

ELECTRIC RAILWAY JOURNAL

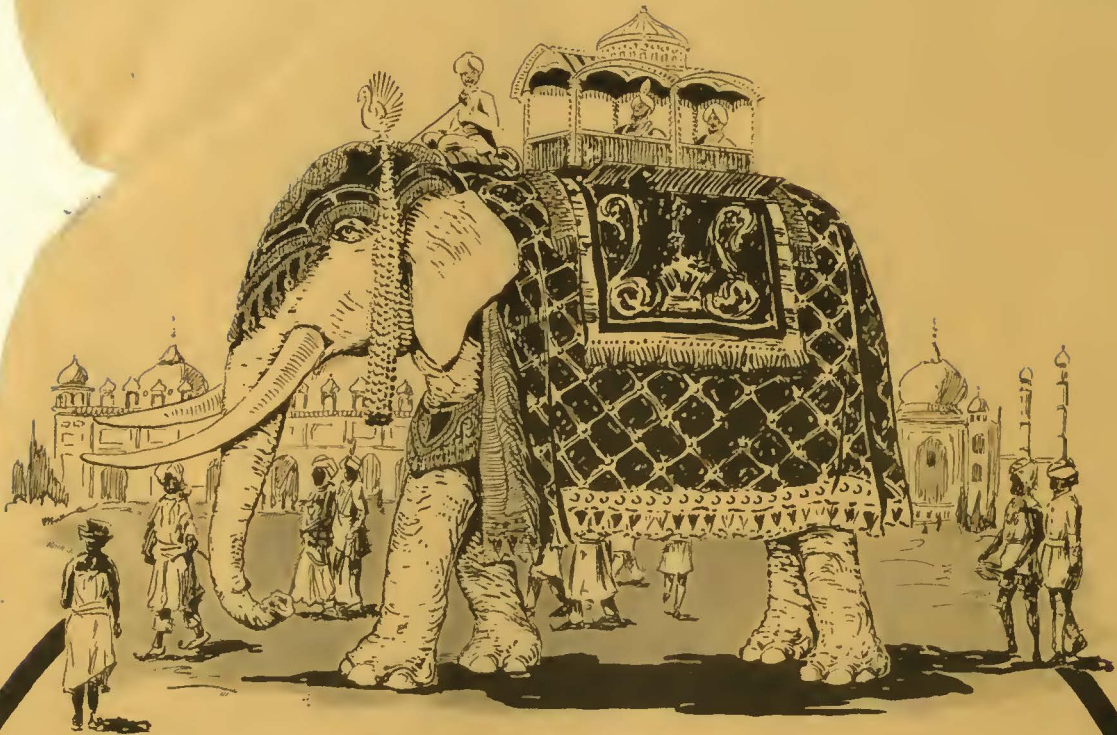


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ELECTRIC RAILWAY JOURNAL

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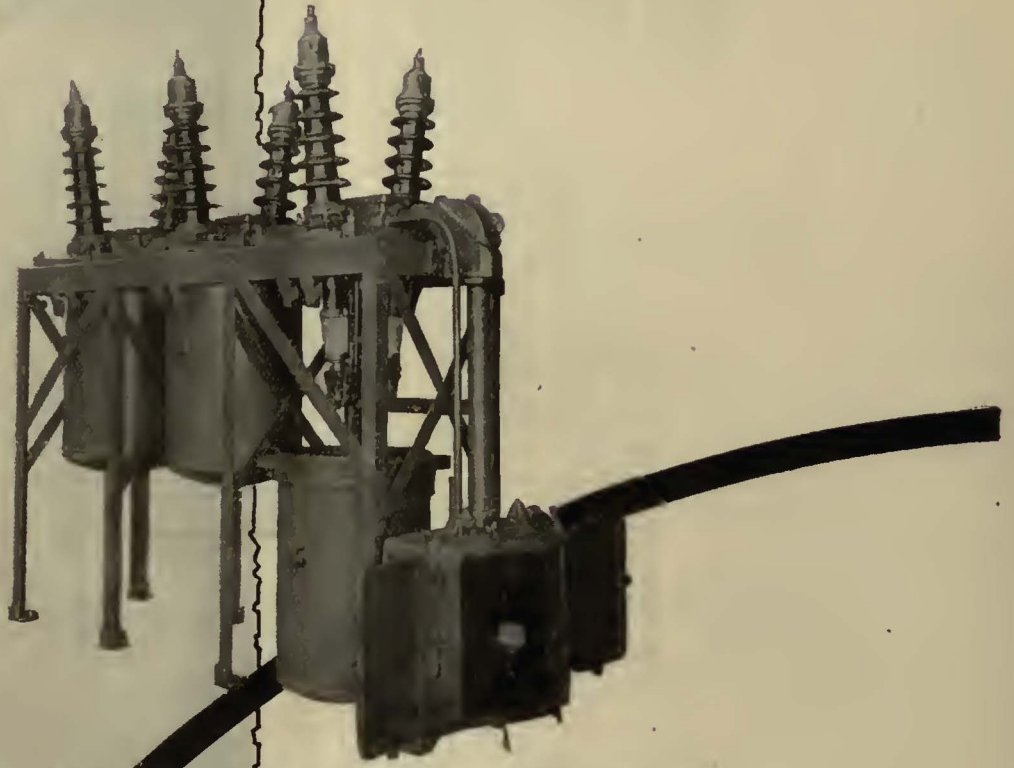
What Good Is It?

MANY years ago William Morris said: "Have nothing in your room which you do not believe to be beautiful or know to be useful."

You have a copy of the ELECTRIC RAILWAY JOURNAL in your room now. Does it qualify? Since this paper is essentially a practical tool for railway men we may disregard the first classification and consider only the question of utility. What good is it?

Evidence is continually reaching us to show that the JOURNAL is of real practical value to electric railway men. An equipment engineer writes to us to say that his company is about to equip all of its cars with a device which first came to his attention in the pages of the JOURNAL. After reading a description of it, he was so much interested that he obtained a sample equipment from the manufacturer. The satisfactory performance of the sample led eventually to the purchase of similar devices for all the cars on his property.

In the same mail with the foregoing letter came an inquiry from another railway, asking where it could purchase a utility car of the type which had been described in a recent issue of the JOURNAL. These instances are in themselves not particularly noteworthy, because similar instances occur so frequently. But they certainly show that the JOURNAL does qualify under the head of being useful.

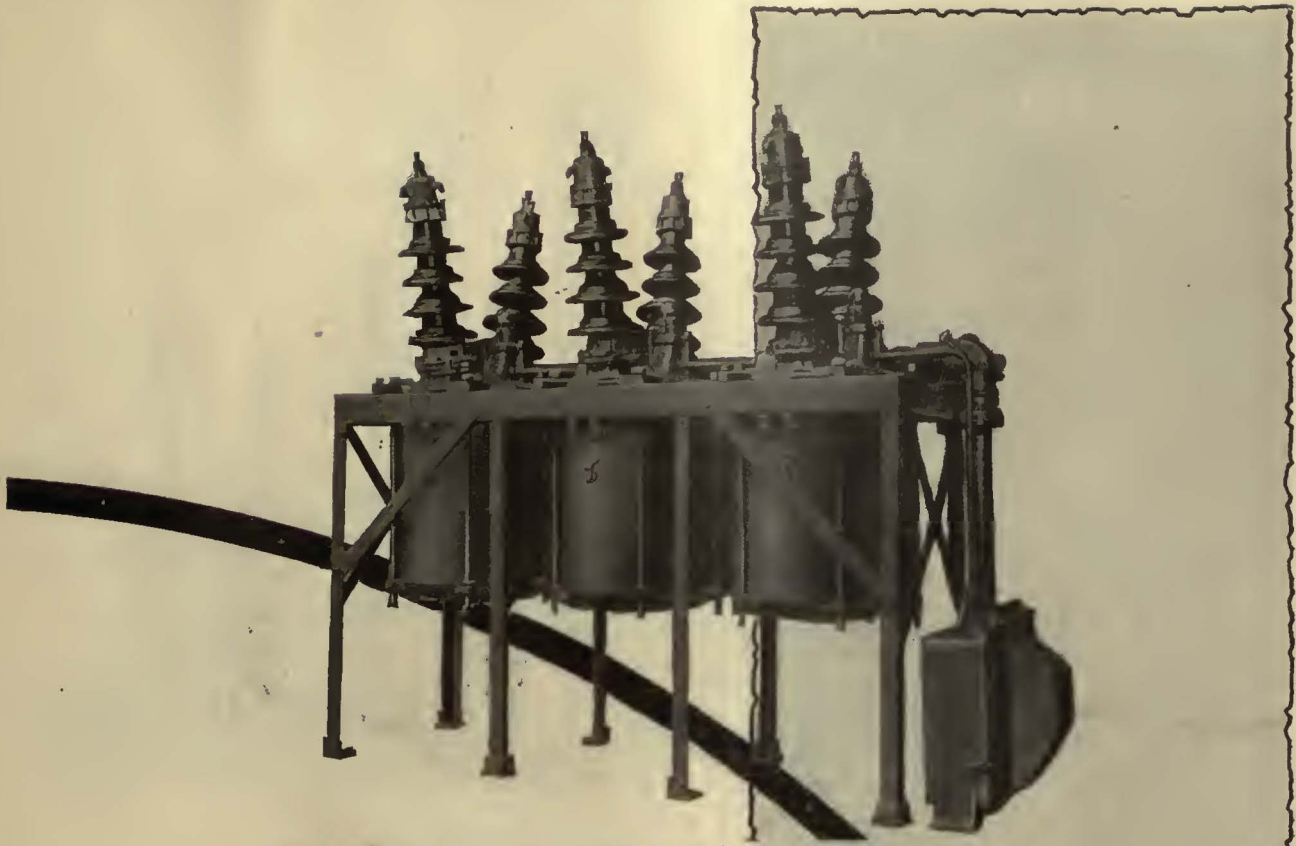


Type "G-22," 400 Ampere, 50,000 Volt, 3 Pole, Single Throw,
Electrically Operated Oil Circuit Breaker.
Interrupting Capacity at Rated Voltage, 8700 Amperes.

TYPE "G-22" OIL CIRCUIT BREAKERS: A complete line of high capacity, round tank, oil circuit breakers for indoor and outdoor service is available for use on systems where large amounts of power are concentrated. The Type "G-22" oil circuit breakers are made for frame mounting up to, and including, 88,000 volts; for 110,000 volts and above, floor mounting breakers only are furnished; they can be either manually or electrically operated.



Westinghouse



Type "G-2," 400 Ampere, 73,000 Volt, 3 Pole, Single Throw, Electrically Operated Outdoor Oil Circuit Breaker. Interrupting Capacity at Rated Voltage, 6500 Amperes.

MUFFLERS: When a circuit breaker, equipped with mufflers, opens a heavy short circuit, the air in the top chamber is forced out through the muffler, in advance of the arc gases rising through the oil, thereby preventing the possibility of a violent explosion in the breaker structure due to the mixture of oxygen and arc gases. The rupturing capacity and severity of the duty cycle which a given breaker structure will handle is thereby greatly increased.



Sectional View of Muffler used with Westinghouse Oil Circuit Breakers.

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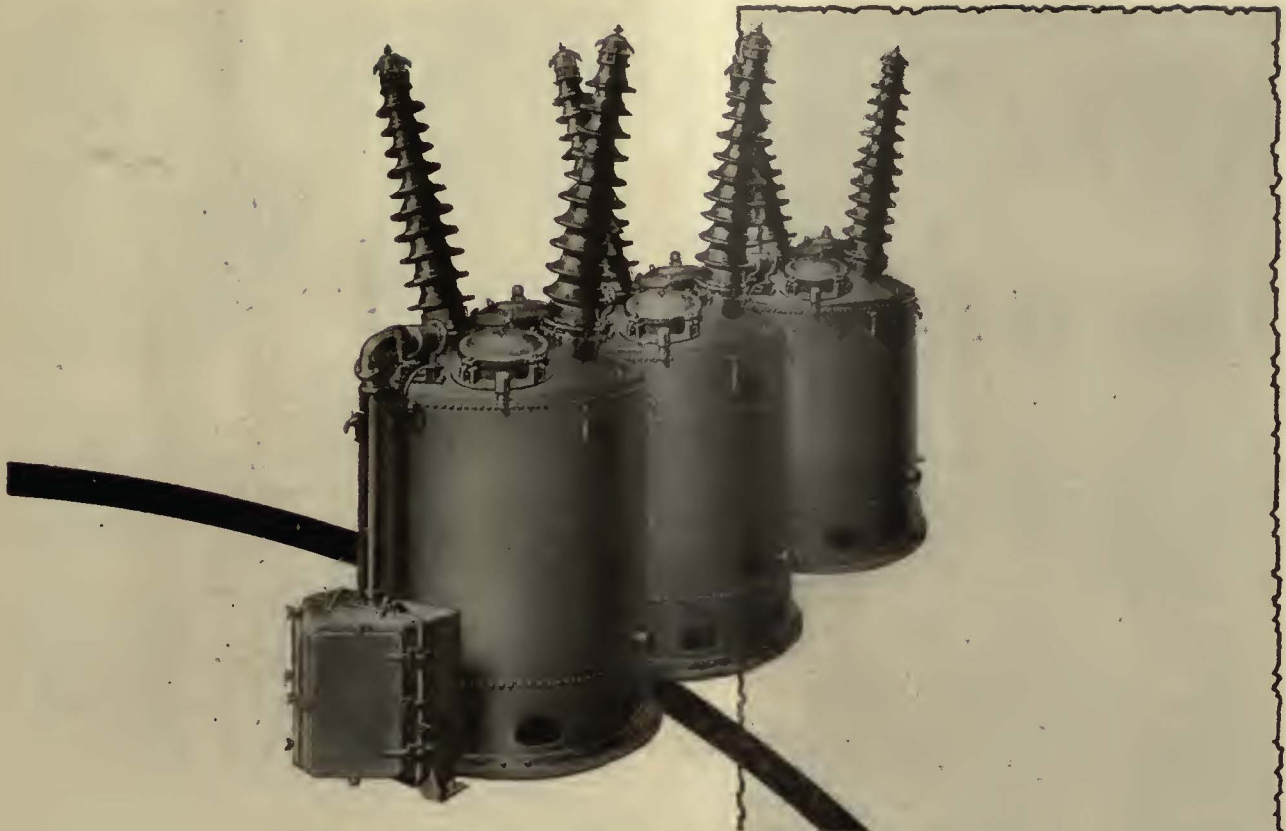
Type "G-2," 400 Ampere, 110,000 Volt, 3 Pole, Single Throw, Electrically Operated Floor Mounting Oil Circuit Breaker. Interrupting Capacity at Rated Voltage, 5300 Amperes.



50 KV. Oil Circuit Breaker
Contact Details
Showing Contacts
Completely Open.

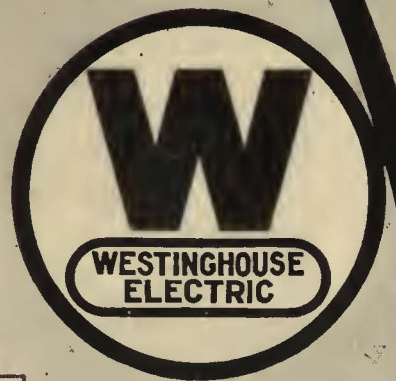
HIGH SPEED CONTACT SEPARATION: The effectiveness of oil circuit breakers is greatly increased by reducing the duration of the arcing time. Because of the inertia of the moving elements of high tension breakers, it is not possible to accelerate them to the same extent as the moving elements of low tension breakers; to obtain quick rupturing of the arc in high tension breakers, high speed contacts, similar to those in our other G line of breakers, have been developed which give approximately the same speed of contact separation on high tension breakers as secured on low tension breakers.

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Type "G-22," 400 Ampere, 154,000 Volt, 3 Pole, Single Throw,
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Interrupting Capacity at Rated Voltage, 5500 Amperes.

CONSTRUCTION: The "G-22" Breakers are of sturdy construction with all parts easily accessible, thus making for ease of installation and maintenance. The tanks are all of boiler type construction. The individual pole units are each equipped with a muffler. Effective means are provided to prevent communication of gases from one pole unit to the others or to the mechanism.



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Mr. Bibbins speaking:

Mr. J. Rowland Bibbins, Consulting Engineer, Washington, D. C., in an article recently published in this paper said this:

“Here are essentials for the future toward which every large railway system should be working:

Increase of 10 to 20 per cent in car schedule speed—imperative to meet automobile competition. * * *

”

Maximum schedule speeds are possible with safety and comfort only on track kept in good condition. Most of our successful roads maintain good track by means of the grinders and welders shown on this page.

*Do you know all about
all these machines?
Our bulletins tell all.*

Railway Trackwork Co.

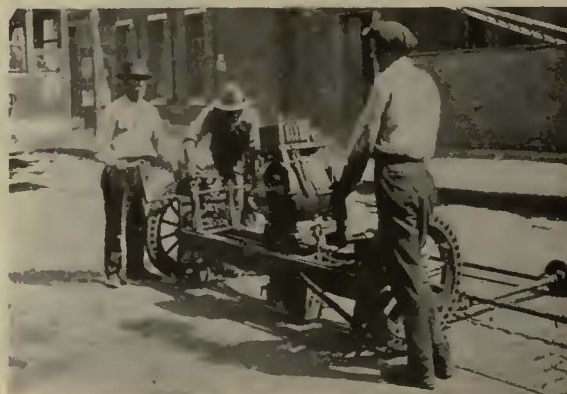
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“Reciprocating” Track Grinder



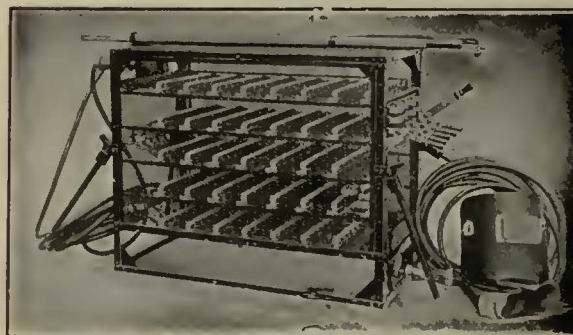
“Universal” Rotary Track Grinder



“Hercules” Rail Grinder



“Atlas” Rail Grinder



“Ajax” Electric Arc Welder



Crossing Accidents give no Warning

What is National Trolley Guard?

It is a wire mesh of galvanized iron or copper, formed into an inverted trough over the trolley wire. Being energized, it will carry the car safely on in case the wheel jumps the wire.



This is rather an unusual example of the installation of National Trolley Guard,—under an elevated structure and over a steam road crossing. Whether here or at a crossing in more open country, National Trolley Guard knows no confusion in the approach of a steam train and in the face of impending tragedy. Unlike the car man, it hasn't the human element. It is a safeguard that carries the car over the crossing even though the trolley wheel jumps the wire.

*Accidents or tragedies give no warning.
Put up National Trolley Guard before they visit your property.*

THE OHIO O B BRASS CO.
Mansfield, Ohio, U.S.A.

TROLLEY MATERIAL—ELECTRIC RAILWAY CAR EQUIPMENT—RAIL BONDS—HIGH TENSION PORCELAIN INSULATORS—THIRD RAIL INSULATORS

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Red marks—and white ones!

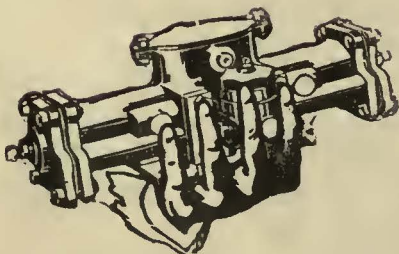
In this plant they represent selective steps toward the production of a perfected product

National Pneumatic Door Engines are subjected to a most rigorous system of inspection and testing from raw materials to the finished product.

When an inspector finds the slightest flaw, the tiniest leak or discovers that a tolerance has been exceeded—a *red mark* goes on the part, and it is scrapped or sent back to be made right.

Only parts that are exactly correct, get *white marks* from the inspector or test expert, and without these white marks, no door engine ever reaches the shipping room.

That's why NATIONAL PNEUMATIC DOOR ENGINES always give satisfactory service, why they require so little attention, and why so many repeat orders arrive unsolicited at our office.



National Pneumatic Co., Inc.

Originators and Manufacturers

Principal Office: 50 Church Street, New York

Philadelphia—Colonial Trust Building Chicago—McCormick Building
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Manufactured in Canada by Dominion Wheel & Foundry Co., Ltd., Toronto, Ont.



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CLEVELAND, OHIO, MARCH 22ND, 1924.

