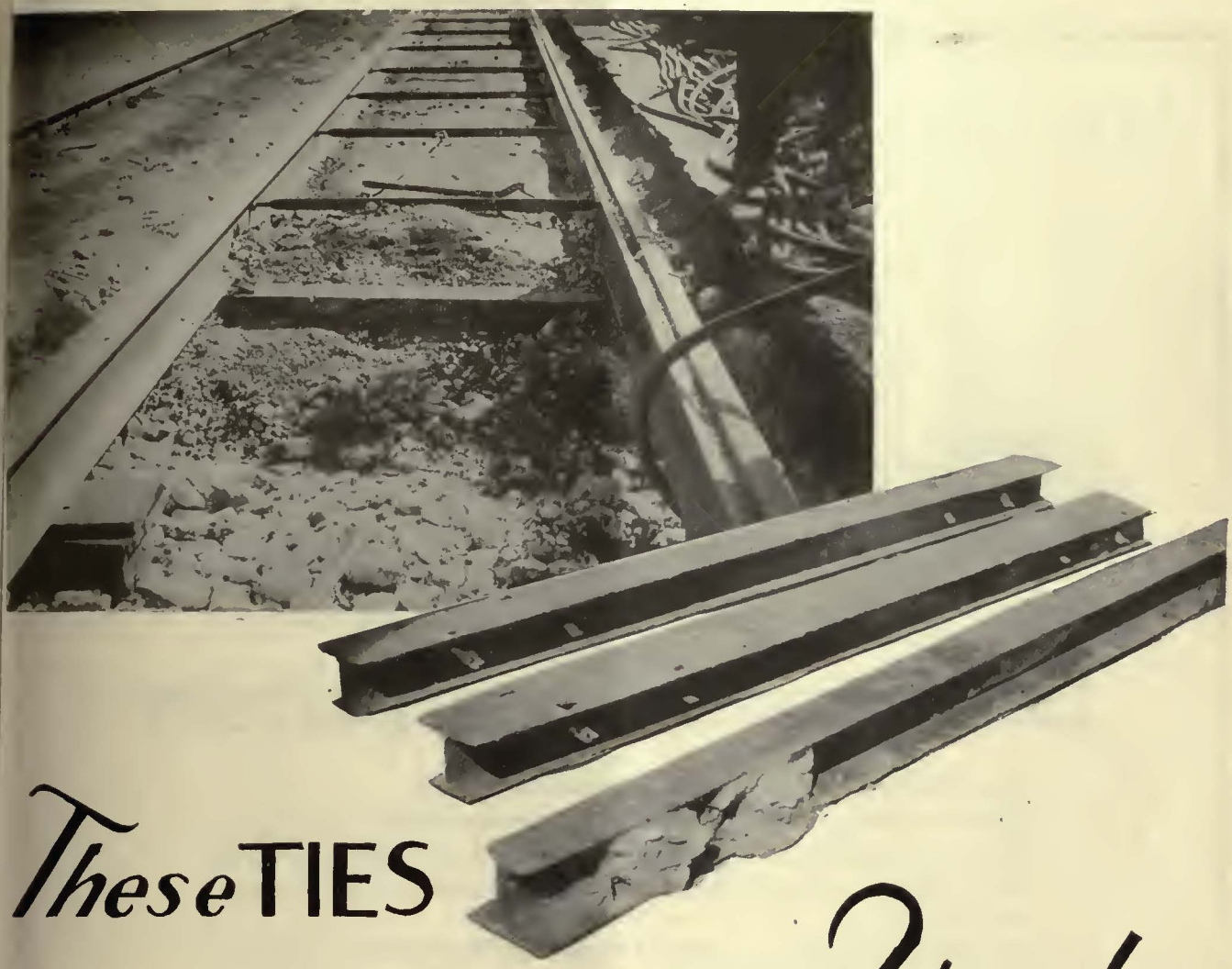
"A Better Seat for Every Type of Modern Transportation Service"

HALE & KILBURN COMPANY

General Offices and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co., Graybar Bldg., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta
Frank F. Bodler, 903 Monadnock Bldg., San Francisco
T. C. Coleman & Son, Starks Bldg., Louisville
W. L. Jefferies, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 146 N. Sixth St., Portland, Oregon
C. S. Wright Co., 66 Temperance St., Toronto, Ont., Canada



These TIES Answer Yes!

Does it pay to use steel ties in track construction? The Carnegie Steel Cross Ties pictured above are old enough to vote and will add their voice to the affirmative. In 1907 they were laid in the tracks of the Chicago Surface Lines. Recently uncovered, it was decided to rerail the ties inasmuch as they were in such splendid condition. Twenty-two years of service and still going strong!

Yes! It pays to use Carnegie Steel Cross Ties. Nor is long service their only dividend. They provide a track that is free from interruptions for track repairs—a smooth track on which your passengers ride swiftly, safely and comfortably. Passenger appeal starts with the track. A poor track not only offsets the advantages of luxurious rolling equipment, but hastens it to a premature discard. In your 1929 track construction program, plan to include Carnegie Steel Cross Ties—an investment that pays dividends.

Booklet on Request.

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION

CARNEGIE BUILDING—PITTSBURGH, PA.

1955

Bankers and Engineers

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

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

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

Proposals, 40 cents a line an insertion.

INFORMATION:

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

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

DISPLAYED—RATE PER INCH:

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

Other spaces and contract rates on request.

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

R.J.

POSITIONS WANTED

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

SUPERINTENDENT transportation, broad experience, established successful record city, interurban railways, buses. Will accept position of assistant with future. Salary and location secondary importance. Fine references. PW-162, Electric Railway Journal, Tenth Ave. at 36th St., New York.

POSITION VACANT

MANAGER

Experienced street railway man wanted on eastern property operating 75 cars. Must be familiar with all phases of street railway work and successful in public relations. Technical education desirable. Good opportunity for advancement. Apply giving details and references. State salary expected.

PV-163, Electric Railway Journal
Tenth Ave. at 36th St., New York City.

OFFICIAL PROPOSAL

Bids: March 22.

Signal System

New York, N. Y.

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

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

JOHN H. DELANEY,
Chairman.

FRANCIS J. SINNOTT,
Secretary.

March 5, 1929.

FOR SALE

Center Entrance Trailers

5—Kuhlman Car Co., mounted on Brill 67-F trucks with 24-in. steel wheels; equipped with G. E. air brakes. Seating capacity 58. Length over-all 47 ft. Very good condition. Low price for quick sale.

Erie Railways Co., 231 State St., Erie, Pa.

FOR SALE

D. C.—550 Volt Units

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

All motors now in service, but will be released in about 10 days. Can be inspected at Wedron, Ill.

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

25,644

In one year alone, 25,644 advertisements were published in the Searchlight Sections of the McGraw-Hill Publications.

The thousands of orders received by the Searchlight Department every year have given us the experience necessary for handling *your* orders promptly and efficiently.

Write, Wire, 'Phone

SEARCHLIGHT DEPT.

Tenth Avenue at 36th St., New York

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

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

Advertising, Street Car
Collier, Inc., Barron G.

Air Brakes
General Electric Co.
Westinghouse Tr. Br. Co.

Air Circuit Brenkers
Roller-Smith Co.

Ammeters
Roller-Smith Co.

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

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

Automatic Regulators, Voltage, Current & Synchronizing
American Brown Boveri Electric Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Illinois Steel Co.
Westinghouse E. & M. Co.

Babbitting Devices
Columbia Machine Works

Badges and Buttons
Elec. Service Supplies Co.
International Reg. Co., The

Batteries, Dry
Nichols-Lintern Co.

Bearings, Anti-Friction
Hyatt Roller Bearing Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Westinghouse E. & M. Co.

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

Bearings, Roller
Hyatt Roller Bearing Co.

Bells and Buzzers
Consolidated Car Htg. Co.

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

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Brill Co. The J. G.

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

Bolts and Nuts, Track
Illinois Steel Co.

Bond Testers
Electric Service Supplies Co.
Roller-Smith Co.