TO ANY GENERAL MANAGER, OR CHIEF ENGINEER,
WHO HAS PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR.

IF YOU HAVE PAVED TRACK WITH CONCRETE UNDER TIES TO REPAIR, OR RECONSTRUCT, ALLOW US TO PRESENT COMPLETE METHOD OF SAVING PRESENT CONCRETE FOUNDATION. USED IN CLEVELAND, BALTIMORE, AKRON, DES MOINES, ASHTABULA AND TOLEDO AT SAVING FROM TWO (2) TO SIX (6) DOLLARS PER FOOT TRACK. WIRE ANSWER COLLECT.

THE INTERNATIONAL STEEL TIE COMPANY.

TJL-JLH.

Steel Twin Tie Track

WESTINGHOUSE "VARIABLE LOAD" BRAKE



... permit change of air in the ca
 ... hour sufficient to meet all health requirem
 A serious traffic condition that is affecting surface
 car operation is the increased use of automobiles, and
 traffic regulation by the Police Department, which
 makes almost every street intersection a point where
 congestion or slow movement occurs. Automobiles
 are able to accelerate to a greater extent than most
 of the older types of cars, so it seemed desirable to
 design a car that would afford higher acceleration
 with a view to keeping pace with other vehicular
 traffic, and particularly to prevent automobiles in
 the rear from passing the car until the next stop was
 reached. To accomplish this, motors were provided
 to accelerate rapidly at the rate of two miles per
 hour per second.

To improve the braking efficiency, permitting more
 rapid deceleration, these cars are equipped with a
 variable load brake, so named because it provides
 a braking force, automatically regulated by the weight
 of the load in the car, thus ensuring a short, uni-
 form stopping distance regardless of whether the
 car is empty, partly loaded or loaded to capacity.
 A braking efficiency of one hundred per cent at
 all times is attained by this apparatus. The use of
 this type of brake reduces the average time con-
 sumed in stopping, and cuts down the running time
 between stops by allowing a longer peak speed be-
 fore deceleration begins, thus accomplishing a gen-
 eral speeding up of service. The brake rigging is
 so arranged that if a fracture should occur in any one
 rod or lever there would still remain sufficient pres-
 sure to stop the car.

The cars are equipped with all the modern safety
 devices, the most important of which is the so-called
 Dead Man's Hand.

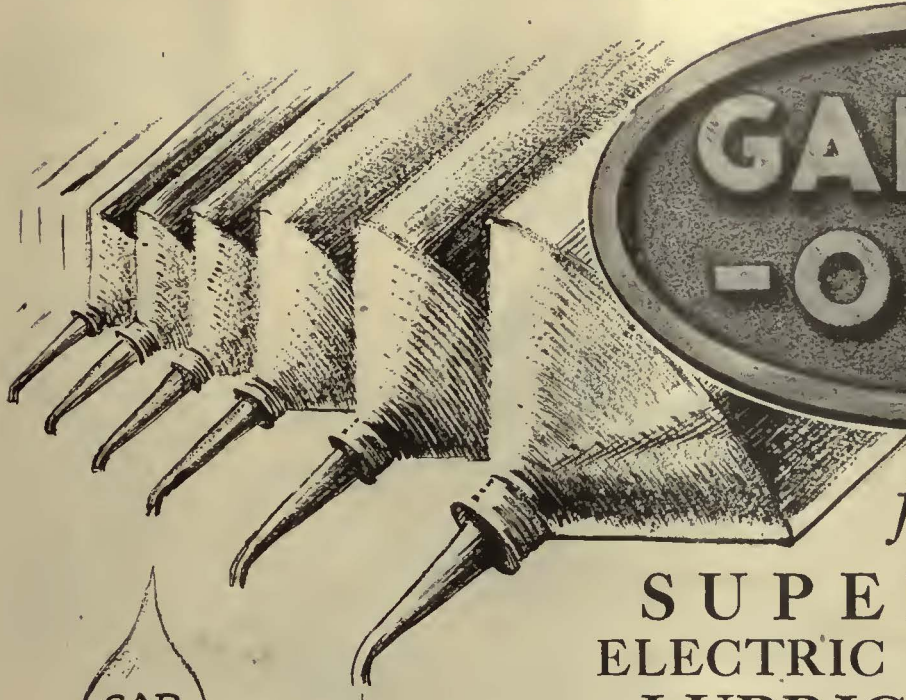
**Conditions
 Demanded it—
 We Supplied
 it.**

The clipping reproduced here is from a recent magazine article dealing with the 200 new cars of the Brooklyn City Railroad. Many other progressive companies are adopting the Variable Load Brake to meet the same conditions as those described in this particular case.



Westinghouse Traction Brake Company
 General Office and Works: Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES



for

**SUPERIOR
ELECTRIC RAILWAY
LUBRICATION
GALENA OILS**



Every oil and grease manufactured by the Galena Signal Oil Co. is made according to our own specifications to meet the requirements of the particular service for which it is intended.

These specifications are the result of years of actual experience in the field.

The vitality of Galena Oils—their superior strength and staying power—distinguishes them from all other railway lubricants in actual results. They cost but little more than ordinary refinery lubricants but the price difference is insignificant when compared to the economies in repairs, replacements, and wear and tear.

*Galena Service accompanies all
Galena Lubricants without cost.*

GALENA-SIGNAL OIL COMPANY

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A Complete Service

For years the General Electric Company has encouraged high standards for railway apparatus and supplies. It has persistently emphasized the wisdom of maintaining good equipment with supply parts equally as good. It has spared no effort in guiding electric railways in the selection of modern equipment; in giving helpful suggestions on proper operation and maintenance; and in facilitating maintenance by supplying duplicate parts to perpetuate the quality built originally into equipment—a complete, permanent service to the industry.



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GENERAL ELECTRIC

New York, March 29, 1924

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Company, Inc.

HENRY W. BLAKE and HARRY L. BROWN, *Editors*

Volume 63
Number 13

Good Records Make for Better Transportation Employees

A COMPLETE system of records of individual employees, such as that used by the Chicago Surface Lines in its transportation department, and described in this issue, requires considerable effort and co-operation on the part of the various other departments to make it efficient and valuable. But with this co-operation, the value of such records is indeed great, as is evidenced in part by the marked improvement in conditions in the transportation department of this company.

Up-to-date records filed in such a manner as to be readily available at any time serve as a guide to the supervisory force when employing, disciplining or dismissing a man. With details of the employee's service record before him, unprejudiced judgment may be given by the one rendering a decision. From the employee's point of view, the knowledge that complete records are kept of every detail of his service life prompts the conscientious man to do better and offers a means of bringing to light his qualifications for advancement.

Elimination of undesirables from among the applicants is greatly facilitated by records of all men who have ever served the company. Nearly always the "ringer" will return for employment, often under an assumed name, and it is only through a complete system of records which includes photographs that he is detected.

It is with a view toward employing and keeping desirable men in the train service that the records of the Chicago Surface Lines are maintained. Their effectiveness is apparent to one who takes note of the quality of platform men now seen on the surface cars in Chicago.

Sincerity Should Be the Keynote of Relations with Employees

THE problem of good relations between management and men is no less important today than it has been in the past, but the development of a friendly spirit is being more and more left to natural growth instead of being forced. This is a good thing in every way.

As a matter of fact the whole plan of improving employee relationship by a kind of beneficent paternalism was based on a false theory. It never had much chance of being successful with men of average intelligence. What the employees want is plain, straightforward and fair dealings. If that is the attitude of the management the slap-on-the-back and the too hearty appearance of friendliness are unnecessary. The spirit is recognized by the action. If that is not the attitude of the management no amount of soft words will secure real co-operation from the men.

It is desirable, when opportunity offers, for the railways to provide reasonable comforts for the men and

opportunities for recreation at the carhouses and repair shops. Such things the employees cannot well provide for themselves and they serve to make working conditions more attractive. They have, therefore, genuine value and usually are appreciated.

But to think that good will can be bought by a comparatively small expenditure of this sort without real mutual confidence and understanding betrays ignorance of human nature. That more and more railway executives are conducting their relations with the men on the basis of outspoken frankness—saying what they mean and meaning what they say—is an encouraging indication for the future.

St. Louis Planning to Start Anew

RECENT news indicates the prospect of an early removal of the United Railways of St. Louis from the direction of the federal courts. As one step toward straightening out the local railway situation, the receiver of the company, subject to the instructions of the court, has indicated that as promptness in reorganizing the company is desirable he is prepared to accept the \$53,620,059 valuation of the company's property fixed by the State public utilities commission and drop the litigation seeking an increase in that figure. The valuation thus set was fixed on June 4, 1923, and was for the property as of Jan. 1, 1919. Since then capital expenditures amounting to \$4,039,054 have been made.

The commission had overruled requests of both the company and the city for a rehearing of the valuation finding. Both the city and the company then sought court intervention. The company claimed a valuation of approximately \$70,000,000. The city sought to have the valuation figure fixed at \$29,805,975. The commission very distinctly said at the time its decision was rendered that no reduction in fares would be justified until operating conditions had improved by increased revenue or decreased operating expenses. As the net income for 1923, under the present 7-cent fare, was only \$809,745, there would appear to be little prospect for a change in the fare in the near future.

The \$53,620,059 valuation on which agreement was reached covers amply the present bonded indebtedness of \$50,690,000, but following the bonds are \$16,383,000 of 5 per cent cumulative preferred stock, on which no dividends have been paid since 1910, and \$24,918,000 of common stock, a total of \$41,296,000 of junior securities. Theoretically the stockholders would appear to be entitled to share in the future of the company only to the extent of the difference between \$53,620,059 and \$50,690,000 of indebtedness, plus \$4,039,054 put back into the property since the date of the valuation, or

\$6,969,113. On the other hand an 8 per cent permissible return on \$57,659,113 of capital value would provide, if earned, \$4,612,729, as compared with interest requirements last year of only \$2,913,614. These figures are of course hypothetical. Many other things remain to be settled in which the city is equally interested with the company, among them the mill tax and the working out of an arrangement which will provide a plan for the co-ordination of transportation facilities in the future.

As for the former owners of the property, the extent to which they will be permitted to participate in the terms of the reorganization remains to be seen, but the case for them, while it does appear bad, is not so hopeless as it might appear from the bald valuation figures. The hope of the stockholders lies principally in the spread between the interest rate and the permissible return, and on the prospect for economies resulting from the money already put back into the property and that may in the future be put back.

So the St. Louis news is good news, even to the stockholders. It may be followed by the announcement of an Irishman's dividend, but for the stockholders almost any arrangement would seem to be preferable to the present one, under which there is neither profit for them nor participation in the management of the company.

Detroit Finds Its Railway Purchase Plan Unworkable at Low Fare

DETROIT is finding it difficult to pay for the system of the Detroit United Railway out of earnings and at the same time function as a going concern. Of the total purchase price there remains an indebtedness of \$15,000,000 to be taken up during the next nine years. As one of the local papers puts it, there is no doubt in the minds of practically all city officials that a new financing scheme is essential to the success of the Detroit municipal railway. At present the city must meet, out of current earnings of the railway, all expenses, pay semi-annually \$500,000 on the purchase price in addition to interest, and accumulate a reserve with which to make the final payment of \$7,580,000 in 1933. On the unpaid balance of the purchase debt the city is required to pay 6 per cent interest.

With the need for expansion ever present the city is apparently finding it increasingly difficult to carry on successfully and keep pace with current needs. Fares have already been boosted once. The hope is expressed that the city may be able to arrange a loan, possibly through Henry Ford, covering the unpaid balance of the purchase price of the private undertaking which it took over, this new bond to run for twenty years at a rate of interest considerably less than is called for under the present terms. It would seem that sooner or later resort must be had to some such plan if fares are not to go still higher.

The measure of success which may attend the city's attempt thus to solve its problem remains to be seen. The optimists who conceived and put across the purchase at Detroit had of course hoped to amortize the cost of the purchase out of earnings in fifteen years, but it appears there were a number of practical considerations that did not enter into their calculations. To say that this is usually the case does not make it any the easier for those who are being called upon now to grapple with the problem.

Regulation for the Bus Is Inescapable

MANAGERS of steam and electric railways in Oklahoma view with alarm the failure of the recent session of the Legislature there to impose any measure of regulation on buses and trucks similar to that under which they are compelled to operate. And well they may. But the advocates of the policy of a free field for the buses have won only a temporary victory. Everywhere the tendency is toward regulation, for it is obviously unreasonable to restrict and tax the railway while letting its competitor continue operating free of virtually all obligation.

The very things that the bus operators of Oklahoma hope to enjoy brought about regulation of transportation in the first place. Already some twenty-five states exercise supervision over bus operation. That supervision extends from control over routes, through the establishment of rates and fares to the examination of accounts and records, to mention just a few things. Unless the operator intending to engage in the bus business is prepared eventually to accept regulation similar to that imposed on other common carriers he had better not enter the field. It is only as a temporary respite that he is free from road-use fees and other obligations which other carriers must meet. Regulation is inescapable. It is bound to come. The iniquities that will grow up under the present system in Oklahoma will eventually drive the state to regulation as a matter of self-defense. In thus standing out at this time against the tendency of the day Oklahoma by its lethargy or indifference will be called upon in the future to pay the price that unfair discrimination always imposes on the users of a service.

Need More Publicity Men as Managers

FEW men have a "nose for news." This holds true for men of all professions, and surely it applies to most general managers of traction companies. Nowadays, in view of the great importance placed on publicity work, perhaps we need more publicity men in the position of manager; that is, we need managers who also have a good sense of what makes readable and worth-while publicity.

If a good newspaper man were sitting in on all the things that pass over the general manager's desk, he would find all kinds of "great stuff" there for publication in the newspapers. Yet few executives see the public interest in the things they pass upon. Particularly do they miss the publicity value of the routine reports of operation. These contain much that would make newspaper copy.

For example, why not tell of the quick work of the wrecking crew in removing a broken-down truck? Why not tell of the skill and quick thinking of the motorman which averted a bad accident—rather than to tell only of the accidents? Why not, in short, tell of the good things the company has accomplished that are evident on every hand to those familiar with it?

A good way to get more of such matter before the public would be to route more routine company business over the publicity man's desk. Or give the publicity man a desk in the G. M.'s office. One of the most successful executives in the country, in point of public relations, has his secretary as his publicity man.

Records Facilitate Transportation Department Management

Co-operation of All Branches of Transportation Department, Together with Adequate Forms and Filing System, Gives the Chicago Surface Lines Accurate, Available Employee Records—Forms Are Result of Twenty Years' Development

CAREFUL development by the Chicago Surface Lines over a period of twenty years has resulted in a system of collecting, compiling and filing the "live" records of more than 12,000 trainmen and the "dead" records of all men who have left the service since 1914, which greatly expedites the management of the transportation department. These records are designed for a threefold purpose: First, to record promptly all infractions of rules and to call the man's attention to such infractions promptly, so as to enable the supervisory force to offer constructive criticism and advice before the infraction is repeated; second, to build up a running history of the character and efficiency of each employee, as a guide for promotion; third, to give the heads of the department accurate and quickly available records to aid in judging the man when disciplinary action seems necessary.

THE FORMS ARE DESIGNED FOR SIMPLICITY

The printed forms are designed with a view toward avoiding red tape. A portion of the time of nine clerks and two stenographers in the transportation department is used to maintain these records so that they are always up to date and quickly available when required. This is possible since each has a definite part of the work to perform.

The system used may be termed a "one-file" system; that is, all of the records pertaining to the employee's service life, together with manuscripts substantiating these records, are filed together in a large manila envelope known as a "jacket." After an application for employment has been accepted, it is sent to the transportation department office, together with all forms which the applicant may fill out during the employment and instruction period, where these records are filed in the "jacket." Termination of his service by no means terminates the record of the man. It is kept on indefinitely as an aid to this company or to any other company desiring information on the man's ability or character. To insure the accuracy of the record, the complete co-operation of all branches of the department, both at the main office and at the twelve outlying division offices, is essential.

When the application blank is filled out at the employment office the applicant begins his relationship with the company. A careful investigation of his former record is made by the employment division of the transportation department. Many interesting irregularities and discrepancies are thus divulged, and in case of doubt as to the validity of replies to reference questionnaires, letters are sent to prominent citizens such as the postmaster or president of a bank in the town which the applicant refers to as his home. This procedure has frequently eliminated "ringers" who make a practice of "floating" from one property to another.

If the applicant's record is found favorable he is noti-

fied by a call letter to report back to the employment office and is sent to the doctor, who makes an examination and fills out the form designed for the examining physician. From the doctor to the transportation department office, and then back to the employment manager, is the route taken by the successful applicant before he finally signs his contract and is furnished with a badge and other credentials. A deposit is taken from the applicant for his badge and uniform. Orders signed by the employment manager give him the right to be measured for his uniform, to have his photograph taken, and to enter the school of instruction.

At this school he is given preliminary instruction for one day, after which an assignment is made for a "student run" on a division as near his residence as possible. Under the instructions of able employees the student takes up a fourteen-day run, for which he receives no pay. Following the successful passage of an examination at the school of instruction after his student period the new employee is sent back to the employment manager for final instructions. The superintendent of transportation makes it a point to interview all new employees personally, either singly or in groups, at this stage in their training. Permanent assignment to a carhouse is then made and the man's name is placed on the "extra" list.

Up to the point of signing the contract, all forms and records which have been made out are kept at the employment office. When the applicant becomes an employee, which is marked by his signing the contract with the company, and which establishes his seniority, these records are transferred to the transportation department, where they are placed in the "jacket" and filed numerically by badge number in the company's "live record file." This includes the application blank, reference replies, medical examination, and contract with the company. At the same time a notice is sent by the employment department to all department heads containing information relative to the men who have signed contracts on that day.

ALL FORMS FILED IN INDIVIDUAL "JACKETS"

The "jacket," previously referred to, which holds the forms while they are in the possession of the transportation department, is of ample size to accommodate all letters or other data. On the outside are rulings for notations of badge number changes, or transfers from one depot to another. It is also in this space that notation is made of the reason for leaving the service, such as discharge, decease, or resignation. At the time the "jackets" are filed, two cards are made out on which are recorded the man's name, conductor or motorman, depot, date of employment, date of final instructions, and badge number or badge number change. These are filed, one numerically by badge num-

ber and the other alphabetically, in the "live card index." A yellow card is used for motormen and a white one for conductors, and odd badge numbers are assigned to the former, while the latter are given even badge numbers. Although the "jackets" are filed numerically without reference to the man's work, the cards are segregated into a conductors' and a motormen's file. These cards serve as a cross index on the "jacket"

procedure requires the man to turn in his badge and paraphernalia and receive his deposit, or that portion to which he is entitled. Some men prefer to retain their badges in lieu of receiving their pay and deposit. Where such is the case the auditing department attempts to force a settlement so as to have the badge returned. A daily notice similar to the employment notice is sent around to all division offices, indicating

C.S.L. 3092

CHICAGO SURFACE LINES

DELAYS TO SERVICE FOR 24 HOURS AT _____ DIVISION

BEGINNING _____ 7 P. M. _____ 19____ ENDING _____ 7 P. M. _____ 19____

TIME OF DELAY	LINE	PLACE OF DELAY TO SERVICE	RUN NO.	CAR NO.	DIRECTION	CAUSE OF DELAY TO SERVICE	TIME CARS WERE DELAYED		SUPERVISION BY (GIVE NAME)	ACTION TAKEN TO MAINTAIN OR RESTORE SERVICE
							MIN	HR		

CHICAGO SURFACE LINES

TRANSPORTATION DEPARTMENT

DELAYS OF FIVE MINUTES OR MORE DURING 24 HR. PERIOD ENDING 7:00 P.M. MONDAY, DECEMBER 17, 1923.

Time of Delay	Line	Place of delay to service	Run No.	Car No.	Direction	Cause of delay to service	Time cars were delayed		Action taken to maintain or restore service
							Hr.	Min.	
7:12PM	Blue Island Ave.	26th & Crawford Ave.	566	397	E	Collision auto	5		
7:19	59th St.	61 st & Blackstone Ave.	189	5028	W	Auto down	8		
7:30	Halsted St.	18th St.	445	5438	N	Defective car	10		
9:48	Cott. Gr. Ave.	94th St.	55	6181	N-S	Railroad Crossing	7		1 car switched
11:15	Western Ave.	River Bridge	223	854	N-S	Trolley wire down	14		Cars switched
12:06AM	Cott. Gr. Ave.	60th St.	49	5850	N	Collision of autos	13		
			300	5586	W	Collision of autos	5		

file and also aid in locating the new badge number of a man whose badge has been changed at any time. Given the employee's badge or name, it is possible to establish definitely his identity and to procure quickly all records pertaining to his service.

To systematize the recording of incidents in the employee's service life and the disciplinary action taken by the division superintendents, a record sheet of such size as to fit conveniently into the "jacket" is made out for each current year by the clerk at the division superintendent's office. This, and an inspection record card, are the only two pieces of current manuscript pertaining to the employee which are not at all times kept in the vault of the transportation department.

At the end of each year, however, these records are sent to the transportation department office for filing in the "jacket" of the man. In the case of dismissal, the current record sheets are immediately sent to the transportation department and are promptly placed with the rest of his record, so as to be available at the time he is interviewed by the superintendent. Upon the employee terminating his relationship with the company, the "jacket" is filed alphabetically by years under the year in which he left the service, and cards are filed both alphabetically and by badge number in the dead file.

The outside of the jacket carries a notation of the man's settlement with the company. The customary

C.S.L. 2231 PHONE DEARBORN 6900

CHICAGO SURFACE LINES

DELAY TO SERVICE

DATE _____

LINE _____

DIRECTION _____

RUN NO. _____ CAR NO. _____

PLACE OF DELAY _____

TIME OF ARRIVAL AT DELAY _____ { A.M. / P.M. }

TIME CALLED WRECK WAGON _____ { A.M. / P.M. }

TIME WRECK WAGON ARRIVED _____ { A.M. / P.M. }

TIME DELAY WAS CLEARED _____ { A.M. / P.M. }

TOTAL TIME OF DELAY _____ HRS. _____ MIN.

CAUSE OF DELAY TO SERVICE _____

CONDUCTOR _____

MOTORMAN _____

BADGE _____

BADGE _____

Forms Used in Compiling Delay Report. Delay Card Is Filled In by Conductor on Lead Car at Point of Delay

the number of men who have left the service by their badge numbers, names, and reasons for leaving.

Careful attention is given to all complaints received from patrons. A great majority of these are received through the mails, but some are transmitted by telephone or personal call. When a complaint is received from any one outside the company, no matter in what form it may have been delivered, a complaint form or blank is made out by the transportation department clerk who receives the information. This gives the location of the car, badge number of conductor and motorman, and details pertaining to the incident. The regular supervisors also transmit complaints relative to infractions of the rules. The form, together with the letter, if the information is received by mail, is sent to the executive department, where a reply is written thanking the writer for his co-operation. The complaint form is then forwarded, for disciplinary action, to the superintendent of the division in which the accused man operates. After the incident has been investigated, the form is returned to the transportation department office with the action noted thereon and is filed with the man's record. When a supervisor or inspector makes a report of a breach of rules, a similar complaint form is filled out and is sent directly to the division superintendent's office for action, after which it is returned to the transportation department to be filed in the "jacket."

The field supervisory forces of the department con-

sist of supervisors, traveling conductors and traveling motormen, operating out of each carhouse. Their duty is to foresee and correct defects in service on the street. In cases of trouble such as an interruption of service or difficulty between a patron and trainman, they act as the direct representative of the division superintendent and make every effort to handle the case on the job so that the situation may be cleared up

correct errors in trainmen while on duty. It is part of the duty of these men to instill in the new motorman or conductor that confidence which is so often lacking in the new man who has recently completed a course of instruction. When necessary the new man is shown how to feed the power, apply the brakes, and in case of a conductor, to handle fares rapidly and to be courteous to passengers. There are a total of ninety-

Group of Forms Used by Transportation Department for Keeping Records of Trainmen

No. 1. Manila "jacket" which holds manuscript in file.
 No. 2. Record sheet kept at division headquarters for current year, then filed in main office jacket.

No. 3. Appointment notice sent to all division superintendents at the time assignment is made.
 No. 4. Card record form used in cross index on jacket file. The one for motorman

is shown, that for conductor being exactly similar.
 No. 5. Departmental notice of trainmen leaving service.
 No. 6. Complaint form.

with promptness and to the satisfaction of the passengers.

The supervisor is a street man, and his primary duty is to keep traffic moving. The traveling motorman and traveling conductors, while they wear the badges of supervisors, are really traveling instructors and are selected for their personality and ability to

six supervisors, of which number twenty-four, or two out of each division, are classed as traveling motormen and conductors.

A man's ability as an operator is largely judged on the basis of accidents in which he figures as a responsible party. A form covering the usual data on the car, location, and time of day, together with the con-

ductor or motorman's statement and the names of witnesses, is made out by the conductor when reporting any unusual incident in the trip. The men are encouraged to do this work carefully and are paid for time taken to fill out these blanks at the division superintendent's office after their day's work is over. The report is sent directly to the claim department, where a number of copies, known as accident briefs, are made. Two of these are sent to the transportation department office the following morning. Passing through the transportation department, one copy goes to the depot out of which the man is working, and the other remains in the department office for reference.

The division superintendent takes whatever disciplinary action is necessary, notes action taken on accident brief, enters report and action on man's yearly record sheet and sends the brief back to the main office, where it is filed in the man's "jacket." As in the case of other infractions of rules, if the matter is serious enough to warrant dismissal, the general superintendent has the final ruling.

SENIORITY RIGHTS MAINTAINED

An interesting and important function of the transportation department is the compiling and maintaining of the seniority record of all trainmen. A new man's name is placed on the seniority book the morning after his contract notice is sent out by the employment office. A section in the book is devoted to the names of men working out of each depot, and is further subdivided for motormen and conductors. The names of new men are added to the list for the station to which they are assigned, in the same order as they appear on the employment notices. Although a man's name may appear fifth on the employment notice for a given day, he will rank first for that day in the seniority book for that depot, if no one of the preceding four was assigned to the same depot. As men leave the service for one reason or another a line is drawn through their names. A new book is made up each year so that the book for the current year does not contain the names of men leaving service during the previous year.

Seniority rights determine the order of the man's choice of run. A general "pick" is conducted every three months and after the trainmen have made their selection of runs, a list showing the runs picked is sent to the main office, where the validity of a man's claim of rating is checked against the seniority book. As this list also contains the man's badge number, it serves as a quarterly check on the information recorded in the book. A similar list is made up of extra men, with the newest man at the depot occupying the bottom position on the list.

HANDLING DELAYS

A daily delay sheet is run off on a duplicator each morning by the transportation department, listing the time, place, duration, and cause of every specific delay of five minutes or more occurring between 7 p.m. of the second day preceding and 7 p.m. of the day preceding the day of issue. Copies are sent to heads of departments and executive officers of the company. There are two sources of information from which this general delay sheet is compiled. The first is a smaller sheet which is made up by the clerks at the various division headquarters from information recorded on delay cards made out during the day by trainmen. These sheets are forwarded to the main office for tabulation.

The other source of delay information comes from the dispatcher on duty at the main switchboard. He makes out a report of each delay which requires a wreck wagon. A check on the service rendered by the various departments in time of trouble is made from the time noted on the trainman's delay card. The following blank headings to be filled in by the conductor of the lead car indicate the efficiency of the co-operating departments: Time of arrival at delay, time called wreck wagon, time wreck wagon arrived, time delay was cleared, and total time of delay. An unusually long time elapsing between any two of the above calls for an explanation from the man or department responsible.

Chicago & Joliet One-Man Cars

Double-Truck, 44-Passenger Cars for Suburban Service in Joliet—Low Floor, Maximum Traction Truck, Safety Devices Are Features

TEN new cars recently built for the Chicago & Joliet Electric Railway, Joliet, Ill., by the G. C. Kuhlman Car Company have been placed in suburban service on the Lockport to Rockdale run, a distance of 6½ miles, the greater part of which is made



The Interior Has White Maple Floor, Mahogany Finished Seats and Trim and White Enamel Headlining

through the city streets of Joliet. The car is more comfortable than would be a strictly city type car, due to the generous spacing of the seats and the wide windows. The cars are arranged for operation by one man.

In the design considerable thought was given to the fact that these cars would be used during heavy rush-hour periods when the workers in the wire and steel mills of Rockdale are transported to and from their homes in Lockport and Joliet. Ample provision has been made both in the width of aisle and in the length of platform to accommodate a large standing load.

The car is of the straight side type, with a low arched roof, and drop platforms, mounted on maximum traction trucks. Double folding doors are provided at the right-hand front corners of the car, while a single folding door opposite provides means of egress from the car where an island platform stop makes this arrangement necessary. The side sills are 3-in. x 3-in. x 3-in. angles, securely gusseted with 4-in. x 4-in. x 3-in. angles to



The Wide Windows and Extended Platforms of the Chicago & Joliet Cars Give a Pleasing Appearance

3-in., 4-lb. channel cross sills which extend the full width of the car body. The outside platform knees consist of 8-in., 15.5-lb. channels extending to the inside of the bumpers. Additional support is given to the platform by means of center knees of 3-in., 4.1-lb. channels. The bolsters are of the built-up type, made with an 8-in. x $\frac{5}{8}$ -in. top plate and an 8-in. x $\frac{3}{4}$ -in. bottom plate. The body, corner and side posts are of 1 $\frac{1}{2}$ -in. x 1 $\frac{1}{2}$ -in. x $\frac{3}{8}$ -in. tees. The same material is used for carlines, poplar strips being bolted on each side of the tee for nailing strips for the roof boards and for the Agasote headlining.

The side sheathing of the car consists of $\frac{3}{8}$ -in. steel, riveted to the side sill and to the side posts. It is secured to the wood body corner post by means of screws and bolts. The belt rail is a flat steel bar, 2 $\frac{1}{2}$ in. x $\frac{3}{8}$ in. It extends the full length of the car body between body corner posts, with a formed sheet steel cover. The seat rest angles are of 1 $\frac{1}{4}$ -in. x 1 $\frac{1}{4}$ -in. x $\frac{1}{2}$ -in. steel, riveted to the side sheathing. A steel letter board riveted to the side posts extends over the top sash frame.

There are eleven side windows. The top sash is stationary and is framed in one continuous piece the length of the car body, while the lower sash is arranged to raise. The side posts are placed on 33-in. centers, allowing a somewhat wider window than that usually found in city cars. Window guards in two sections are provided for each side of the car. The length over bumpers is 44 ft. 10 in. and the width over corner posts is 8 ft. 4 in. The truck centers are 22 ft. apart, and the truck wheelbase is 4 ft. 10 in.

The interior of the car is finished in cherry, with white enamel ceiling. No bulkhead or step separates the platform from the car body. The Agasote headlining is continued into the vestibule and a slight ramp drops the platform level approximately 2 in. Seven Brill reversible cross seats of wood slat construction

are spaced opposite the seven middle windows on each side, while a longitudinal seat occupies the space in front of the remaining two windows at each end. There is also a single folding seat on the left side of each platform between the body corner post and the door, making a total of forty-four seats.

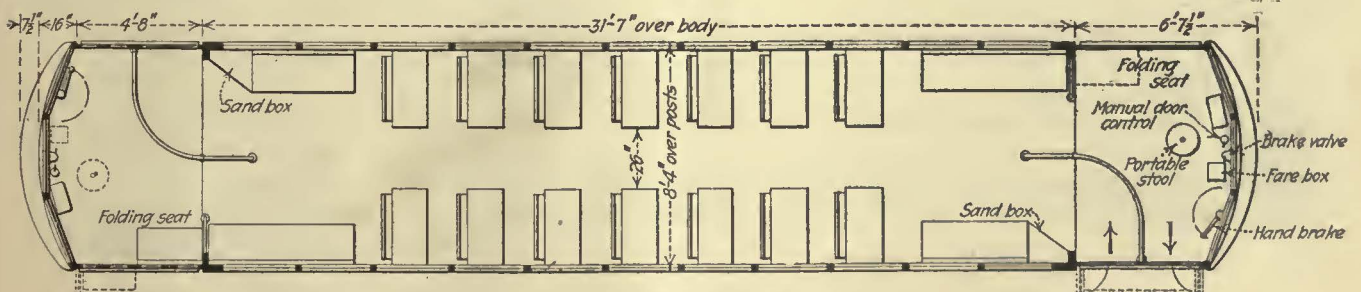
To insure warmth and comfort to the passengers a double flooring has been provided, made up of $\frac{1}{2}$ -in. hard maple laid upon $\frac{1}{2}$ -in. pine flooring, with a layer of building felt placed between. The inside sheathing from the floor up to the window rests is of $\frac{1}{2}$ -in. Agasote.

Thermostatically controlled electric heat is provided with twenty single coil truss-plank heaters under the seats. A cab heater is located in each vestibule close to the operator's position. Eight Brill exhaust type ventilators, spaced four on each side of the roof, may be regulated by means of ceiling registers with movable shutters.

PASSENGERS ENTER AND LEAVE BY SEPARATE DOORS AT THE FRONT END

The two-leaf folding doors on the right side swing outward against the body corner post and vestibule post. They are equipped with National Pneumatic door and folding step mechanism. The single folding door on the left side of the vestibule is hand operated. The cars are operated "Pay-As-You-Leave"; passengers enter through the door adjacent to the car body and leave through the other one. A Johnson fare box is used for fare collection. The car has the standard safety features of the Safety Car Devices Company.

One Westinghouse 535-A, 60-hp. motor is mounted on each of the Brill 39 E-1 maximum traction trucks. The driving wheels are of 28 in. diameter and the pony wheels 22 in. The control is K-35 double end. The Westinghouse air brake equipment is used, including DH-16 compressor.



The Platforms of the Chicago & Joliet Car Is Flush with the Body, Facilitating Passenger Movement



Substantial Waiting Platforms of Concrete Are a Feature of Some of the Downtown Streets in Auckland

Auckland Will Make Extensive Improvements

New Zealand Tramway Carried About 52,000,000 Passengers in 1923 and Has Decided Upon a Development Program to Cover Four Years

DURING the next four years the city of Auckland, New Zealand, will spend £280,000 (approximately \$1,260,000) on improvements to its tramway system. This is in addition to £250,000 invested under recent appropriations and to the £1,277,201 paid by the city for the property in July, 1919, when it was taken over from its private owners, the Auckland Electric Tramways Company, Ltd. The new improvements contemplated include extensions of the line, new repair shops, a number of additional cars and ten up-to-date motor buses.

Auckland has a population of about 140,000, and on Jan. 1, 1924, the trolley system comprised 51½ miles of single track, 170 passenger cars and eleven service cars. About 4,300,000 car-miles were run and about 52,000,000 passengers were carried during 1923. This makes the system the largest electric railway property in New Zealand, the total number of passengers carried in Wel-

lington in 1923 being about 37,000,000, in Christ Church 25,000,000 and in Dunedin 20,000,000.

The zone system of fares is used, the zones being about 1 mile in length. Weekly tickets, available over six sections, are issued for 3s. 9d., and in some cases return tickets are used, as, for instance, an ordinary fare for six sections is 7d. each way, but a return ticket is issued for 11d.

Accompanying illustrations show the standard car used as well as a typical view downtown, with a concrete waiting platform, of which there are a number on the Auckland system.

One striking feature of the car is the window arrangement, made up in what might be called in this country an exaggerated empire style. A close inspection of the photograph will show that each of the two openings at each end of the car actually is divided into three upper and three lower sash. Other features of the car are a completely inclosed motorman's cab, the elaborate lining of the panels, the side safety guard between the trucks, the anti-climber and the very conspicuous route sign at each end of the car.

A. E. Ford, general manager Auckland Municipal Tramways, was formerly traffic superintendent of the Adelaide Municipal Tramway Trust, and began his tramway career in the service of the Sydney tramways.



The Auckland Standard Car Has a Peculiar Arrangement of Sash, Inclosed Motorman's Compartment and Conspicuous Route Signs on Roof

Making Tests to Save \$15,000,000 a Year

A Joint Capable of Developing the Full Life of the Rail Would Greatly Reduce Track Reconstruction Expenditures—Results of Numerous Tensile, Bending and Drop Tests Are Given

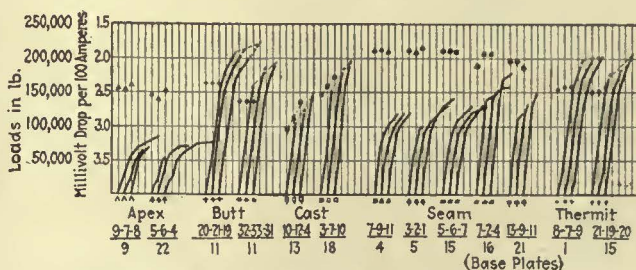
THERE are something over 25,000 miles of urban electric railway track in this country. At \$60,000 a mile this represents an investment of \$1,500,000,000, and on the assumption that this track has to be reconstructed on an average once in 20 years, there is an expenditure of \$75,000,000 per year. If it be assumed that track built with welded rail joints capable of developing the full life of the rails would have an average life of 25 years, the corresponding annual expenditure for track reconstruction would be \$60,000,000 per year. The difference would constitute a saving of \$15,000,000 per annum.

In order to discover a way in which such a saving can be accomplished a committee representing the American Electric Railway Association and the American Bureau of Welding has conducted an extensive series of tensile, bending and drop tests. It is planned to make also a series of repeated impact tests and some sort of service test, but the method of making the latter has not yet been definitely decided upon.

The Emery tensile machine of the United States Bureau of Standards is being moved from one building to another and it will not be possible to complete the series of tensile tests for two or three months. The impact testing machine designed and built especially for the committee has been constructed and is now being erected in Washington. As soon as these two machines are available all the tests can be completed which are contemplated in the preliminary program of determining the state of the art. It was thought undesirable to attempt to pass judgment on the relative service value of the different joints tested until after service tests have been made. However, the results given by the conductivity, tensile, drop and bending tests are so clearly shown that the engineers of electric railway companies will find in them valuable information for their guidance.

A standard method was followed by engineers of various railways in making test joints on special rail in order to have the work done under conditions ap-

proximating normal track methods as closely as possible. Two 33-ft. 6-in. rails furnished by steel companies for the purpose of making test welds were laid end to end in existing track after removal of existing rail and 15 in. of pavement each side of the rail down to the top of the ties. This was to insure that conditions for the workmen making welds were normal and that the temperature conditions were normal, including the ability of the adjoining rail to conduct heat and electric current.

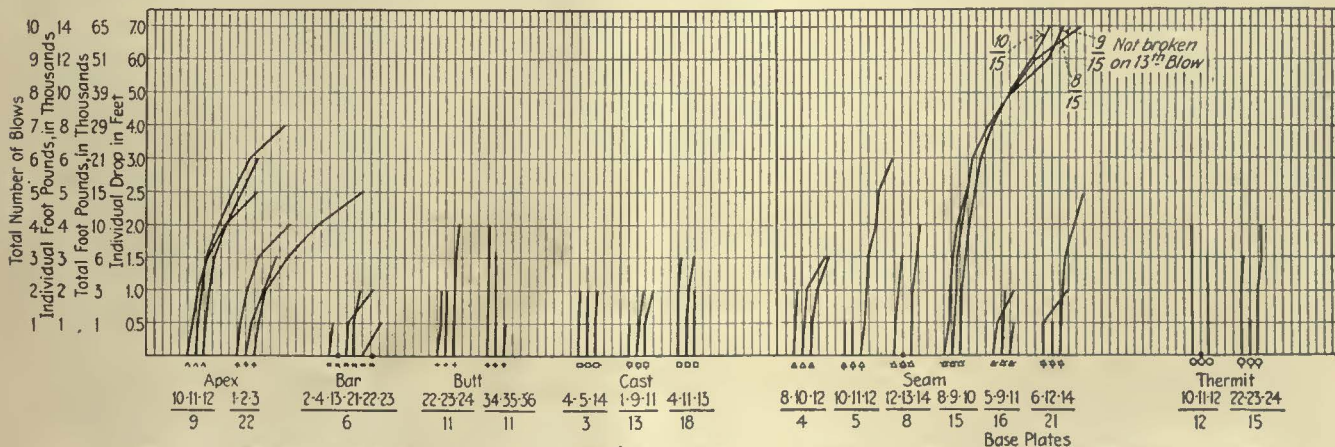


Results of Bending and Conductivity Tests. On the Horizontal Scale (Deflections) Ten Divisions Equal One Inch

Test rails were spiked to the ties and the outside ends welded to the adjacent rails. The joint between the test rails was fastened with standard bolted plates with 1/2-in. open joint to permit wedging the test rails together at the individual joints as each was cut and welded.

An identification number was assigned to each company making test welds. Each weld bore this identification number and also was numbered individually. Conductivity, tensile and repeated impact tests are being made by the Bureau of Standards. Bending and conductivity tests are being made at Purdue University, and the University of Illinois is making drop tests.

As a result of the tensile tests of three cast-welded rail joints it was found that they first showed separation of the rail ends and finally failed by breaking the cast material. Slag inclusions were found under the rail flange and head. These joints all failed between 200,000 lb. and 300,000 lb.