Bonding Apparatus
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

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

Books
McGraw-Hill Book Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
Bates Expanded Steel Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Brake Adjusters
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
American Brake Shoe & Found. Corp.
Bemis Car Truck Co.
Brill Co., The J. G.

Brake Testers
National Ry. Appliance Co.

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

Brakes, Magnetic Rail
Cincinnati Car Co.

Brushes, Carbon
General Electric Co.
Morganite Brush Co., Inc.
Westinghouse E. & M. Co.

Brushes, Graphite
Morganite Brush Co., Inc.

Brushholders
Columbia Machine Works
General Electric Co.

Buses
Twin Coach Corp.

Buses, Motor
General Electric Co.
General Motors Truck Co.

Bus Lighting
National Ry. Appliance Co.

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

Cables (See Wires and Cables)

Cambric Tapes, Yellow and Black Varnish
General Electric Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

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

Car Steps, Safety
Cincinnati Car Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Carbon Brushes (See Brushes, Carbon)

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

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

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

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

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

Castings, Brass Composition or Copper
Cincinnati Car Co.
Columbia Machine Works

Castings, Gray Iron and Steel
American Brake Shoe & Found. Corp.
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works
Standard Steel Works

Castings, Malleable & Brass
American Brake Shoe & Found. Corp.
Bemis Car Truck Co.
Columbia Machine Works

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

Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co.

Change Trays
Cincinnati Car Co.

Circuit Breakers
American Brown Boveri Electric Co.
General Electric Co.
Roller-Smith Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners
Oakite Products, Inc.

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

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

Coils, Armature and Field
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

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

Coin Changers
Johnson Fare Box Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Reg. Co., The
Johnson Fare Box Co.

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

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slitters
Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

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

Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.

Condensers
General Electric Co.
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Htg. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

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

Controller Regulators
Elec. Service Supplies Co.

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

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

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
International Reg. Co., The
Roebling's Sons Co., John A.

Cord Connectors and Couplers
Elec. Service Supplies Co.

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

Cowl Ventilators
Nichols-Lintern Co.

Cranes, Hoists & Lifts
Electric Service Supplies Co

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

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

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

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

Crossings, Track (See Track Special Work)

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

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

Cutting Apparatus
General Electric Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse Tr. Br. Co.

Dealers' Machinery & Second Hand Equipment
Erie Railway Co.
Weblon Silica Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Works
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

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

Doors, Folding Vestibule
National Pneumatic Co.
Safety Car Devices Co.

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

Drills, Track
Electric Service Supplies Co.
Ohio Brass Co.

Drum Truing Lathes
Nat'l Rlwy. Appliance Co.

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

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

Electric Grinders
Railway Trackwork Co.

Electrical Wires and Cables
John A. Roebling's Sons Co.

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

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

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

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Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Rlwy. Appliance Co.
Perey Mfg. Co.

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Electric Service Supplies Co.
Johnson Fare Box Co.

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Brill Co., The J. G.
Cincinnati Car Co.
Star Brass Works

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General Electric Co.

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American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Frogs, Track (See Track Work)

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

Furnaces, Electric
American Brown Boveri Electric Co.

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Consolidated Car Htg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Gas Electric Drive for Buses
General Electric Co.
Nat'l Rlwy. Appliance Co.

Gas Producers
Westinghouse E. & M. Co.

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Gasoline
Texas Co., The

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

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

Gear Cases
Columbia Machine Works
Electric Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Columbia Machine Works
Electric Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.

Generators
American Brown Boveri Electric Co.
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gongs (See Bells and Gongs)

Grease
Texas Co., The

Grinders & Grinding Supplies
Metal & Thermit Corp.

Grinders, Portable
Railway Trackwork Co.

Grinders, Portable Electric
Railway Trackwork Co.

Grinding Bricks and Wheels
Railway Trackwork Co.