Deflections of Welded Rail Joints During Drop Tests Made at the University of Illinois, October, 1923-January, 1924
Horizontal scale (deflections) is four divisions equal one inch. Each specimen broke under the blow following the last shown on the chart

Three of the butt-welded rail joints tested were found to be perfectly clean and welded over the entire rail section, the fractures having a crystalline structure. Another specimen developed the yield point of the rail material. Failures occurred at somewhat more than 700,000 lb. in one case and in the other two at a little below and a little above 900,000 lb.

In the case of three seam-welded specimens the failures occurred by the shearing of the weld at contact of fish plates and rail. One specimen had four bolts through fish plates and web; the remaining joints were without bolts. The seam welded joints having Abbott plate reinforcements failed by breaking in the rail section at or near the end of the fish plate. All failures occurred at figures varying from about 300,000 lb. to about 400,000 lb. except one specimen which failed at 800,000 lb.

Failures of Apex type joints in three instances occurred by shearing of bolts and welds, at about 200,000 lb. Lengths of 2 to 4 in. of weld were found to show no fusion with the rail section.

A number of the thermit welds showed blow holes and slag inclusions. Failures occurred at approximately 600,000 lb. Attention is called to the fact that the inserts in the welds tested were not all fused. Slag was found to be trapped under the inserts. The failure began by separation of the rail heads at the unwelded insert.

RESULTS OF BEND TESTS

In making the bend tests two Riehle testing machines, one of 300,000 lb. capacity and the other of 200,000 lb. capacity, were used. The test specimen was placed on two supporting knife edges, so that the joint was midway between the supports, which were spaced to give a span length of 42 in. Load was applied by a knife edge resting midway on the saddle block. The number of load increments was such as to give from 10 to 20 points on the chart for each joint.

In three of the cast welds flaws and air holes appeared in the cast iron at the web and flange. In another a sudden tension failure occurred through the sides of the casting even with the bottom of the flange, while in two cases failure took place through the sides at one end of the casting even with the bottom of the flange.

The butt welded joints all fractured suddenly at the weld. In the Apex joints the seams opened up and failures occurred by bolts shearing. In the tests of

the electric seam welded joints, failures occurred both by opening of the seams and by fracture of the rail flange.

In the thermit welded joints one specimen failed suddenly through the rail $\frac{3}{8}$ in. from the joint; another failed suddenly through the rail $\frac{1}{2}$ in. from the joint and a third $\frac{3}{8}$ in. from the joint for the lower half and $\frac{1}{2}$ in. from the joint in the opposite rail for the upper half of the joint. Three other specimens failed through the rail at the edge of the weld and $\frac{3}{8}$ in. from the joint; all failures of these three specimens were sudden.

METHOD OF MAKING DROP TESTS

The drop test machine used in making the tests by the University of Illinois conforms to the specifications of the A.R.E.A. The machine is arranged to allow a 2,000 lb. tup or hammer to fall freely from various heights up to 50 ft. The rail supports were bolted to the anvil of the machine and had a cylindrical upper bearing surface with a radius of 5 in. The distance between centers of the supports was 3½ ft.

Rail joints to be tested were placed on the supports with the head of the rail up and with the center of the joint directly under the center of the striking face of the tup. The tup was slowly raised and automatically tripped at a height of 6 in. above the joints. The tup was then raised a short distance above the joint and the test specimens inspected so that the effect of the drop could be noted and recorded. If the joint was bent or developed a crack the extent of the deflection was measured and recorded and the joint removed and photographed. It was then placed back in the machine and subjected to the next blow. After the blow that finally destroyed the joint both ends of the specimen were photographed to show the nature of the fracture. For successive drops the height from which the hammer fell was increased by 6 in. until the height of 3 ft. was reached, after which the increment in height was 1 ft.

The cast weld specimens in general showed no deflections until several blows had been struck. Failures occurred in some instances by fracture of the rail and in other cases the weld failed. The butt welds in most cases showed some deflection after the first blow. Breaking of the weld was the prevailing reason of failure with these joints. In the tests of the bar welds, failures were accompanied by breaking of the side plates.

No outstanding tendency was noted in the experiments with seam welded specimens. In some cases the rail broke without disturbing the weld and in other cases failures occurred along the seams. Among the Apex joints the majority of failures resulted from cracking of the seams. Thermit welded joints failed in most cases by fracture of the rail outside the weld.

Early in 1923 the Bureau of Standards issued specifications for making conductivity tests on the rail joint specimens submitted. Owing to the fact that few tensile tests were made before the dismantling of the Emery testing machine, definite conclusions cannot be drawn as to the relations between tensile strength and conductivity. The relation between conductivity and bending is shown on an accompanying chart.

Detailed results of the tests so far made, and exact descriptions of the methods followed in making the joints, are given in the report of the committee. This was published in full in the *Journal of the American Welding Society* for February, 1924.

KEY TO TEST SPECIMENS

Type of Joint	Made by	Steel from	Joint Numbers
Cast Iron	Cram	Bethlehem	3-1 to 3-12
Cast Iron	Pinckley	Bethlehem	13-1 to 13-12
Cast Iron	Wilson	Lorain	18-1 to 18-12
Bar Weld	George	Lorain	6-1 to 6-12
Bar Weld	Lorain	Lorain	11-1 to 11-12
Butt Weld	Lorain	Bethlehem	11-25 to 11-36
Butt Weld	Lorain	Lorain	11-13 to 11-24
Seam Welds			
Carbon Electrode	Clark	Bethlehem	2-1 to 2-12
Carbon Electrode	Dalziel	Bethlehem	4-1 to 4-12
Carbon Electrode	Estill	Bethlehem	5-1 to 5-12
Carbon Electrode	Graves	Lorain	8-1 to 8-12
Carbon Electrode	R. W. & B. Co.	Lorain	14-1 to 14-12
Carbon Electrode	Ryder	Lorain	15-1 to 15-12
Carbon Electrode	Steward	Bethlehem	16-1 to 16-12
Carbon Electrode	Wysor	Bethlehem	21-1 to 21-12
Metallic Electrode	Gould	Bethlehem	7-1 to 7-12
Metallic Electrode	Walker	Lorain	17-1 to 17-12
Metallic Electrode	W. W. & M. Co.	Lorain	19-1 to 19-12
Apex Type Electrode	Way	Bethlehem	22-1 to 22-12
Apex Type Electrode	Ind. S. & F. Co.	Bethlehem	9-1 to 9-12
Thermit Weld	Larned	Bethlehem	10-1 to 10-12
Thermit Weld	M. & T. Corp.	Lorain	12-1 to 12-12
Thermit Weld	Ryder	Lorain	15-13 to 15-24
Thermit Weld	Candy	Lorain	24-1 to 24-12
Thermit Weld	Line	Lorain	25-1 to 25-12

Eliminating Poles in El Paso

European Method of Attaching Span Wires Directly to the Buildings Is Being Employed with Marked Success

THE American electric railway visitor to Europe is nearly always impressed with the way in which the span wires of the trolley line are attached in a great many instances to adjoining buildings instead of to span-wire poles. This not only removes an obstruction from the sidewalk, but it lightens the aerial structure and decreases the total expense of pole maintenance. Such a form of construction, of course, is especially adapted to the narrow streets found in many cities on the continent of Europe, but its advantages are by no means confined to streets of this kind. They apply almost as strongly to broad thoroughfares, and it is interesting to note that the El Paso Electric Railway has been employing this method of overhead construction with success in a number of instances. The accompanying views "Before" and "After" at a typical corner show how it was possible to get rid of an unsightly wooden pole on the corner by attaching the span wires to abutting buildings.

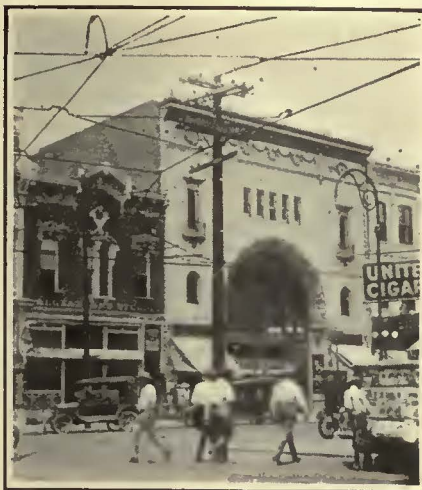
Owing to the variety of local conditions a standard type of fastener has been found impracticable in El Paso. Those used were made from a 1/2-in. x 2-in. bar iron, shaped to fit the particular location where it is to be used.

If it is at all possible to place the fastener at a corner where it can be attached to both sides of a building, this method is followed. The iron bar is then simply bent at a right angle and an offset is made to form an "eye" at the vortex of the angle. From this

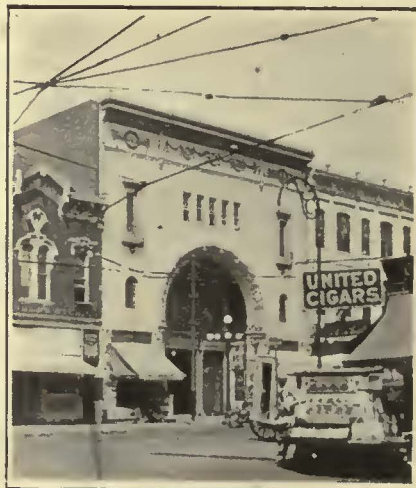
"eye" the supporting spans are attached. Where the pull is straightaway, a flat iron bar of the same size is attached to only one face of the building, and an eyebolt is screwed into a hole near the end of the supporting bar.

All these various types of fastenings are attached to the building, if of stone or brick, by means of 1/2-in. x 4 1/2-in. expansion bolts, and up to the present time no trouble has been experienced with any of these bolts pulling out.

It so happens that no supports of this kind have



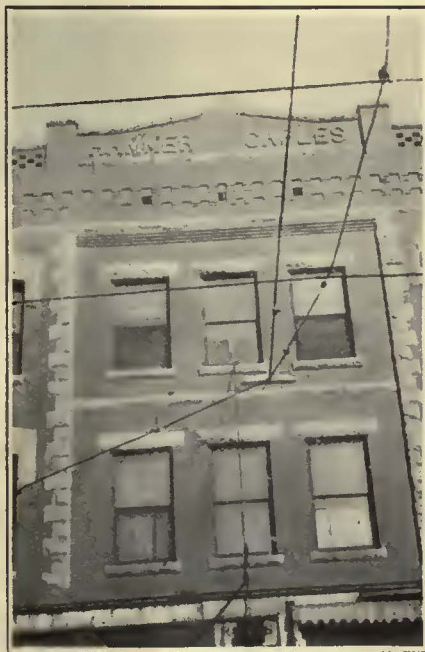
Before



After

The Same Corner with the Overhead Wires Supported by Wooden Span Pole and Attached to a Building

been attached to wooden buildings, but no difficulty is anticipated by the company in making the attachment by screws, light bolts, or bolts with washer and nut. Where the attachment is made to both faces of a stone or brick building, two bolts in each face have proved sufficient. Where the attachment is made to a single face of the building, three or four bolts are used. Other than the fastening, there is no change from standard



Some of the Buildings in El Paso to Which the Span Wires Are Attached Are of the Most Substantial Character

The view at left shows San Antonio Street, an important business thoroughfare, after the poles were removed. The second view shows a face pull-off. The third view shows a corner attachment.

in the overhead construction or in the type of strain insulator used.

At first the company had some difficulty in securing permission to make these attachments, but after explanations were made to the owners of the building as to the benefits in civic beauty, permanence, removal of poles from the sidewalks, etc., the disinclination was overcome. The advantages of this construction from a public standpoint are particularly evident on a handsome business thoroughfare, like San Antonio Street. On this street all the poles that could be spared were removed. As will be seen from the illustrations of individual attachments, the buildings to which the wires are attached are of very substantial construction, including several handsome structures.

Children Aid Safety Campaign

Posters Prepared by 3,000 Pupils in Beaver Valley Schools Emphasize Accident Prevention—The Co-operation of Newspapers and a Local Photographer Obtain Wide Publicity

A NOVEL plan for enlisting a large part of the entire community in safety work is in effect in New Brighton, Pa. This consists of a contest in which some 3,000 school children prepared posters. The best of these are being published serially in the local papers

along with photographs of the children preparing them. While not definitely identified with the Beaver Valley Traction Company, the campaign has been planned and conducted by H. O. Allison, safety engineer of the company. As vice-president of the National Safety Council, he addressed each of the schools of the valley, making as many as seventeen talks in one day. Following the talks a special poster blank, 11x14 in., containing on the reverse side suggestions for preparing the posters and a list of 100 suitable topics, was distributed and

Use by day, hour by hour, moment by moment; let this thought grow in your mind and be the main-spring of all your efforts.

JOHN L. STEWART,
President, The Beaver Valley Traction

Accident Prevention Poster



GOOD BYE

IT MAY HAVE BEEN GOOD BYE FOR EVER IF THE MACHINE HAD NOT STOPPED JUST AT THAT MOMENT.

NEVER STAND IN THE MIDDLE OF THE STREET

"SAFETY FIRST"

Made by
Charles N. Hays
225 Commonwealth St., Beaver, Pa.

Selected as one of the best posters made by the pupils of the public schools toward safety improvement.



Photo by Brown Studio

Here is a child wandering away from the sidewalk and into the middle of the street because from the moment he started out in this position by the roadway apparatus of the car had been what, and apparently the only thing possible to see and a liability to stand in the middle of the street. The picture of the automobile is not the fault of the car, but of the driver. Your action may prevent a serious accident tomorrow by the reversing of ordinary care today.

Contributed.

the pupils requested to make posters. No prizes were offered and each poster made was the voluntary act of the student. More than 3,000 posters were received.

The posters were displayed at a special safety rally held at the Junction Park pavilion. Some time later judges selected 100 of the best. With the posters on hand the news value and publicity possibility of the

posters for the newspapers were quickly seen. A conference with the representatives of the six papers in the territory confirmed this, and each paper agreed to publish a poster daily until the entire hundred had been printed. These are now appearing in the local newspapers.

A local photographer was approached and it was suggested to him that to have 100 children call at his studio to be photographed would be of sales value to him. He saw the point and agreed to photograph the children and furnish two prints of each without charge. The picture of each child is reproduced along with the poster. Several people interested in safety and children agreed to take care of the cost of the engravings so that no one was particularly burdened.

With each poster is a brief statement of the safety precautions indicated through a study of the poster. In addition there appear with each poster two safety cautions written and signed by prominent men and women of the district. A typical poster is reproduced. In order that the list of best posters made may be preserved by those who made them, a book containing them has been prepared and is being distributed by Mr. Allison.

Railway Bus Sets Standard

THE Holyoke Street Railway is in the business of supplying transportation to the people of Holyoke, Mass., and it is the belief of the company that it should supply facilities of such high quality that complaints will be forestalled and possible competitors will be discouraged. The railway has been operating buses for about two years and has recently purchased two new Macks.

These buses are painted exactly the same color as the street cars and carry the name "Holyoke Street



Color Scheme and Name Identify Bus with Railway

Railway Company" on the sides. This is done so that the public may thoroughly understand that the street railway is in the transportation business in every way.

The buses operate on a 2-mile route with a twenty-minute headway and a twenty-minute round trip time. One bus is in regular operation and the other is kept as a spare. The route runs from the center of the city up a street along which there are no car tracks and through a residential district. The fare is 6 cents, the same as on the cars, and no transfers are issued. By operating buses on this route the company has saved the expense of new track and it has also obviated the necessity of operating a car line which could not be conveniently tied in with any other existing line. Up to the present time the bus line has paid its operating cost but has made no great profit.

Detroit Answers Motorbus Proposal

Rapid Transit Commission and Department of Street Railways Present a Brief to the Common Council of the City in Reply to a Proposition to Substitute Buses of a New Type Carrying 250 Passengers for the Surface Cars and Proposed Rapid Transit System

RECENTLY a petition was presented to the Common Council of the City of Detroit for the substitution of a new type of autobus to supplant the present surface cars operated by the city and to forestall the construction of a rapid transit system for which plans are now being prepared by the Rapid Transit Commission. The most revolutionary feature of the plan is the use of a vehicle with a capacity of 250 passengers.

A joint answer has been filed with the Common Council, signed jointly by William B. Mayo, Commissioner and general manager, and Ross Schram, assistant general manager, for the Department of Street Railways, and by Sidney D. Waldon, chairman, and Daniel L. Turner, consulting engineer for the Rapid Transit Commission. This answer, which cites the main arguments against the proposition, is particularly interesting to electric railway men since it expresses the opinion of the city's transportation executives regarding transportation methods where all the facilities are owned by the city, or are being planned as municipal projects. An abstract of the reply, as addressed to the Common Council, follows:

THE CITY'S STATEMENT

The petitioner claims among other things "that the proposed new type of autobus has been proved to be superior to the street car in every conceivable manner." He then recommends that the city "build and prove the bus," and "effect complete substitution of buses for street cars as quickly as possible." The petitioner further claims that "the bus will provide rapid transit on present streets for an indefinite period," and then states that, "assuming the bus will not provide rapid transit in the present streets, it is still worth while as a substitute for street cars, but more particularly it is still the most valuable rapid transit conveyance because it will do everything that a train will do and do it better." The petitioner admits that: "Some may say that this is all premature and should not be thought of until the bus is built and proved."

In this latter conclusion, the commissioners and engineers of both the Department of Street Railways and of the Rapid Transit Commission state that they are in entire agreement with the petitioner. Considering only the major issues involved, they may be stated about as follows:

1. Shall the city decide now that its street railway system is obsolete and proceed to adopt the proposed new type of autobus with which to replace it?

2. Shall the city decide now that the proposed new type of autobus will be able to carry such loads of passengers at such speeds through the streets as to make it unnecessary for Detroit further to consider the use of trains upon exclusive rights of way, below or above ground, as a necessary rapid transit requirement?

These two questions seem to sum up the main points contained in the petition, states the reply.

The street car and the present or future motorbus

are held to be essentially surface vehicles, each with its proper place in the scheme of surface transportation of great cities. However, neither the street car nor the motorbus operating upon the street surface will meet the requirements of urban rapid transit, but that safety, capacity, economy in operation, and speed will demand the exclusive right of way, underground in the thickly built-up sections of the city and on the surface, with suitable grade separations wherever possible, in the outlying districts, and with six, eight or ten car train units, as now used in New York City.

At the present time in Detroit the motorbus and the street car are, to a large extent, serving two different purposes and are each aiding the other, even though in some places their routes occupy the same street. The motorbus is a smaller vehicle, giving a seat to every passenger, making fewer stops to take on and discharge a full load, and consequently, giving a faster service between points. For this limited, or special service, the rider pays a special and higher rate of fare.

The street car does not guarantee a seat, but it does stand in the position of giving to Detroit its mass transportation until construction is authorized and completed upon a real rapid transit system. It is, and must continue to be, the backbone of the city's mass transportation until such time as it can be gradually relieved by underground train operation. For the absence of a guaranteed seat the street car gives a ride at a lower rate of fare.

IMPORTANCE OF THE MOTORBUS RECOGNIZED

Following a sketch of the development of the bus as a factor in urban transportation, which has taken place in the last 20 years, the answer states that the importance of the motorbus as an element of urban transportation upon the surface is being recognized more and more every day, and it is destined to play an increasingly important part in circulating and distributing the population of our cities in the future. But admitting this fact, the conclusion that the motorbus is now ready to supersede all other means of urban transportation is wholly unjustifiable. The motorbus must still pass through many stages of development before any city can afford to consider seriously substituting the motorbus for the street car for its first step in mass transportation.

While it is not important in comparison with the main issue under consideration, the practical engineering and operating side of the proposed new type of 250-passenger motorbus proposal should be mentioned, states the answer. It is suggested that the city, with an experience covering the use of 48 and 60-passenger vehicles jump to the construction of buses capable of carrying 250 passengers. It is proposed to incorporate into this proposed new type of bus a number of elements not now in regular use in motorbus operation, and with a very limited amount of experience after one is built to launch into manufacturing and operating commitments upon an extensive scale.

To jump from a 60-passenger vehicle, steered and controlled by one man, with fare collection attended to by another man, to a 250-passenger vehicle, also steered and controlled by one man, and with fares collected by another man, with all of the unsolved problems such a jump presents, would not normally be undertaken by any private company with its own money, and with its own future staked upon the result. The evolution would be gradual. Is it wise to recommend doing with public funds what no one has attempted to do, or would seriously consider doing, with private capital?

The city of Detroit has invested in its street railways approximately \$40,000,000. With this system it serves 93 per cent of the total revenue passengers at a 6-cent fare, the remaining 7 per cent being carried by the bus lines and by jitneys at a 10-cent fare. The service offered compares favorably with that offered in any other city.

It is now proposed that this self-supporting transportation system be discarded as rapidly as possible as obsolete and be replaced with a new type of vehicle yet to be built and proved out at city expense. The writers state that they fear that numerous taxpayers might consider such action imprudent.

They are quite in accord with the idea that there should be more buses, as this would avoid the cost of the less important extensions to street railway lines that would otherwise be necessary, pending the construction of a rapid transit system, but they do not advise an increase in buses for the purpose of displacing the surface car system.

STREETS ARE INADEQUATE FOR RAPID TRANSIT SERVICE

Considering the second half of the proposal, that the motorbus be utilized for rapid transit instead of trains on rails, there are inherent and controlling reasons against it. The city's street system is wholly inadequate for any such use, according to the writers. The existing streets were originally planned for a two or three-story town and for man and horse traffic. On the one hand the automobile has been substituted for the horse, and on the other hand people are being piled up layer upon layer in multi-storied buildings. Already the 23-story building has been reached in Detroit, the 32-story building is in prospect, and the end is not in sight. In other words, in some places, we are superimposing ten cities on one, and yet the same circulating and distributing street system that was designed to serve a two-story village is expected to continue to serve a 25 or 30-story city.

The capacity of the land is flexible. The sky is the only limit. But the street capacity is inflexible and made so by the very bulk and cost of the enormous structures that impose the greatest traffic burden upon the streets they hem in so tightly.

What is needed is new street space, not an increased use of the existing streets. Only when rapid transit subway or elevated lines are constructed through the developed and congested sections of the city will this new street space be really provided by building under or over the existing street.

Rapid transit presupposes mass transportation at high speed. High speed is impossible on the surface of the street congested with all other kinds of surface traffic. Again, high speed cannot be attained when the transit vehicles are interfered with by cross traffic at every street intersection. High speed in congested

streets is impossible with safety. The essential feature of rapid transit lines is that they must be located where they will not be subjected to interferences from any kind of traffic either along the line or at intersections with it. In the outlying and undeveloped sections of the city the streets can be made wide enough to permit a rapid transit line to operate on the surface over an exclusive right of way in the center of the street, with cross streets carried over or under the line, thereby eliminating all surface interferences. But in the developed sections of the city such a thing is not possible because the streets cannot be widened sufficiently. These are the conditions under which subways or elevated lines must be constructed, thereby permitting a high speed to be attained through the congested districts, at least three to four times what is possible on the surface.

The petition so far as it relates to the substitution of the proposed new type of motorbus for the present street car system is considered to be unwise, uneconomical and contrary to the best interests of the city. As to the claims that the proposed new type of motorbus will provide rapid transit upon the existing streets and make unnecessary real rapid transit on rails upon exclusive rights of way, this is regarded as impracticable and the claims are not borne out by fact. Subway rapid transit will serve the public with the maximum of safety, economy and speed. The motorbus is still in an evolutionary stage, both mechanically and as a surface transportation medium. It has a service to render as an aid to the street car system, but not as substitute for it.

Medical Department in Milwaukee

THE medical department of the Milwaukee Electric Railway & Light Company was begun in a limited way in 1912 and has expanded now so that it includes the complete medical, surgical and obstetrical care of employees and their families. It is under the direction and part of the work of the Employees' Mutual Benefit Association.

In an article on the department by Dr. E. W. Miller, medical director, in the January issue of *Nation's Health*, stress is laid upon the need for the physicians in such a department to continue some private practice as it gives them a wider experience and broader vision than would be likely with full time medical men. In Milwaukee the medical service is available not only to the employees but their families, and this, in the opinion of Dr. Miller, is an important influence in improving the capacity of the employee for business. If he knows the best of medical and surgical care for the members of his family is at his immediate disposal, without worry as to the expense incurred, he can carry on his work in a proper and normal frame of mind. The department also includes two visiting nurses.

Besides direct medical care of employees the department has done much in preventive medicine on the Milwaukee system, including the drafting of specifications for employment in the different branches together with medical examination of all applicants. The article points out that this does not mean that a person with some minor physical defect cannot obtain employment, but the various positions are classified medically to determine what defects are serious for each. At times this plan really favors an applicant who on strict physical examination might otherwise be rejected.

Measuring Electrolytic Currents in Soil

Two New Methods of Measurement Are Proposed, One Based on Substitution of Known Resistance and the Other on Balancing the Current to Give Zero Galvanometer Reading—Latter Method Eliminates Calculation of Earth Resistance—Method Useful in Quantitative Electrolysis Tests

By B. A. Williamson

Electrolysis Engineer Los Angeles Gas & Electric Corporation

THE measurement in direction and quantity of the electricity flowing between the soil and a pipe for unit area of surface or length of pipe at any desired location is the basic index by which the intensity of electrolysis may be estimated and the efficiency of the mitigative measure determined. Unfortunately the problem of finding an accurate method of detecting and measuring current in the soil adjacent to a metallic conductor has been attended with great difficulties. In the writer's opinion these have been only partially met. A number of methods have been described, but it would seem that they have certain limitations either in basic principle, accuracy or scope in the matter of practical application. It is believed that this research work has marked a slow but steady progress that will lead ultimately to a standard of electrolysis engineering practice comparable with other present-day measurements.

It is desired to present herein two methods, believed to possess value and certain new features, to describe how the required physical apparatus may be constructed and assembled at low cost and to discuss frankly their utility and limitations.

The problem of determining current flow in the earth does not permit of an ordinary solution based on Ohm's law, as the area of the cross-section of the path of the current increases in direct proportion to the distance from the center of the pipe. The current density and the effective soil resistance decrease as the first power of this distance and the potential or IR drop decreases as the second power. In the equation $E = IR$ it would be possible to determine the potential E between two points, m and n , within the soil, but no direct way exists for measuring either I or R for substitution in the equation for the solution of the other. In fact, there exists no straight line relationship.

If the pipe P in Fig. 1 is discharging current through the earth to the rail R by reason of a potential difference between them that is proportional to the vertical distance of $P'-R'$, the earth adjacent to the pipe will have a potential gradient of a form represented by the curved line $p-r$. A potential $P'-p'$ will be spent at the surface of the anode P and a potential $r'-R'$ will be expended at the surface of the cathode R in a chemical action known as electrolysis. This will leave an unexpended potential of $p'-r'$ that is effective in causing the vagrant current to flow against the resistance of the earth. It is evident that if the current leakage from the pipe is to be calculated from data involving the potential drop within the soil and its resistance, three factors must be considered, namely: (1) The variation of the current density in the soil; (2) the potential drop within the soil; (3) the resistance of the soil.

Having indicated that Ohm's law is not practically applicable to a solution of the problem, a method will now be offered which is based on this law, but which in practice requires neither the measurement of the fall

of potential in the soil nor of its specific resistance. Before proceeding with the development of the solution, it will be necessary to describe briefly a non-polarizable electrode which is an element in the physical equipment. This electrode was designed by Professor Haber to provide a means of determining the potential

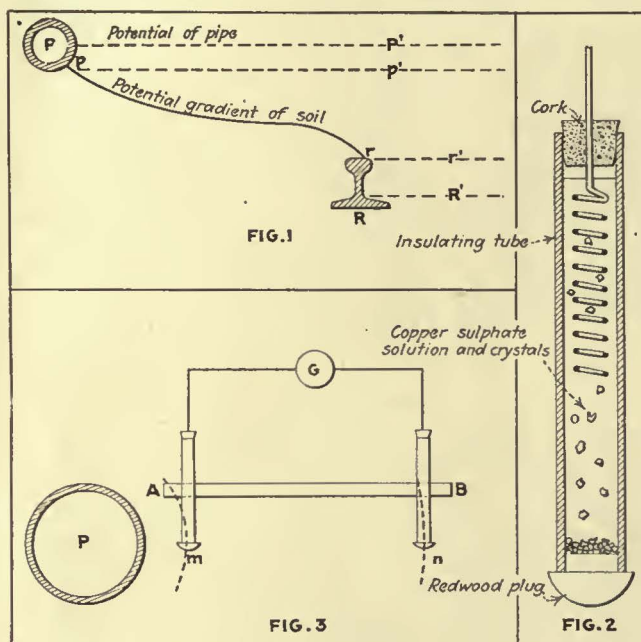


Fig. 1—Drop of potential at surfaces of the electrodes and within electrolyte earth.
 $P'p'$ = potential spent at anode.
 $p'r'$ = potential effective for overcoming the resistance of the soil.
 $r'R'$ = potential spent at cathode.
 Fig. 2—Details of a non-polarizable electrode.
 Fig. 3—How two non-polarizable electrodes may be definitely spaced in the earth adjacent to a pipe and used with the galvanometer G to measure electrolytic current.

gradient of the earth by furnishing non-metallic contact between the earth and the voltmeter terminals, thereby avoiding the galvanic potential occasioned by ordinary metallic electrodes.

One form of construction, shown in Fig. 2, consists of a tube of rubber or other insulating material, filled with a saturated solution of copper sulphate, stoppered at the end in contact with the soil with a thin porous wooden plug and closed at the other end by an ordinary cork through which is passed a copper voltmeter wire that makes intimate contact with the solution by being wound in a spiral.

If the pipe P , Fig. 3, is discharging current to the soil, the potential will be higher at the point m than at the point n . Let two non-polarizable electrodes that are definitely spaced with respect to each other and the pipe P by the insulating bar $A-B$ be placed at these points. Assuming uniform soil resistance and equal distribution of current in all radial directions, the

potential difference between the points m and n , located on imaginary circles concentric with the pipe, will be the same for all radial positions.

If I represents the current leakage in amperes per unit length of pipe, and R is the resistance of the soil between concentric circles per unit length of pipe, then E , the potential drop in the soil between m and n , is equal to IR .

Since it is impossible to measure the resistance R , it is necessary to resort to the expedient of measuring the resistance between the electrodes located at m and n . This resistance, R_s , is proportional to the resistance R , and

$$E = CIR_s \quad (1)$$

where C is a geometric constant depending on the size of the electrodes, their spacing and the diameter of the pipe.

This potential difference E between the electrodes at the points m and n will cause a current, I_g , to flow through the shunted circuit formed by the galvanometer of resistance R_g and by the electrodes, whose combined resistance is R_e . That is,

$$E = I_g (R_g + R_e) \quad (2)$$

This current I_g in the shunted circuit will produce a deflection of the galvanometer of θ divisions. If c is a constant expressing the ratio between the current I_g through the galvanometer and its deflection θ , the last equation may be rewritten thus:

$$E = c\theta (R_g + R_e) \quad (3)$$

The quantity E may be eliminated by evaluating equations 1 and 3. Equating them and solving for I ,

$$I = K\theta \frac{R_g + R_e}{R_s} \quad (4)$$

where the constant K replaces the ratio of constant c/R .

MEASURING THE SOIL RESISTANCE

The resistance of the soil between the electrodes may be determined by means of a battery and voltmeter by a slight modification of the well-known direct-deflection method of measuring a high resistance. Two readings are taken, one with the voltmeter directly across the battery and the other with the earth resistance in series with the voltmeter. The Standard Handbook* gives the value of the high resistance as " $R = R_v (d - d_1)/d_1$ ", where R_v = the resistance of the voltmeter (the greater the resistance per volt, the higher the precision), d = deflection of the voltmeter in first reading, d_1 = deflection in second reading." In this particular case it is evident that the resistance of the electrodes R_e may be considered a part of the voltmeter resistance, thus:

$$R_s = (R_v + R_e) (d - d_1)/d_1 \quad (5)$$

This value of the soil resistance, R_s , should be substituted in the working equation 4, and with the deflection θ of the galvanometer determined the value of the leakage current I per unit length of pipe.

This method is subject to a certain degree of error due to the factor of the contact resistance being neglected in the development of both the equations 4 and 5. If it were possible to make a separate measurement of the contact resistance R_c , equations 4 and 5 would be written thus:

$$I = K\theta \frac{R_g + R_e + R_c}{R_s} \quad (4a)$$

$$R_s = (R_v + R_e + R_c) (d - d_1)/d_1 \quad (5a)$$

It will be noted that when the value of R_s as determined by equation 5a is substituted in equation 4a, the indeterminate quantity R_c tends to elimination by

appearing in both the numerator and the denominator. In order that this error may be kept to the lowest possible limit the contact plugs of the electrodes should be plastered lightly with thin mud in taking the galvanometer reading θ and the two voltmeter deflections d and d_1 .

CALIBRATION OF THE SET

The set is calibrated by a single and separate measurement in the laboratory of the resistance of the voltmeter R_v and of the non-polarizable electrode R_e . The value of the constant K may then be determined experimentally by impressing a definite leakage current of I amperes on an isolated pipe line to permit the substitution of numerical values in all quantities in equation 4, except K , for which solution is made.

On account of the uncertainty due to the contact resistance, it is believed a more accurate measurement may be taken by a method now to be proposed, or by an ingenious method and instrument that were developed by Burton McCollum, electrical engineer United States Bureau of Standards, in the ELECTRIC RAILWAY JOURNAL, Nov. 5, 1921. Credit belongs to him for having successfully perfected a method of measuring soil currents through the application of the basic principle of using non-polarizable electrodes.

THE ZERO DEFLECTION METHOD

This method is somewhat similar to the preceding in that it is based upon the general principle of determining the current discharge from a pipe by the fall of potential in the soil. Use is made of two non-polarizable electrodes, and the value of a geometric constant is obtained by a process of calibration. Its accuracy lies in its simplicity and in the avoidance of the necessity of measuring the soil resistance in any way.

The pipe P , Fig. 4, is represented as discharging current to the soil along the dotted lines extending in radial directions. A certain small portion of the vagrant current will tend to take the shunted circuit formed by the non-polarizable electrodes m and n and the galvanometer G . By means of two metallic electrodes, M and N , a battery, B , ammeter A and a variable resistance, C , a measured current is passed through the soil in a general direction opposite to that taken by the vagrant current, and whose intensity is just sufficient to neutralize that of the vagrant current along the radial direction $m-n$. When this condition has been realized, it will be indicated by a zero deflection of the galvanometer.

If I denotes the value of the vagrant current being discharged or received per unit area of surface or length of pipe, and i represents the current in ammeter A for neutralization for a definite diameter of pipe and spacing of electrodes, it is evident that there will be a definite geometric factor of proportion between these currents for all homogeneous soils regardless of their specific resistances.

$$I = K i \quad (6)$$

After the value of K has been determined experimentally, a field measurement for electrolysis is taken by manipulating the applied battery voltage and the resistance to obtain a zero deflection of the galvanometer by a current, i , which is read and substituted in equation 6.

While this method is simpler and more accurate than the preceding, the test set requires instruments that are less likely to be found in the ordinary laboratory. The ammeter must be of high sensitivity, of the degree of about 1 milli-amp. for full scale deflection. The

*Standard Handbook for Electrical Engineers, Fifth Edition, page 148.

resistance should have considerable range and flexibility to meet the extreme variation in the soil resistance and the intensity of the vagrant current.

A portable, direct-reading type of D'Arsonval galvanometer should be selected, having a current sensitivity such that an impressed potential of 1 volt through an external resistance of about 1.25 megohms will give a deflection of one division. Its sensitivity may be reduced, where desirable, by adding an external resistance.

UTILITY

The value of a method for testing for electrolysis should be appraised on the basis of comparative merit rather than by the standard of absolute worth. It is perhaps sufficient to state that while there are a number of ways for testing which may be described as indicative or qualitative, such as voltage readings between the rails and pipes, there is practically no recognized method of making a quantitative measurement of the current leakage unless it is the one by Mr. McCollum to which reference has been made. Though the assumption of the ideal conditions of homogeneous soil and an equal distribution of current in the soil in all radial directions from the pipe for the purpose of the development of the theory of the solution lead to somewhat erroneous conclusions in practice on account of these conditions not being realized, yet the best solution of today must be accepted, subject to its known limitations, with an idea to present needs and future development.

LIMITATIONS OF THE METHODS

The limitations of these methods of testing electrolysis by the use of non-polarizable electrodes may be included and discussed under four general classifications as follows:

Time.—These tests are confined to that class known as instantaneous, since galvanometers are not usually built in the recording chart type. Electrolytic conditions are of such a variable quality that no accurate estimate of them can be made unless the tests show the average conditions for a twenty-four-hour period.

Location.—This system of testing contemplates the installation of the test set adjacent to the pipe. Since nearly all the mains and the greater part of the services are laid under sidewalks and public streets, which are usually paved or surfaced in some way, it is evident that considerable effort and money must be spent in making these tests. It might seem possible to drill test holes to the pipes to avoid the expense of excavating, but experience has shown that the average main or service pipe is too indefinitely located to permit this being done with precision. Aside from the uncertainty of the location of the pipe, rocks might be mistaken for the pipe or interfere with the drilling of the hole. In an attempt to overcome these difficulties the writer located the services beneath the parking between the curb and sidewalk by "listening in" to a high-frequency inductive current that was impressed on the pipe system by means of a head-set and an exploring coil made of fine wire wound on the wooden rim of a bicycle wheel. Tests were made for a time upon the service pipes at this location, which seemed the best from the standpoint of expense, but were discontinued after a time, for there was no reason for believing that the electrolysis was the same on the shallow service pipe in the drier soil as on the deeper mains nearer the car tracks where they were inaccessible except at the time of making repairs or running services.

Range.—Unlike rust, the corrosive action of electrolysis is not uniformly distributed over the surface of the pipe but is concentrated in pits and may be confined to a considerable extent to general areas, as on one end or side of a pipe. Since the test set is placed but a few inches from the pipe under investigation, it is evident that the range of the test is somewhat limited. Just as electrolytic conditions may vary minute by minute during the day, they will vary in a similar manner foot by foot along the length of the pipe. The same necessity exists for taking a number of readings at different locations to obtain a fair estimate of the district as a whole as exists for taking a number of instantaneous readings at various times in order to obtain a good idea of the average electrolytic condition during the entire day.

Distortion.—The term distortion is used to indicate a distribution of current at variance with the ideal condition assumed, that a current of dynamic origin flows

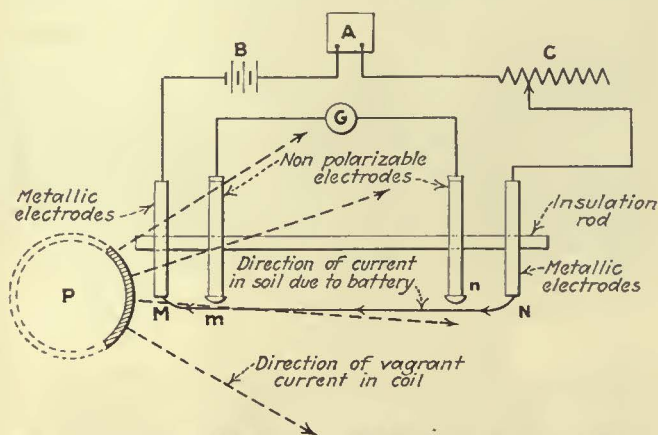


Fig. 4—How a Small Battery Current May Be Passed Through the Soil to Neutralize the Vagrant Current and Give a Zero Deflection

to or from a pipe in a continuous and homogeneous soil in radial directions at uniform intensity. The soil must be removed for the installation of the set, which violates the assumption of continuity of the soil. The earth, to which the non-polarizable electrodes are applied in making the test, will either have a lesser or greater moisture content, depending upon the weather, than the surrounding earth, which affects the homogeneity of the soil. A vagrant current may exist in the soil by reason of sub-surface conductors, other than that under inspection. A soil current of galvanic origin, due to chemical inequalities at the surface of the pipe or of the pipe and other metallic bodies, may act in a way to increase, decrease or neutralize the reading of the instrument that is due to vagrant current. For instance, if comparative tests are made upon a galvanized iron service water pipe in metallic circuit with a black iron gas service pipe, the former may show a current leakage to the soil and the latter may show a leakage from the soil.

VALUE OF THE METHOD

It is believed by the writer that this method has great value and will grow in favor as a means of making fairly accurate quantitative tests for electrolysis. In view of the necessity of uncovering the pipe it will probably be confined in practice in general to cases where the pipes are exposed for repairs, extensions, or running services and to particular cases where the expense of making excavations for the tests would be of little consequence.

Noise in London Cars Photographed

IN AN article in *ELECTRIC RAILWAY JOURNAL* for Jan. 26, 1924, page 135, on the reduction of noise in train operation, reference was made to a series of tests under the direction of Prof. A. H. Low with a device known as the audiometer. The accompanying illustration shows the audiometer as used in the work by Professor Low and an assistant. The sound caught in the horn causes a diaphragm to vibrate, which in turn operates a mirror, causing a beam of light to play on a



Measuring Noise with an Audiometer in Experimental London Tube Car

sensitized film. Temporary padding used in the experiment as one means of noise prevention is shown on the walls and roof of the car.