Guard Rail Clamps
Lorain Steel Co.
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Harps, Trolley
Columbia Machine Works
Elec. Service Supplies Co.
Ohio Brass Co.
Star Brass Works

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Headlining
Columbia Machine Works

Heaters, Car (Electric)
Consolidated Car Heating Co.
Railway Utility Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Smith Heater Co., Peter

Heaters, Car Stove
Smith Heater Co., Peter

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Railway Trackwork Co.
Una Welding & Bonding Co.

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Columbia Machine Works

Hose, Bridges
Ohio Brass Co.

Hose, Pneumatic
Westinghouse Tr. Brake Co.

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General Electric Co.
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Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.

Insulation (See also Paints)
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Ohio Brass Co.

Insulators (See also Line Materials)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

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Columbia Machine Works
Elec. Service Supplies Co.

Joints, Rail
(See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.

Lamp Guards and Fixtures
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
General Electric Co.
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Elec. Service Supplies Co.
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Nichols-Lintern Co.

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Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
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Locomotives, Diesel Electric
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Locomotives, Electric
American Brown Boveri Electric Co.
Cincinnati Car Co.
General Electric Co.
Westinghouse E. & M. Co.

Lubricants
Texas Co., The

Lubricants, Oils & Grease
Texas Co., The

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

Manganese Steel Castings
Bemis Car Truck Co.
Lorain Steel Co.

Manganese, Steel, Special Track Work
Bethlehem Steel Co.
Wm. Wharton, Jr. & Co.

Manganese Steel Switches Frogs and Crossings
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

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Cincinnati Car Co.

Motor Buses, (See Buses)

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American Brown Boveri Electric Co.

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

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General Electric Co.

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Brill Co., The J. G.
Cincinnati Car Co.
Elec. Service Supplies Co.

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American Steel Foundries
Bemis Car Truck Co.
Cincinnati Car Co.

Ohmmeters
Roller-Smith Co.

Oil
Texas Co., The

Omnibuses (See Buses)

Oxy-Acetylene (See Cutting Apparatus)

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Elec. Service Supplies Co

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National Ry. Appliance Co.

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Elec. Service Supplies Co.
Ohio Brass Co.

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Elec. Service Supplies Co.

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American Steel Foundries
Ohio Brass Co.
Westinghouse Tr. Brake Co.

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Standard Steel Works
Westinghouse Tr. Brake Co.

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Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Supplies Co.

Pole Line Hardware
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
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Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.

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Intern. Creos. & Const. Co.

Poles and Ties, Treated
Bell Lumber & Pole Co.
Intern. Creos. & Const. Co.

Poles, Trolley
Elec. Service Supplies Co.

Poles, Tubular Steel
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Elec. Service Supplies Co.

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Railway Trackwork Co.

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Okonite-Callender Cable Co., Inc.

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National Ry. Appliance Co

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Pressure, Regulators
General Electric Co.
Westinghouse E. & M. Co.
Westinghouse Tr. Brake Co.

Punches, Ticket
International Reg. Co., The

Rail Braces and Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Illinois Steel Co.
Rail Joint Co.

Rail Joints, Welded
Lorain Steel Co.
Metal & Thermit Corp.

Rail Welding
Metal & Thermit Corp.
Railway Trackwork Corp.
Una Welding & Bonding Co

Rails, Steel
Carnegie Steel Co.
Illinois Steel Co

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

Rattan
Brill Co., The J. G.
Cummings Car & Coach Co
Elec. Service Supplies Co
Hale-Kilburn Co.

Rectifiers Mercury Arc Power
American Brown Boveri Electric Co.

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Brill Co., The J. G.
Cincinnati Car Co.
Elec. Service Supplies Co.
International Reg. Co., The

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Bethlehem Steel Co.

Repair Shop Appliances (See also Coil Handling and Winding Machines)
Elec. Service Supplies Co

Repair Work (See also Coils)
Westinghouse E. & M. Co.

Replacers, Car
American Steel Foundries
Cincinnati Car Co.
Elec. Service Supplies Co.

Resistance
Consolidated Car Htg. Co.
General Electric Co.

Resistance, Wire and Tube
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Safety Control Devices
Safety Car Devices Co.

Sanders, Track
Brill Co., The J. G.
Elec. Service Supplies Co
Nichols-Lintern Co.
Ohio Brass Co.

Sash Fixtures, Car
Brill Co., The J. G.
Cincinnati Car Co.

Sash, Metal Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers Track)

Screw Drivers, Rubber Insulated
Elec. Service Supplies Co.

Seating Materials
Brill Co., The J. G.
Hale-Kilburn Co.

Seats, Bus
Brill Co., The J. G.
Hale-Kilburn Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.

Second Hand Equipment
Erie Railway Co.
Webion Silica Co.

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

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Brill Co., The J. G.

Shovels, Power
Brill Co., The J. G.

Side Bearings (See Bearings Center and Side)

Signals, Car Starting
Consolidated Car Htg. Co.
Elec. Service Supplies Co
National Pneumatic Co.

Signals, Indicating
Nichols-Lintern Co.

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Elec. Service Supplies Co
Nachod and United States Electric Signal Co.

Signal Systems, Highway Crossing
Nachod and United States Electric Signal Co.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Cincinnati Car Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.

Smokestacks, Car
Nichols-Lintern Co.

Snow Plows
National Ry. Appliance Co

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Columbia Machine Works

Snow Sweeper, Rattan
J. G. Brill Co.

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Lorain Steel Co.
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Illinois Steel Co.

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Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs
National Ry. Appliance Co.

Springs, Car and Truck
American Steel Foundries
Bemis Car Truck Co.
Brill Co. The J. G.
Cincinnati Car Co.
Standard Steel Works

Sprinklers, Track and Road
Brill Co., The J. G.

Steel, Electric Furnace
American Steel Foundries

Steel, Open Hearth
American Steel Foundries

Steel and Steel Products
American Steel Foundries
Carnegie Steel Co.
Illinois Steel Co.

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

Stokers, Mechanical
Westinghouse E. & M. Co.

Stop Signals
Nichols-Lintern Co.

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

Strand
Roebling's Sons Co., J. A.

Street Cars (See Cars, Passenger, Freight, Express)

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American Brown Boveri Electric Corp.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switch Stands and Fixtures
Ramapo-Ajax Corp.

Switches
American Brown Boveri Electric Corp.
General Electric Co.

Switches, Selector
Nichols-Lintern Co.

Switches and Switchboards
Consolidated Car Htg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Switches, Tee Rail
Ramapo-Ajax Corp.

Switches, Track (See Track Special Work

Synchroscopes
Roller-Smith Co.

Tampers, Tie
Railway Trackwork Co.

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

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Elec. Service Supplies Co.

Telephone & Telegraph Wire
John A. Roeblings Sons Co.

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Consolidated Car Htg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers and Destroyers
Elec. Service Supplies Co.

Tie Plates
Illinois Steel Co.

Ties & Tie Rods, Steel
Carnegie Steel Co.
International Steel Tie Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

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Goodyear Tire & R. Co.

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Johnson Fare Box Co.

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Wm. Wharton, Jr. & Co.

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Elec. Service Supplies Co.
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Railway Trackwork Co.
Ramapo-Ajax Corp.

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Bates Expanded Steel Truss Co.
Westinghouse E. & M. Co.

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Metal & Thermit Corp.
Railway Trackwak Co.
Ramapo-Ajax Corp.

Track, Special Work
Columbia Machine Works
Ramapo-Ajax Corp.

Trackless Trolley Cars
Brill Co., The J. G.

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General Electric Co.
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Treads, Safety Stair, Car Step
Cincinnati Car Co.

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Okonite-Callender Cable Co.

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Ohio Brass Co.

Trolley Bases, Retrieving
Ohio Brass Co.

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Brill Co., The J. G.
Twin Coach Corp.
Westinghouse E. & M. Co.

Trolley Material, Overhead
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Pins
Bemis Car Truck Co.

Trolley Wheel Bushings
Star Brass Works

Trolley Wheels (See Wheels Trolley)

Trolley Wire
Roebling's Sons Co., J. A.

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

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Elec. Service Supplies Co.

Turnstiles
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Perey Mfg. Co., Inc.