The two sound photographs reproduced show the influence of padding and other changes described in the previous article on the amount of noise within the car. The upper photograph shows the results with only the floor and lower sides of the carriage padded and before special treatment had been applied. The wide spread of the vibrations is an indication of the quantity of noise. The lower sound photograph shows the result



Sound Photographs Obtained by Audiometer

Above—With only floor and lower side of carriage padded, before treatment. Below—With padding and wheels shrouded, ventilators half open.

with the padding on all parts of the interior and with the wheel shrouded. The elimination of vibration is indicated by the concentration of the beam of light in a single line. With the padding arranged as in this test the ticking of a watch could be heard 1 ft. away from the ear.

The London Underground Railways is now obtaining delivery on 191 cars of the new type, in which the recommendations of Professor Low for noise elimination have been embodied. Tests made on the new cars show a considerable reduction in the noise.

The Readers' Forum

Should Have Rail Corrugation Investigation

ROBERT W. HUNT COMPANY, ENGINEERS

CHICAGO, Feb. 25, 1924.

To the Editors:

The article on "Rail Corrugation Experience" published in the *JOURNAL* of Feb. 16 is timely and very interesting. Apparently many companies suffer large expense annually because of this aggravating trouble, for which no specific cause or cure has yet been discovered. The opinion in some quarters that corrugation is in some way a feature of electrically operated roads is decidedly incorrect. One of the worst cases of corrugation the writer ever saw is on a steam-operated road of standard character in every way. Other instances of lesser degree can be easily found on almost any steam road. The facts go to show that the real cause of corrugation is probably in the rail when it leaves the mill. The cure is quite another matter, but if the cause could be definitely ascertained some effort could no doubt be made to effect a remedy.

Mere discussion of the subject will produce only a maze of confusing or contradictory statements. An extensive investigation is being made of various types of welded rail joints, and in the interests of economy it would certainly seem that funds should be made available for instituting an investigation into the cause of rail corrugation.

C. W. GENNET, JR.,
Manager Rail Department.

Detroit Train Increases Street Capacity

DEPARTMENT OF STREET RAILWAYS

DETROIT, MICH., March 21, 1924.

To the Editors:

In the discussion of the three-car articulated train for service on the Woodward Avenue lines at Detroit, one very important feature has been overlooked; that is, that by the use of this unit a greater volume of traffic may be handled than is possible with the present motor car and trailer equipment.

At present it is considered that we are operating as many cars on the street as is possible, and our problem is to move more people without further congestion. During rush hour the cars are spaced approximately 440 ft. apart, so on the assumption that this is the minimum spacing, it means a seating capacity of 0.198 per lineal foot of track with a motor car and trailer, while with the three-car articulated train the seating capacity per lineal foot of track is 0.249 or an increased carrying capacity of more than 25 per cent.

H. S. WILLIAMS,
Assistant Superintendent of Equipment.

Route Signs Differentiate Turnbacks

IN PARIS all tramway routes are numbered or lettered, and the cars carry the number or letter of the route conspicuously displayed. Where a car is scheduled to be turned back at a point short of the terminal, the car route sign or letter carries a broad red horizontal stripe. These numbers and letters are also used to distinguish the routes on maps issued by the company and sold for 25 centimes (or about 1½ cents) each.

Association News & Discussions

American Railway Engineering Association Holds Largest Convention

Proceedings Contain Many Points of Interest to Electric Railway Engineers, the Gist of Which Is Given Here—National Railway Appliance Association and Signaling Section, A.R.A., Also Hold Meetings

THE largest annual convention in the history of the American Railway Engineering Association was its 25th meeting, held in Chicago, March 11 to 13. Final registration figures show a total of 987, which exceeds the previous maximum of 859 registered in 1922 by 15 per cent. Sessions were held morning and afternoon of each day; the time being devoted largely to the discussion of committee reports. The annual dinner was held on Wednesday evening. It was necessary to turn a number of applicants away, the last seat being sold hours before the time for holding the dinner.

The National Railway Appliance Association held an exhibit conjointly with the meetings, and the Signal Section of the American Railway Association held its annual meeting on Friday immediately following the session of the Engineering Association.

PRESIDENT LEE STRESSED IMPORTANCE OF THE ENGINEER

In his presidential address Edward H. Lee, vice-president Chicago & Western Indiana Railroad, stressed the place of the engineer in the development of American railroads. "It is hardly too much to say that, physically speaking, they created the railroads," he stated. "They invented the locomotive, and the tracks and roadbed upon which it runs. They likewise developed a multitude of structures, and the many types of equipment that, taken together, make up the railroads as a unit. They aided in the effective organization of the railroads for operating purposes, and had an influence upon establishment of the rate structure of the country's railroads."

Although twenty-five years ago relatively few engineers occupied high official positions, since then men of this training have been advanced to higher places in increasing numbers, according to Mr. Lee. In this period conditions have changed greatly, and new and grave problems are confronting the railroads. Excessive regulation, adverse labor conditions, and the decline of the morale of the working force, coupled with the great advance in the cost of materials and supplies, have largely increased the cost of transportation and been a source of great discouragement to railroad managements. He feels that the question of morale is possibly the one in which the engineers as individuals can affect

the situation most actively. Proper education of the right kind will show the worker that his own best interests are tied up with the best interests of his company, and that a fair day's pay merits a fair day's work.

"Under the transportation act," Mr. Lee said, "the railroads are enjoying greater prosperity than for years past. But every single member of the association should be a publicity agent who leaves no stone unturned, when in contact with anyone outside the railroad game, to affect his opinion favorably toward the railroads."

At the Wednesday afternoon session G. J. Ray, chief engineer Delaware, Lackawanna & Western Railroad, was elected president of the association for the ensuing year.

At the exhibition of the National Railway Appliance Association, which occupied the Coliseum and annex during the sessions, 166 exhibitors had displays. At the annual meeting of this association, A. J. Filkins, president Paul Dickinson, Inc., was elected president.

Some of the more important points in the committee reports, which may be helpful to electric railway men, follow:

WOODEN BRIDGES AND TRESTLES

The committee on wooden bridges and trestles recommended a number of changes in the manual, including specifications for workmanship for pile and frame trestles of untreated material to be built under contract. Work in progress was reported on the useful strength of new, old and treated timber when used in railway trestles, which is being worked out in conjunction with the Forest Products Laboratory. The committee agreed unanimously that the ballast deck has many advantages over the open-deck timber trestle. The work indicates that the ballast-deck structure should be constructed with treated material. The report was adopted.

BALLAST

A few changes in the manual were recommended by the committee on ballast, the principal one being the addition of the yardage of stone and gravel ballast to the ballast sections adopted as recommended practice. It also was stated that there seems to be considerable sentiment in favor of a smaller size of stone if the material is hard

trap rock or granite. It was felt unwise to adopt general rules for the handling of mechanical tampers, but it was recommended where track is being lifted from 1 to 3 in., out of face and on stone, that for use as an individual section tool a two-tool pneumatic or a two-tool electric tamper be used. As an alternate two-section tool a four-tool pneumatic or electric tool may be used.

TIES

The committee on ties has brought up to date its tabulation on substitute cross ties, showing the various test installations in progress. A tabulation was included showing the use of ties of various grades, lengths and spacings in main line, branch line and yard tracks. Changes in the standard reported by various roads are principally for thicker, wider or longer ties for use under the heaviest main line traffic. In general these call for 7-in. x 9-in. x 8-ft. 6-in. ties, spaced 20 per 33-ft. rail. Tables also were presented showing the amount of tamping, the bearing area on the ballast, and various grades of ties in use. The least practicable space between ties to permit tamping was stated to be 10 in. After considerable discussion, particularly with regard to the permissible spacing of ties, the report was adopted.

UNIFORM GENERAL CONTRACT FORMS

A number of forms of agreement covering such relations as trackage rights, joint use of passenger and freight facilities and the placing of snow or sand fences beyond the company's property line were presented by the committee on uniform general contract forms. On the matter of arbitration, the forms of limited arbitration reported on to the association were (a) classification of material not clearly covered by contract; (b) delays arising not the fault of the contractor; (c) changes ordered not clearly covered within the terms of the contract. It was brought out in the discussion that sooner or later the National Conference for Uniform Construction Contract Forms and the other national organizations concerned will bring out some form of national construction contract. The report was adopted for inclusion in the manual.

BUILDINGS

For freight houses a plank floor laid on wooden joists is recommended by the committee on buildings as satisfactory and economical, except in larger and more important freight houses, where a floor of concrete is usually justified. Concrete floors are approved for freight storage houses, which are usually of fireproof construction. For blacksmith shops it is stated that floors of cinders, earth or clay are to be preferred in all

cases. For machine shops, wood plank floors are favored, as they are for freight car repair shops. Concrete floors meet all requirements for paint shops, and it is stated that it is doubtful if a more expensive type of floor is justified. Where paint is sprayed on, a floor of cinders is suitable. Wood-plank floors are considered desirable for carpenter shops, where considerable bench work is done, because of the comfort to workmen they afford. Because of the necessity for fireproof construction, concrete is recommended for oil houses.

On the subject of paint, the committee believes that satisfactory and economical results could be obtained by placing before the reputable manufacturers the requirements that the various classes of paints are to meet, and depending on their judgment and ability to produce the most efficient paint for the service expected.

Considerable discussion ensued, particularly regarding the subject of floors. It appeared that considerable success had been obtained with creosoted wood floors having a comparatively thin wooden wearing surface. The report was accepted with minor exceptions.

STANDARDIZATION

The committee on standardization stated that its work during the past year had consisted principally in co-operating with the American Engineering Standards Committee and the Bureau of Simplified Practice of the United States Department of Commerce. Progress has been made in additional standard plans for double slip switches, solid manganese crossings and for spring rail frogs and slip split switch fixtures for heavy rails of 6½-in. height and over; general specifications for steel railway bridges and specifications for movable railway bridges; specifications for the construction of overhead electric supply lines for railroad use on railroad property; specifications for porcelain insulators for railroad supply lines; rules for the protection of all sidings from danger due to stray currents, and specifications for insulated wires and cables.

In the ensuing discussion the organization of the American Engineering Standards Committee, with respect to the approval of the project by the original sponsor association, was taken up by E. A. Frink, chairman of the committee, and the meeting adopted a resolution proposed by him, that the American Railway Engineering Association believes that it will be a serious mistake on the part of the A. E. S. C. to change its constitution and rules of procedure so as to eliminate, or even impair, the veto power now possessed by the sponsor of a project.

ECONOMICS OF RAILWAY LOCATION

The committee on economics of railway location presented a progress report covering principally the relative merits of increasing tonnage by reducing ruling grades or by the use of more powerful locomotives, including consideration of momentum grades and the availability of the locomotive booster. Other subjects under consideration by the committee included the economics of railway location as affected by the

introduction of electric locomotives. It was stated that the sub-committee did not feel justified in submitting a report on this subject at the present time. The report was accepted as information.

STRESSES IN RAILROAD TRACK

A progress report was presented by the special committee on stresses in railroad track. During the year an extensive series of tests was conducted on both straight and curved track on the electrified section of the Chicago, Milwaukee & St. Paul Railway in Montana, and another series on four Eastern railroads. The St. Paul tests were made at various speeds up to 60 m.p.h. on straight track, 50 m.p.h. on a 6-deg. curve, and 40 m.p.h. on a 10-deg. curve. Several types of electric locomotives and also a Mikado freight steam locomotive were used.

An interesting set of tests intended to determine the effect of the regenerative features of the electric locomotive upon flange wear was made by coupling two electric locomotives together and running them around a 10-deg. curve, first the head one motoring and the other regenerating and then the second pushing and the other regenerating. The results so far worked up appear to show that the position of the flange of the drivers with respect to the edge of the rail was not the same for the two conditions of motoring and regenerating.

The committee stated that sufficient progress had been made to indicate that interesting comparisons may be expected of the stresses in rails produced by the various wheels of the several forms of electric locomotives and those produced by the steam locomotive, both on straight track and curved track. The purpose of the tests made in the East was to try to determine the effect of canting the rail in producing changes in the stress in the rails, both on straight track and on curved track, as having a bearing on the wear of the rail and the maintenance of the track, as well as upon the strength of the rail. Not enough progress had been made in working up the data to indicate whether conclusive evidence had been obtained, but the many auxiliary observations on the tilting and lateral movement on the rails themselves promise to give information of real value.

IRON AND STEEL STRUCTURES

A large amount of material was presented by the committee on iron and steel structures, including classification of bridges, specifications for steel highway bridges, electric welding of connections in steel structures, tests of I-beams connected in groups by diaphragms and bracing, and column tests. Elimination of the options between punched work and reamed work now allowable in the specifications for steel railway bridges was recommended, as the committee stated that it proposed to make tests to determine the relative values of the two kinds of work and, if practicable, their relative cost. Classification of railway bridges with respect to their ratings and of the equipment they are designed to carry was proposed. The general specifications for steel highway bridges covering fixed spans less than 300 ft. in

length have been revised to suit the conditions of heavy motor-truck traffic.

The report on electric welding of connections in steel structures contained a short description of the resistance and arc methods of welding, and a bibliography covering the latest articles on the subject. It is stated that it is quite evident that sufficient progress in the welding of steel structures has not yet been made to justify the association in taking any action, so that the committee thought it advisable to keep in touch with current experiments. The specifications for steel highway bridges were received as information by the association. The report on tests of I-beams, column tests, and electric welding were accepted as progress reports.

ROADWAY

On the economics of filling bridge openings, the committee on roadway made a continuation of an analysis comparing renewals under existing conditions and replacements by elimination of the bridge.

Further study was made by this committee on deferred construction costs chargeable to track laying and surfacing. A detailed study of 29 lines seems to prove that there are greater costs incurred in track maintenance labor during the period of operation immediately following construction than during the period after the roadbed has become seasoned. The costs determined by the investigations are stated to be specifically seasoning costs. The committee states that its studies indicate that the seasoning period averages a little over five years. It was also stated that if the standards of a low class branch line were raised to a higher standard, a secondary seasoning period would ensue.

Regarding the revision of roadway sections to meet requirements of standard ballast sections, the committee recommended a change in the manual to state that Class A railways, with constant and heavy traffic, should have a minimum permanent width of 20 ft. of subgrade. A roadbed shoulder of not less than 18 in. should be maintained outside the toe of the ballast slope.

The revision of the roadway section was adopted with the provision that it should apply to single track. The other reports of the committee were accepted as information.

ELECTRICITY

The committee on electricity, E. B. Katté, chairman, presented a 58-page report. Revised tables were submitted showing clearances for third rail and overhead working conductor, compiled from the returns from all the electrified steam railroads in the United States. The work of electrical interference has been delegated to a national joint committee on inductive co-ordination with the view of establishing common practice and general rules with regard to the mitigation of inductive interference.

The work of the sub-committee on electrolysis has been referred to a somewhat similar American committee on electrolysis, and it was recommended that representation on this committee be continued.

The committee on electricity has been

co-operating with the Bureau of Standards in the revision of the National Electrical Safety Code, under the procedure of the American Engineering Standards Committee. This work is progressing in various sub-committees.

A tentative specification for the construction of overhead electric supply lines for railroad use on railroad property was submitted. This report covered such questions as types of construction; clearances; grading; mechanical loading of lines; material sizes and sags of wires and cables; insulators; conductor attachments; insulator pins; cross arms; strength of supporting structures; wood poles; steel structures; concrete; guys; grounding, and permissible unit stresses and proportion of ultimate strength for various supporting structures.

Standard specifications for insulators were presented as tentative recommended practice. It was recommended that the study be continued and that the committee collaborate with the appropriate committees with a view of next year submitting a specification acceptable to all the sections of the American Railway Association. The specifications submitted call for porcelain made by the wet process, and provide for inspection and assembly, and tests as required by the standards of the A. I. E. E. In an appendix some causes of insulator failures were given, and the methods of selection of insulators according to atmospheric and climatic conditions. The recommended revisions of the manual were adopted.

TRACK

A number of changes and additions to the nomenclature and definitions in the manual were proposed by the committee on track. These include general track terms, slip switch terms, frog terms, guide rail terms, crossing terms, and turnout terms.

Plans for No. 10 double slip switches with movable center points were offered for adoption as recommended practice. These plans were prepared on the basis of No. 8 double-slip switches adopted last year as recommended practice, and in line with adopted switch and frog plans.

Plans of solid manganese crossings of steam railroad over electric railway, and steam over steam railroad were also offered for adoption as recommended practice. These plans were drawn in co-operation with the standard committee of the Manganese Track Society, and were considered in conference with the committee on way matters of the American Electric Railway Engineering Association, and also with the American Railway Engineering Association committee on signals and interlocking. A number of plans were submitted for adoption as recommended practice of switch and spring rail frog details and bills of material for rails 6½ in. high and over. These plans, including the manganese crossings, were approved by the association.

Detailed specifications for track tools were presented.

Replies from 20 railroads regarding the limit of curvature on which rails are curved prior to being placed on the track led the committee to believe that the practice of pre-curving rail is gradually being discontinued, and to recom-

mend that except on very sharp curves rails need not be curved before laying.

The conclusions reached by the committee with regard to the rerolling of rails is that there is no economy at the present high cost of doing this work, together with transportation costs necessary to move the rail to the mill and its return to points where it will be placed on the track. The resawing of rails for relayers is considered economical and is good practice, whether done by the company or the contractor. The committee stated that in its study of rerolling or resawing rails for relaying, it had concluded that the relative economies as between resawing and reconditioning rails or building up the joints in the track by acetylene, electric, or other processes is so interwoven that a study of the economies as between the two methods can best be made by a further study.

The committee presented a tentative table of dimensions for tie plates, both flat and canted. For use in track construction in and across paved streets and highways, the committee stated that the mills are prepared to roll girder rail sections 7 in. high and 9 in. high. Guard rail for curves, and straight guard rails are available in two sections 9 in. high and one section 7 in. high.

In the discussion the desirability of specifications for track tools was brought out, and it was stated that similar specifications for other material had assisted the railroads greatly in obtaining better quality. These specifications were adopted by the association, as were the recommendations for pre-curving of rails.

YARDS AND TERMINALS

The principal work of the committee on yards and terminals was the continuation of a study of the proper size and arrangement of large passenger station facilities, as determined by the business handled. Analyses were made of the movements of passengers, baggage and other material at terminals in order to determine the proper relationship between their size and arrangement, and the volume of business. The conclusions cover the time element in the discharge of passengers from cars onto platforms of various types and proper arrangements of stairways, ramps and platforms to insure separation of passengers from trucking operations. The report was approved for publication in the manual.

RAIL

The committee on rail proposed revised specifications for quenched carbon steel and alloy steel track bolts and quenched carbon steel joint bars. The committee stated that, continuing a study of rail manufacturing practices, it had secured chemical and physical tests on approximately 100,000 tons of high-silicon dead-setting steel. The record in general, it stated, shows a better quality of material in the dead-setting steel rail than in the average output under the standard specifications, without additional rejections or hardship upon the manufacturer.

The rail failure statistics were brought up to date. The comment was given that the 1917 rollings show an

increase in the number of failures during the five years' service period, but it appears that this registers the peak of bad performance, and the better records of later rollings justify the hope that the banner record of the 1914 rollings will at least be equaled within the next few years.

The committee stated that it is not yet prepared to recommend a definite rail length in excess of the present 33-ft. standard for adoption as an alternate standard. A design for 150-lb. rail section was submitted.

A joint investigation of the underlying cause of transverse fissures is being carried on by several national bodies. It is believed by members of the rail committee that the tabulated data will serve to establish a predisposition of certain furnace heats toward failures of this type, and that progress in co-operation with the rail manufacturers may be made toward eliminating such heats from mill shipments.

The report of the committee was approved with minor modifications.

ECONOMICS OF RAILWAY LABOR

The attention of the committee on economics of railway labor was concentrated principally on the study of methods of obtaining and handling railway employees to promote continuity of service and efficiency in production. The outstanding feature of all data collected was the emphasis placed upon co-operation in industry, and that the recognition of the distinctive rights, responsibilities, and obligations of employers and employees has been the foundation on which all the plans rest. The duty of management is to provide means for the development and co-operation. This may be done by the adoption of methods which, by their natural workings in an organization, reflect the attitude of the managers. Methods to inspire co-operation automatically will not be a substitute for personality in management. Rather they will be aids providing channels for the constant expression of that relationship in industry so essential to the solution of the problem of the economic handling of labor.

The methods investigated by the committee were grouped under six headings. The conclusions with regard to the first, that of personnel, is that where roads are of sufficient size to warrant it a personnel department should be established. It should include (1) employment, promotion and transfer; (2) education, training and service, including foremen's training courses and apprentice systems; (3) discipline and separations from service.

The adoption of a plan of employee representation in management in railway work will, through the improvement of the spirit of co-operation, serve largely to stabilize labor and reduce the problem of obtaining new employees.

The extension of benefit associations providing insurance against the hazards of sickness, accident, superannuation, and death, is essential to the development of a loyal and co-operative spirit in railroad organizations. Saving funds and loan provisions placed at the disposal of all worthy employees are an added incentive of merit and of economic value.

The promotion of the mutual inter-

ests of employers and employees through participation in the ownership of the industry on which they are dependent is an objective greatly to be desired, the committee states, and warrants the special consideration of railroads as a means for stimulating co-operation in the common objective.

Plans for the establishment of satisfactory working conditions, including the provisions of sanitary and agreeable facilities while on duty, comfortable rest houses, rest rooms and dining rooms, maintained in cleanly condition, and service of a sufficient quantity of wholesome food should be in effect on all roads, it is stated.

Incentive plans have been extensively adopted by industries covered by the committee's examination. The objectives were numerous, but in their aggregate were designed to avoid the waste due to absences, lateness and loafing, to develop interest and skill in the work, to increase production and to inspire loyalty and co-operation.

The establishment of standards and units of measure for all work performed which is susceptible of measurement is a fundamental basis of harmonious understanding between employer and employee, and the foundation for economical and efficient handling of labor.

The committee suggests for further examination and such use by individual companies as their judgment may determine of plans for guaranteed employment or unemployment insurance, and bonus payments for continued service, avoidance of lateness and absence, prevention of waste and other features of economic operation.

On the subject of standard methods for performing maintenance of way work, for the purpose of establishing units of measure of work performed, the committee concluded that (1) the making of time studies and the comparison of performances of an individual gang with a standard increases the efficiency of the gang under observation, and of other gangs which are made acquainted with the results; (2) the general use of standard methods and units of measure of performance on divisions and districts of a railway has resulted in increasing the efficiency of track forces.

The entire report was approved for publication in the manual.

MASONRY

Revisions of the manual proposed by the committee on masonry included definitions, specifications for stone masonry, specifications for constructing pre-molded concrete piles and specifications for driving pre-molded concrete piles. On the subject of design of concrete, plain and reinforced, for use in railroad structures, the committee made a preliminary report and presented a diagram showing proposed design load for culverts. In connection with the development in the art of making concrete, the year's work of the committee was devoted principally to a study of work being done in connection with various railroad projects. Reports on several of these were presented.

In the discussion there was some criticism of the diagram of proposed

design loads for culverts presented by the committee, as it was felt that it was too conservative. It was pointed out in defense of the committee's report that, due to non-uniformity of pressure of the earth on the sides and top of the culvert, a sufficient margin of safety should be allowed. The revision of the manual was adopted and the remainder of the report received as information.

RECORDS AND ACCOUNTS

A detailed report was presented by the committee on records and accounts, in which numerous forms for analyses were given. A sub-committee also has been working as a part of a special committee under the authority of the American Railway Association, preparing a revision of the Interstate Commerce Commission classification of accounts. It was stated that a supplementary report will be issued separately covering this subject.

WOOD PRESERVATION

The committee on wood preservation stated that it has considered the possibility of making changes in the standard specifications for creosote, but that it was decided to retain the specifications as at present.

The committee continued its survey of treated ties which has been made for a number of years. It stated that although creosoted ties have been in use some 18 years none of those laid has as yet been approached an average life. Notwithstanding the incomplete state of the available data, it stated that certain fundamental conclusions may be drawn, which are briefly outlined as follows:

1. *Value of treatment*—The use of treated ties of one kind or another is not only an economic necessity, but an economic duty for all railways. In other words, none but treated ties should be laid, irrespective of climate or any other condition, except for such railways as still have available naturally long lived woods.

2. *Comparative value of treatment*—A study of the complete test records published to date indicates that definite figures as to length of life from different treatments cannot yet be given. The following, however, may be taken as a safe guide:

(a) *Zinc chloride treatment*—The committee adhered to its conclusion made in 1919 that the life of the most inferior untreated timber can be doubled by treating with zinc chloride, and in addition believed that a conservative estimate will place the life of ties treated with zinc chloride at from six to fifteen years, depending upon climatic conditions under which this type of treatment is used and the kind of timber treated.

(b) *Zinc creosote*—Depending upon climatic conditions the probable life of ties treated with this process may be placed at from 8 to 18 years.

(d) *Full-cell creosote processes*—Although ties treated by the empty-cell creosote processes have not been in track long enough as yet to give even a tentative figure, attention is called to the fact that in the most extensive experimental track laid in 1905, with pine

ties treated with one of these processes, 96.2 per cent are still in tracks after a service of 17 years; on another railway, hardwood ties treated with another process of this kind, 89 per cent of ties laid in 1905 are still in tracks. It appears to be a safe conclusion that when properly treated a life of 16 years will positively be obtained, with a chance that this will run up to 25 years or more under proper maintenance conditions.

(d) *Full-cell creosote treatment*—Such ties have been removed in practically every case due to mechanical factors. It is generally recognized that the full-cell creosote process is not warranted at the present time, because mechanical life, under present conditions, will always be very much shorter than the life to be expected from decay.

3. *Choice of treatment*—It is stated that the choice of treatment should, in its first analysis, consist in comparing the life which is being obtained from ties in actual use and determining the annual charge against such ties, and then comparing this with the annual charge for ties treated by various methods. For example, if an untreated tie costs \$1 and has four years' life, roughly figuring, the annual charge against such a tie is 25 cents. If such a tie be treated at a cost of 25 cents, one would have to obtain five years of life in order to have the same annual charge.

Summing up the committee presents the following conclusions:

1. Only treated ties should be used for permanent track construction, with the exception of a few durable woods.

2. Varying lengths of life may reasonably be expected for various types of treatments—zinc chloride, zinc creosote, empty-cell creosote and full-cell creosote.

3. The choice of treatment should be considered as a problem of risk in investment, as shown by probable annual charges.

SIGNS, FENCES AND CROSSINGS

Revisions in the specifications for spacing of anchor posts and wire fences, and in the specifications for highway grade crossings were presented by the committee on signs, fences and crossings. Specifications for bituminous crossings, and substitutes for wooden crossing planks; highway grade crossing separations; and economy of steel, wood and concrete fence posts were presented.

The work of the committee was done along the lines of standardized practice. This is in line with the work done by Secretary Hoover of the Department of Commerce in endeavoring to bring about a reduction in waste in various industries. A survey showed 552 styles of fencing manufactured and 2,072 sizes of packages marketed. Through a conference it was found possible to reduce the styles of fencing to be manufactured effective January 1 of this year to 69 and the sizes of packages to 138.

The revisions in the manual covering spacing of anchor posts and wire fences and the strength of wire fences were adopted and the remainder of the report accepted as information.

International Tramway and Bus Congress

THE technical sessions of the International Tramway and Bus Congress, to occur in Paris June 16-22, will be held in the large auditorium of the Institute of Civil Engineers of France, at 19 Rue Blanche. This congress is being held under the auspices of the Union Internationale de Tramways de Chemin de fer d'Interêt Local et de Transports Publics Automobiles. The program as announced is as follows: On Monday, June 16, there will be a registration of delegates at the office of the French Light Railway & Bus Association, followed by a reception in the evening at the Maison des Centraux.

The opening session will be held on Tuesday, June 17, at the Sorbonne, under the chairmanship of the Minister of Public Works of France, assisted by the president of the Municipal Council of Paris and other prominent officers of the municipality. The second session, at 2:30 p.m., and all subsequent sessions will be held in the auditorium of the Institute of Civil Engineers of France. At 5 p.m. on Tuesday, the delegates will be received at the City Hall by the Mayor.

Wednesday, June 18, will be given up to a trip to Versailles, Saint-Germain and Saint Cloud. In the evening at 8 o'clock, the delegates will be guests at a banquet tendered by the French Light Railway and Bus Association.

There will be two technical sessions of the association on June 19, one at 9:30 a.m. and one at 2:30 p.m.

The fifth and last session of the association will be held on the morning of June 20.

Owing to the demand for hotel space in Paris, the secretary of the association at 15 Avenue de la Toison d'Or, Brussels, will afford assistance.

Annual Meeting of New York Electric Railway Association

THE date for the annual meeting of the New York Electric Railway Association has been set for Saturday, June 21. It will be held at the Nassau Hotel, Long Beach, L. I., one of the most attractive shore resorts near New York City. Golf, surf bathing, and other recreations are available.

There will be a one-day session, with a business meeting in the morning, recreation features in the afternoon, and the usual annual dinner in the evening. A detailed program will be announced later.

Wisconsin Utilities Meeting

THE Wisconsin Utilities Association will hold its annual convention at Milwaukee, Wis., on April 17 and 18 at the Hotel Pfister.

Among those who appear on the program will be Halford Erickson, Chicago; F. R. Coates, Toledo; S. B. Hood, Minneapolis; Adolph Kanneberg, Andrew MacDonald, C. B. Hayden, and H. H. Wilson of the Wisconsin Railroad Commission; John A. Hoeveler of the Industrial Commission; O. L.

Kowalke, James T. Rood, Edward Bennett and R. T. Ely of the University of Wisconsin.

British Meeting Postponed

THE dates for the next annual conference of the Tramways and Light Railways Association of Great Britain, which is to be held in Edinburgh, have been altered from June 26 and 27 to July 3 and 4.

Date Changed for C. E. R. A. Meeting

THE summer meeting of the Central Electric Railway Association will be held at Cedar Point, Ohio, on July 17 and 18.

The change in the dates for this meeting is necessary on account of the fact that several other conventions will be held at Cedar Point during the week of July 6.

American Association News

Electric Railway Men Present Case on Section 15a

Statements Made by Seventeen Companies and Appearances by About Sixty Representatives at Interstate Commerce Commission Hearing as to Application of Recapture Clause to Electric Lines

THE electric railways had a hearing before the Interstate Commerce Commission in Washington on March 19 to present their views on whether Subsection C of Paragraph 1 of Section 15a of the Interstate Commerce Act as amended Feb. 28, 1920, known as the "recapture clause," should be interpreted to include them. Commissioners Meyer and Potter were sitting.

The case for the electric railways was conducted by Charles L. Herry, chairman of the national relations committee of the American Electric Railway Association. Mr. Herry said briefly that whether Section 15a applied to the electric lines depended upon the interpretation of the clause, "engaged in the general transportation of freight." He then presented a statement prepared for the committee by C. D. Cass, Waterloo, Ia., which summed up the position of the electric lines. This statement is given in full later.

Mr. Herry called Mr. Cass to the stand to present statements for two Iowa roads, the Waterloo, Cedar Falls & Northern Railway and the Des Moines & Central Iowa Railway. These statements were for roads which were considered as clearly subject to the provisions of Section 15a.

W. H. Sawyer then presented a statement for the five companies operating in East St. Louis, Ill., and vicinity, of which he is president, these companies being cited as typical of those interpreted to be clearly without the provisions of the act.

R. R. Bradley, who appeared for the Chicago, North Shore & Milwaukee Railroad, was next called to the witness stand. He sought to show also that his road was clearly without the provisions of the act.

Other statements were made by Arthur W. Brady, Union Traction Company of Indiana; Frank Karr, Pacific Electric Railway; C. S. Burlingham, Wheeling Traction Company; Robert P. Woods, Kansas City, Clay County & St. Joseph Railway; William Chamberlain for the Grand Rapids, Grand Haven & Muskegon Railway and the Clinton, Davenport & Muscatine Rail-

way and three other Iowa interurban lines; Robert R. Quirk for the Chicago, Aurora & Elgin Railroad; J. V. Norman for the Interstate Public Service Company; Frank R. Ford and Wilbur LaRoe for the Lackawanna & Wyoming Valley Railroad; John W. Shartel, Jr., Oklahoma Railway Company; Henry I. Green, Illinois Traction System; J. R. Whiting, Michigan Railroad and two other Michigan lines, and William G. Fitzpatrick for the Detroit United Lines.

The statement presented by Mr. Herry, previously referred to, follows:

THE PLATFORM OF THE ELECTRIC RAILWAYS

In the mind of Congress, when the Transportation Act of 1920 was written, the exclusion phrase (c) "or engaged in the general transportation of freight" must have had some relation to a general or common understanding of what those words meant. Some definite condition in the rail transportation industry of this country was the guide which directed Congress in the use of those inclusion words as applied to the electric interurban lines. Let us see if we can find this guide.

From the establishment of rail transportation steam railroads had been the common commercial carriers of the country—exclusively—until a very few years prior to the enactment of the Transportation Act of 1920. At that time—and for a few years previously—there had come into being a very few independent electric commercial carriers. The steam railroads also were operating an ever-extending portion of their own roads electrically, and in dealing with the general railroad subject comprehensively, as was intended by the Transportation Act of 1920, it was necessary to consider these comparatively new electric carriers and assign to them a definite position under the act, by some designated language that would fairly and properly classify them with the commercial steam carriers of the country. The language "or engaged in the general transportation of freight" was finally used as descrip-

tive of a certain definite condition prevailing upon America's steam railroads, and where electric carriers' conditions corresponded, they became amenable to Section 15a—otherwise not.

Now, then, what does that phrase mean—"engaged in the general transportation of freight?" Let us take an illustration. Suppose you go to *any station on any steam railroad at any place* in this country and you say to the agent: "I have a carload of horses—a bushel of turnips—20,000 ft. of lumber—a gas stove—and a tank car of gasoline I want to ship to any town, *any place on any other steam railroad in America.*" What does the agent say? He says: "All right, mister, we will spot the cars for your carload stuff to-morrow, and you can deliver the l.c.l. at our freight house or room any time." In other words, you can make this shipment from any steam railroad station in the United States to any other steam railroad station in the United States at any time you desire, assuming that the freight equipment is immediately available.

But suppose, instead of going into a station on any steam railroad, you go into the Highland Park station, or Glencoe, or Lake Forest, or any other station on the Chicago, North Shore & Milwaukee electric line—or into any other station on most electric railroads in this country, and you put the same proposition up to the agent of the electric railroad, what will he say? Unless it happens to be on one of the few commercial electric carriers in this country—the agent will say: "Why, mister, we haven't any facilities for handling those goods. We could accept your bushel of turnips and your gas stove, and send them by express—but we couldn't handle any of the balance of those goods."

Or on some electric roads the agent might say: "We can load your horses and take them up to Xtown, where you can unload them and put them in a steam road freight or stock car." Or he might say any one of a dozen or more other things which would indicate either an impossibility or a restricted ability on the part of the electric line to furnish transportation for the proposed shipment. In any event, on most electric interurban railroads this shipper would receive an entirely different answer from that received had he tendered the shipment to any steam railroad station anywhere in America. On some few electric carriers in this country this shipper would receive the identical answer he would receive from any steam railroad agent, and as to these electric railroads there can be no question concerning their status under Section 15a. But, obversely, is it not consistent, then, to determine that any electric railroad, handicapped in its handling of freight by any one or more impediments sufficient to eliminate it from the term "general transportation," is *not* amenable to said section.

The word "general" cannot be interpreted to mean "restricted"; and, per contra, the word "restricted" cannot be construed to mean "general."

Most electric railroads have peculiar characteristics as compared to steam railroads. Their physical facilities are not susceptible of being used by steam

road equipment, except in a limited way. If freight is handled at all, it is usually handled in cars built especially to conform to the physical conditions of the road. Such conditions involve clearances and weight limitations—trucks and drawbars designed to negotiate short radius curves, etc., and where physical limitations are not enough to furnish good handicaps, then city ordinances finish the job with legal handicaps, such as requiring freight to be handled between the hours of 12 o'clock midnight and 6 a.m., or prescribing that no cars containing livestock may be transported over city streets. Any electric railroad subjected to these handicaps, either physical or legal, cannot properly be classed with steam railroads in their performance of freight business, even though such road does as a matter of fact handle a large volume of some special commodity like rock or sand or coal over some particular section of its line.

There is another angle to this subject that merits some attention. The inclusion words "engaged in the general transportation of freight" are purely descriptive. Nothing is contained in their meaning that lodges with the commission any power other than to determine whether a given road is or is not so engaged. It might well happen that although a given road was not subjected to either physical or legal handicaps, such road had decided, in its own wisdom, to restrict or limit its freight handling to a certain commodity or commodities, and while not "engaged in the general transportation of freight," there were no limitations in its freight handling ability, except its own definite and well considered policy. We submit that in such a case, even, your honorable commission could not at this time, and without other and additional action, legally determine that such road was amenable to Section 15a. It is granted, however, that by appropriate action in such case your honorable commission might require the filing of such tariffs and routes and divisions with other commercial carriers as would bring the given road within the purview of roads subject to the provisions of Section 15a. We are here in this case dealing, however, with a road having no physical or legal handicaps. As to a road under similar conditions, surrounded by physical and legal handicaps, it is our judgment that such road could never be legally required to place its facilities in condition to "engage in the general transportation of freight."

Summing up, then, it is obvious that any electric interurban railroad which could not accept a shipment of freight at any of its stations, such as was suggested in the typical illustration, could not be considered as amenable to Section 15a. And, further, that although a given electric interurban railroad does, in fact, transport a large volume of freight over a particular section of its line, or does, in fact, handle a large volume of some special commodity like sand or rock or coal—yet this fact, in itself, cannot justify a finding that such road is thereby classified with the commercial steam railroads of the country which were in the mind of Congress when it laid down

its rule "engaged in the general transportation of freight." These words are *only* descriptive of the type of electric roads that Congress was holding within the provisions of Section 15a, and they must have some relation to the common or general understanding of conditions on steam railroads that brought about the use of such words.

AN ELECTRIC RAILWAY WITH INTERCHANGE AMENABLE TO ACT

In his statement for the Waterloo, Cedar Falls & Northern Railway, C. D. Cass showed that 36.9 per cent of the total revenue of the company was derived from freight. The company has direct physical connection with four main-line steam railways and indirect connection with four others through universal switching arrangements. A general railroad business is performed by the company, all classes of freight and passenger business being interchanged with practically all of the trunk line railroads in the United States. Through tickets are sold and through freight is routed to and with all other railroads in the country. The revenue from interchange freight business with other railroads constitutes 76.20 per cent of the total freight business of this company.

The company owns standard interchange steam railroad freight equipment to the extent of 120 box, flat, stock and coal cars. It has no freight cars which are not susceptible to interchange with steam railroads. Substantially all of the freight business of the company is performed on tracks located on private rights-of-way. It has full and complete lines of tariff with all steam railroads in the United States and is a joint party to all joint tariffs in its territory. There is no difference in the conduct of the business of this company from the conduct of the business of a steam railroad except that the power used is electric instead of steam. The company is a member of the following steam railroad associations: American Railway Association, Railway Accounting Officers' Association, Freight Claim Association, Western Weighing and Inspection Bureau, Association of Railway Executives and Chicago Claim Conference.

Mr. Cass maintained that his railroad is engaged in the general transportation of freight within the meaning of subsection C of paragraph 1 of section 15a as it handles as completely as any other railroad a general transportation business, and therefore considers itself amenable to Section 15a.

EAST ST. LOUIS COMPANIES SHOWN NOT TO BE UNDER THE ACT

W. H. Sawyer, in presenting a statement for the East St. Louis & Suburban Company and its five subsidiary railroads, endeavored to show that his companies clearly were not engaged in the general transportation of freight. He showed that 113 miles of the total 191 miles of track owned by the company are on county highways and streets. The company has physical connection with seven steam railroads, some of which are practically never used. Certain business is interchanged with steam railroads, the principal item being coal. The movement is almost

wholly in one direction, namely, from the electric line to the steam lines. The companies' total freight revenue, including package freight, is about 13 per cent of its total revenue. While 814 coal cars are owned, no other type of freight car is owned and no interchange business with steam railroads is solicited because the company is in no position to handle it. The hauling of coal or other carload freight through cities and villages is generally prohibited, and the construction of track is such that standard freight cars cannot be handled except over a small portion of the lines.