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Westinghouse Tr. Br. Co.

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Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Htg. Co.
Nichols-Lintern Co.
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Railway Utility Co.

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Roller-Smith Co.

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Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.

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General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welders, Rail Joint
General Electric Co.
Railway Trackwork Co.

Welding Processes and Apparatus
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

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Railway Trackwork Co.
Roebling's Sons Co., J. A.

Welding Wire
Railway Trackwork Co.
Roebling's Sons Co., J. A.

Welding Wire and Rods
Railway Trackwork Co.

Wheel Guards (See Fenders and Wheel Guards)

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Wheels, Car, Cast Iron
Griffin Wheel Co.

Wheels, Car, Steel & Steel Tire
American Steel Foundries
Bemis Car Truck Co.
Carnegie Steel Co.
Illinois Steel Co.
Standard Steel Works

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Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Star Brass Works

Wheels, Wrought Steel
Carnegie Steel Co.
Illinois Steel Co.

Whistles, Air
Ohio Brass Co.
Westinghouse E. & M. Co.
Westinghouse Tr. Br. Co.

Window Guards & Fittings
Cincinnati Car Co.

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Roebling's Sons Co., J. A.

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General Electric Co.
Okonite Co.
Okonite-Callender Cable Co.
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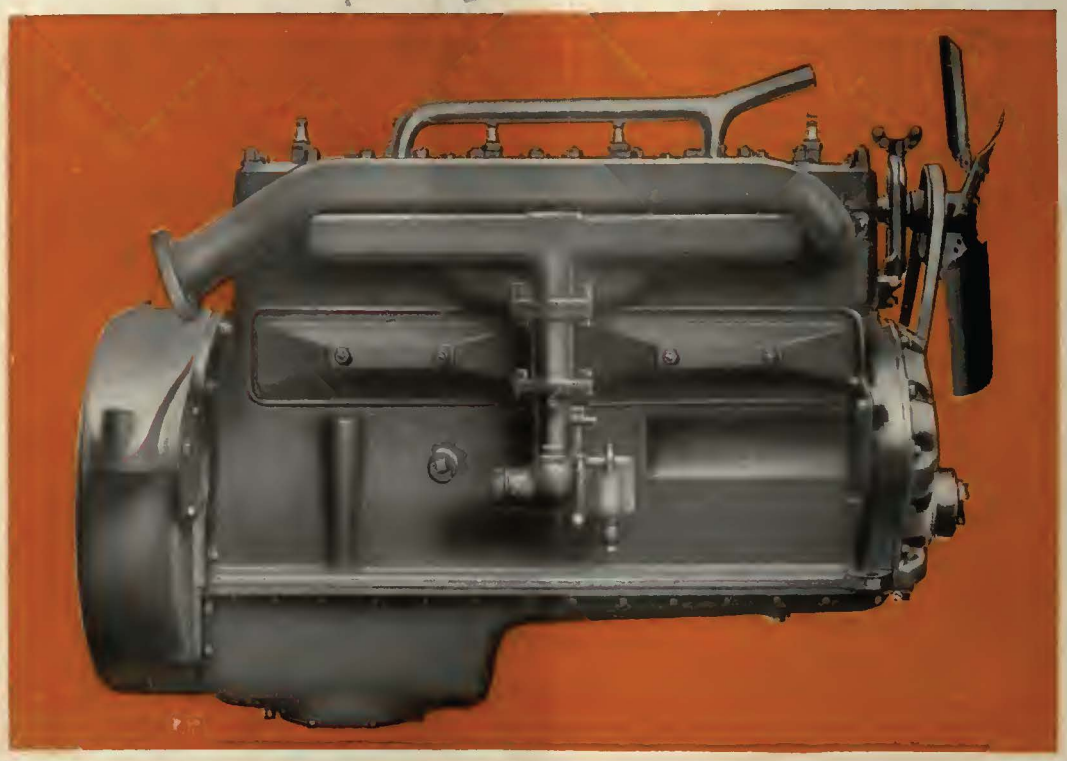

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THEY TAKE BETTER CARE OF THEMSELVES

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