Mr. Sawyer then undertook to define the meaning of the word "general" and from that to interpret the meaning of the clause "engaged in the general transportation of freight." The dictionary shows that "general" means "pertaining in common to all; widespread or prevalent; large or unlimited in scope; not restricted in application; viewed altogether as a whole; customary." He said that the antithesis of "general" is "exceptional," "unusual," "peculiar." The word "general" means general, not restricted. He said his companies are not in the general transportation business because they do not transport all kinds of goods. A much used synonym of "general," he said, is the word "universal"; others are "normal," "prevalent," "usual" and "customary." "General" applies to all with possible or comparatively slight exceptions; "universal" applies to all with no exceptions. These are the definitions as shown by the dictionary. Substitute any synonym in the dictionary, he said, and immediately it becomes apparent that "general transportation" does not apply to the East St. Louis companies. These companies have not only exceptions to general transportation, but the exceptions are the rule. They are not engaged in the general transportation of freight, but in a most restricted transportation of freight.

Maintaining that the Chicago, North Shore & Milwaukee Railroad did not come under the provisions of Section 15a, Judge Bradley showed that for the ten months ended Oct. 31, 1922, the revenue for carrying all kinds of property was \$598,215, while only \$75,848 of this was from carload freight, the balance being from merchandise dispatch and express. During the same period, the revenue of the company from passenger service was \$3,411,285, showing the great preponderance of the passenger business as compared with the freight business of the company. The North Shore Line has no through freight rates with any steam railroads except the Elgin, Joliet & Eastern Railroad, known as the Chicago Outer Belt Line, and its through-rate agreements with that road are limited to the carriage of sand and gravel, slag, coal, coke, cinders, brick and cement. In all cases of interchange, whether originating on the North Shore Line or received from connecting lines, the cars for such service are furnished by the connecting line and movement is restricted to that part of the North Shore Line between Highland Park, Ill., and Harrison Street, Milwaukee. There is no interchange of l.c.l. freight with connecting steam railroads.

A point made by Judge Bradley and presented also by Mr. Henry and Mr. Brady was that the average cost of money to the electric line at the present time is about 8 per cent. Judge Bradley said that the average cost to the North Shore Line on money borrowed since Jan. 1, 1917, has been 8.30 per cent, and that a careful survey of capital requirements and of the company's ability to borrow, shows that it will be unable to get new money for a period of years for less than 7 per cent. The electric railway men undertook to show that if the cost of money to them was around 8 per cent that it would be fatal to them if their earnings in excess of 6 per cent were to be partly taken through a ruling of the commission.

Judge Bradley showed also that the North Shore line owns 109 miles of track, of which 41 miles is so restricted by its location in public streets, by franchise agreements, by its leases of property of other roads, and by the physical construction of its own and leased property, that it cannot handle carload freight or standard steam railroad equipment.

Equipment

A MEETING of the equipment committee of the Engineering Association was held at Pittsburgh, Pa., on March 17 and 18. Those present were: F. H. Miller, chairman; Daniel Durie, sponsor; W. S. Adams, R. S. Bull, A. T. Clark, J. L. Gould, J. M. Hipple, J. F. Miller, M. O'Brien, E. D. Priest, E. S. Sawtelle, P. V. C. See, R. B. Smyth, and W. G. Stuck.

The various subjects assigned to this year's equipment committee were taken up and discussed, and decisions were reached on many points for incorporation in the report of the committee. To obtain information on the use of helical gears, a data sheet has been sent out to the various users, and detailed information is being received. This will be tabulated for the next meeting. The matter of standardization of web holes in gears was discussed at considerable length, and the matter is to be taken up with the Gear Manufacturers' Association, in order to obtain additional information. The committee studying trolley contact devices reported that a questionnaire had been sent out, but replies had not started to come in yet.

Substantial progress has been made in revising various miscellaneous methods and practices for improvements in the Manual. Substantial progress is being made on these reports. The study of spring supports for railway motors is to include information from various companies, but sufficient replies have not yet been received to tabulate.

A detailed report was made on revisions necessary in the various equipment standards. Changes have been recommended for a total of twelve standards and specifications by this year's committee. Of this number, definite recommendations were arrived at for six, and the work on the remaining six has advanced so that definite decision can be reached at the next meeting of the equipment committee, which will be held in New York on June 6 and 7.

Monday evening the committee members were guests of the Pittsburgh Railways, the R. D. Nuttall Company, the Westinghouse Traction Brake Company and the Westinghouse Electric & Manufacturing Company at a dinner given at the Union Club, followed by a theater party.

Tuesday was spent inspecting some of the manufacturing plants in Pittsburgh under the guidance of representatives of the above companies. The members left the Fort Pitt Hotel at 9 a.m. on the two-car six-motor train of the Pittsburgh Railways and visited the works of the R. D. Nuttall Company, from where they went by auto to the Homewood carhouse of the Pittsburgh Railways, and then for luncheon to the Lunch Club of the Westinghouse Electric & Manufacturing Company at East Pittsburgh. After lunch an inspection was made of the East Pittsburgh works of that company and of the Westinghouse Traction Brake Company works at Wilmerding.

Buildings and Structures

A MEETING of the buildings and structures committee of the Engineering Association was held at Cincinnati on March 17. Those present were N. E. Drexler, chairman; J. D. Kent, B. R. Brown, Judson Zimmer, J. R. McKay, E. D. Eckroad, W. H. Stamm and T. H. Stoffel. The meeting was devoted principally to a discussion of progress reports of the sub-committees.

A sub-committee on passenger terminals is to study a number of the more important electric railway terminals as examples of present practice. The sub-committee is to prepare general recommendations on important points in terminal design, such as ramps, subways to avoid crossing of tracks by passengers, adequate capacity and architectural appearance.

The sub-committee on freight terminals for city and interurban service is to obtain plans of several typical electric railway freight station layouts and prepare a suitable questionnaire to obtain further data. The final report is to include plans of several layouts giving data as to number of cars that can be handled, capacity in tons, cost of handling, etc. Combination terminals will also be studied.

Designs of buildings for proper storage and maintenance of buses is also to be considered in the committee's report. It is planned to stress the importance of proper precautions for taking care of carbon monoxide gas, for the storage of gas and oil, proper fire protection and pleasing architectural design.

Akron Publicity Material

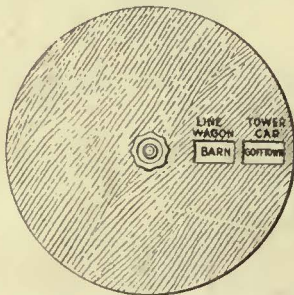
THE Committee of One Hundred of the American Electric Railway Association is distributing a leaflet on the Akron bus situation, giving in a few words the results of the bus service and reasons that impelled the public to demand the return of the street car service again.

It is also distributing a broadside containing reprints of articles and editorials on the plight of the Rubber City.

Maintenance of Equipment

Indicator Tells Location of Emergency Wagon

ON THE wall of the carhouse of the Manchester Street Railway Manchester, N. H., a novel type of indicator has been installed to tell the location of the emergency wagon and the line car. This is done by the movement of two circular disks on which are listed the names of the various railway lines. The disks are of different diameters. There is one opening through the face of the apparatus near the circumference of each disk. Through these openings



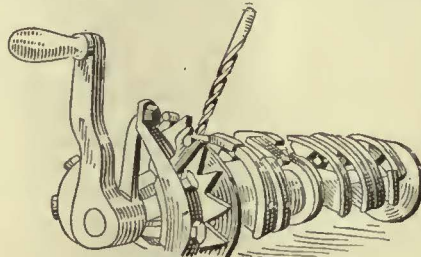
The Names Read Through the Openings Tell the Locations of the Emergency Wagon and Car

the names of the routes are read. Before the line wagon or emergency truck leaves the carhouse its driver sets the indicator to show where he has gone. When he returns the indicator is set back to read "Barn."

Locating Star Wheels on Controller Shafts

THE United Electric Railways, Providence, has adopted a star wheel for its controller shaft of a design different from the ordinary. The chief feature of this wheel is that it has a more pronounced tooth at the point of change from series to parallel, thus accelerating the rotation of the controller shaft at this point. It is the practice of the company to immediately install its own star wheels as soon as new controller shafts are received from the manufacturer.

Accurate locating of the star wheel in relation to the controller handle and to the broached portion of the shaft is important. In order



Jig for Locating Star Wheel

to facilitate this work and secure accuracy, a jig for boring the star wheel in position has been devised. A standard controller handle is used with an attachment fitting into the notches of the star wheel. The wheel is thus held in its proper position in relation to the controller shaft. The outside portion of this attachment has a hole accurately located for drilling.

Renewing Journal Box Pedestal Guides

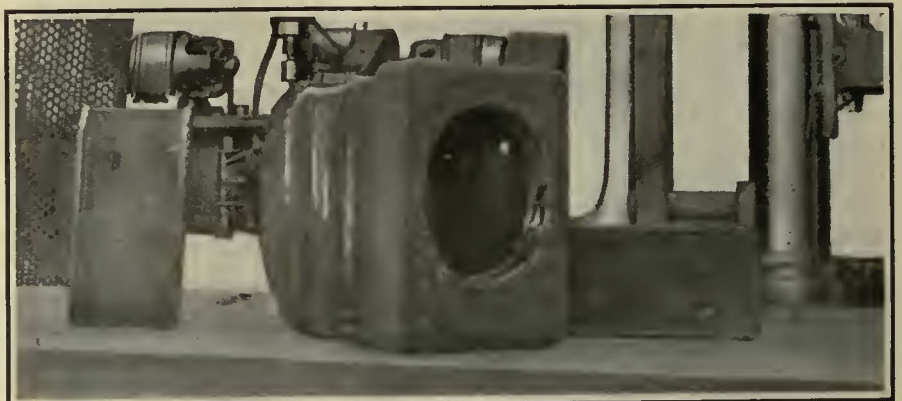
DUE to the spring support between the truck frame and journal boxes movement takes place constantly between the pedestals and the sides of the journal box. On some old-style trucks no provision was made for wear plates, and so the repair of the journal box pedestal guides must be done by building up the worn surfaces by electric welding, or else renewing these entirely.

The Philadelphia & Western Railway, Norristown, Pa., is welding mild steel wearing plates to its journal boxes. This has proved a very satisfactory construction. These wearing plates are of $\frac{1}{4}$ -in. stock,

bent to shape, and when finished are 6 in. wide by 8 in. high and of a channel section. The journal boxes have a recess planed for them to fit in and to give clearance for the welding metal and then they are welded firmly into position, which is done around the edges of the plate. In addition to this the plate is anchored to the journal box by welding to fill two holes drilled through the plate.

The accompanying illustration shows a journal box which has been planed out to receive the wearing plates, and the two plates ready for application. The two plates are clamped in place during the welding operation, which takes about one-half hour. As the plates are of finished stock, forged accurately to shape, no inside machining of the wearing plates is necessary after they are welded in position.

The practice of the railway also is to add material to the opening in the journal box for the axle at the dust guard seat. With any wear on the outside of journal bearings there is a tendency for these to rotate slightly inside the journal box with every application of the brake. This forces the axle over toward the side of the journal box, and eventually there is rubbing between the axle and the journal box at this point. This wears out the opening provided for the dust guard, and in some cases also wears a groove in the axle. This rubbing between the journal box and the axle is sure to cause heating, and in some cases results in hot bearings.



Journal Box Machined Ready for Welding in Wearing Plates

In order to bring these openings back to their normal dimensions, and also to provide a proper surface in case the journal boxes happen to rub against the axle at this point, a 4-in. square wearing plate is welded in. Metal is also added to the opening so as to make a proper fit. Since this construction has been used, the number of hot bearings has been reduced from an average of eight or ten per month to less than one per month. The grinding out of the inside of the journal box opening after metal has been applied by welding is accomplished through the use of a hand grinder with an extended spindle. This makes it easy to get inside of the journal box and provide a proper bearing fit.

In order to prevent rapid wear of the journal bearing sides, a steel wearing plate is screwed onto one side of the bearing. This is anchored in place by brazing, and the screw heads are also prick punched to prevent their working loose.

Eight to One Leverage for Straightening Rail Joints

BY A skillful application of levers the maintenance of way department of the Springfield Street Railway, Springfield, Mass., obtains a pressure of 120 tons for straighten-



The Collar Is Placed Around the Joint to Be Raised and Pressure Applied by Means of the Jack

ing battered rail joints with a 15-ton jack. The lever arm is a piece of 7-in., 103-lb. grooved rail, 7 ft. 6 in. long. A collar composed of pieces of 3-in. by 1-in. steel encircles the lever arm and passes underneath the joint to be straightened. An ordinary hand jack is then placed under one end of the lever. The relative length of the arm can be varied, with a ratio of 8 to 1 as a maximum. The 15-ton force of the jack can thus be multiplied into a pressure of 120 tons exerted on the joint. Welded joints are straightened in place simply by removing the surrounding pavement and placing

the collar underneath the joint. Convenient handles have been welded to the upper rail to aid in carrying it from place to place.

Galvanized Sheeting Protects Car Sides

THE practice of re-covering the lower side panels of its cars with galvanized steel sheeting has been adopted by the Middlesex & Boston Street Railway, Newtonville, Mass. This is done in short sections as shown in the accompanying illustration. Whenever a car is brought into the shop for overhauling examination is made of the condition of these lower side panels and when they are found to be in poor condition this sheeting is applied. An important saving is accomplished because the wood panels originally used were very prone to split after having been steamed and bent to fit the curved sides of the car.

No serious trouble has been experienced with rust, nor has there been any difficulty due to water



Galvanized Steel Panels Are Used to Protect the Woodwork on the Cars of the Middlesex & Boston Street Railway

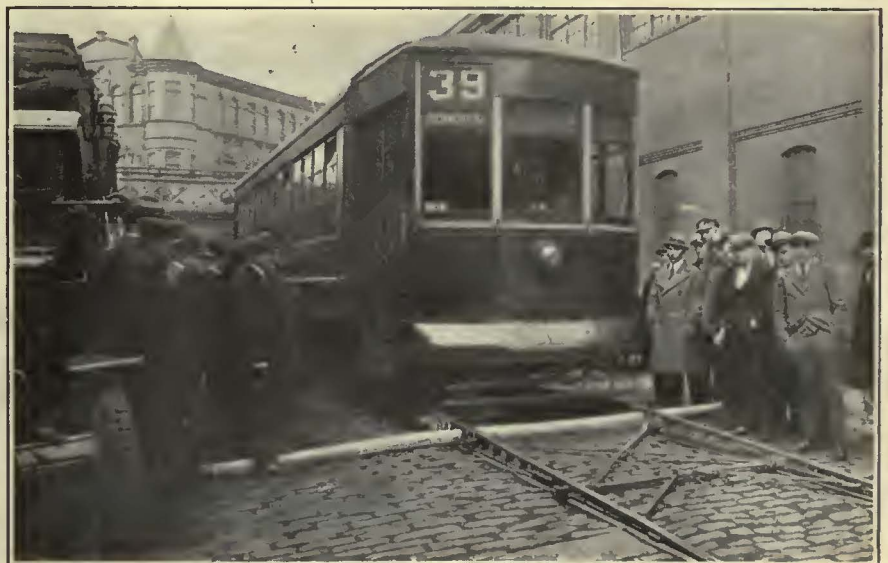
seeping in around the edges of these galvanized pieces. Painting, which is very carefully done, consists of one coat of primer, one coat of flat color, one coat of enamel and one coat of finishing varnish. This is the normal painting procedure on the Middlesex & Boston Street Railway and has been found to afford adequate protection to these panels. Cars are brought into the shop and repainted on the average every two years.

New Equipment Available

Special Fire Hose Bridge Used in Philadelphia

A NEW type fire hose bridge has recently been adopted by the Philadelphia Rapid Transit Company. The design was worked out in collaboration with the Ohio Brass Company, and differs from types previously used in that it is longer and

has a more gradual slope. The development of the high-pressure water supply system for fire protection was an important factor in creating a need for this apparatus. So long as the low-pressure system was in general use in the city, it was possible for the railway to lift the lines of hose over its tracks and support them on its tower wagons. A high-



The Gradual Slope of the Hose Bridge Facilitates the Passage of Cars

pressure hose, however, is too lively to be treated in this way and it was necessary to adopt other means of keeping the cars moving.

The track layout in Philadelphia is such that a fire anywhere in the downtown district is likely to necessitate the laying of hose across the rails. An old-fashioned fire hose bridge was unsatisfactory because of the steep slope, and for that reason a new steel bridge was designed. It is 26 ft. long and weighs 500 lb. The bridge is built in four sections which can be assembled in less than five minutes. Nine more of the same kind have been ordered. They will be carried on all the emergency wagons of the P. R. T. One wagon is located in each district of the city, and responds to every fire alarm in its district.

Combination Woodworker with New Features

RECENT features added to the Combination Woodworker No. 2, manufactured by the Buffalo Forge Company, Buffalo, N. Y., include a change in the planer guide arrangement to provide for quicker and more accurate adjustment. A positive drive for the ripsaw and jointer mandrel have also been added. The drive is by means of a rawhide pinion and gear.

The new planer guide arrangement provides for moving the planer guide forward and backward in a slot or groove. This guide is locked in position by means of a thumb nut. The older type used a two screw adjustment and did not have the slide arrangement. This guide can also be set at any angle desired for beveling purposes.

The former method of drive has been replaced in the new woodworker by a positive drive of the pinion and gear pulley type, which makes a smooth running machine and eliminates belt slippage. The gear ratio of the two pinions is approximately 2 to 1. The pulley pinion is cast in one piece, while the main shaft pinion is keyed to the shaft.

Other important features of this new machine consist of tight and loose pulleys, 8 in. x 3 in., and a handy belt shifter.

The table for the crosscut saw and ripsaw is 37 in. x 15 in. wide, and is made of heavily ribbed cast iron. The table is hinged at one end and can be raised or lowered to adjust the depth of the cut. A cast-

iron crosscut guide is furnished with the machine, which slides in a milled groove in the table and is adjustable for varying angles.

The jointer fastened on the same spindle as the saw is 6 in. long and 3 in. in diameter. A screw and hand wheel arrangement is used to make both sides of the jointer table



Woodworker with Positive Drive Ripsaw and Jointer Mandrel

adjustable. The jointer shaft has an outboard bearing and outside of this is an 8-in. x 3/4-in. emery wheel. A 3/2-in. reamed hole in the shaft end and a tap for a headless set screw allows straight shank bits to be inserted.

In order to facilitate the holding of work to be drilled, a slide table is provided which is readily adjustable to different heights. An 18-in. disk sander may be placed on the lower bandsaw shaft. The bandsaw wheels are 22-in. diameter by 1 1/2-in. face, and are covered by an endless rubber band which reduces slippage of the saw.

Switchboard Instruments

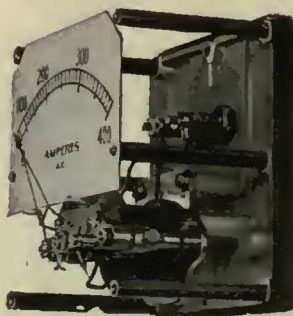
A COMPLETE line of rectangular-shaped instruments, including direct-current voltmeters and ammeters, for use on switchboards controlling alternating-current machines has been developed by the Weston Electrical Instrument Company, Newark, N. J. All the instruments of the group have uniform case size dimensions—5 1/2 in. wide and 6 in. high.

Four of the rectangular type of instruments may be laterally accommodated on a 24-in. panel, whereas the round pattern instruments require a 32-in. panel and a greater vertical space. A triplex ammeter, as shown in the illustration, contributes to the saving in space where an ammeter is required in each phase.

Although the new instruments occupy a much smaller space, reference to the illustration shows how it was possible to preserve exactly the same scale length as in the round-pattern instruments. Further, there has been obtained a much larger scale opening, permitting better illumination and improved legibility, which is also facilitated by larger and heavier scale numerals printed on a horizontal plane.

The wiring studs in the rear of the instrument have been grouped in the center and have been kept uniform on all types. The resistors, where used, are mounted back of the switchboard on studs projecting from the rear of the instrument. These resistors have also been made smaller.

These meters are suitable for substation panels and other uses in the railway field.

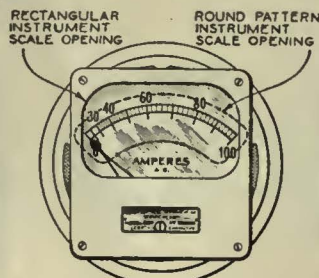


New Rectangular-Shaped Switchboard Instruments

Left—Wattmeter, and ammeter with cover removed.

Center—New instrument superimposed over round pattern showing scale openings and how same scale length was preserved.

Right—Triplex ammeter.



The News of the Industry

Legislation to Regulate Motor Vehicle Fails in Oklahoma

All measures were killed that were proposed in the recent extra session of the ninth Legislature of Oklahoma to protect existing electric and steam railroads from cut-throat competition by buses and trucks, by compelling the latter to conform to the regulations imposed by the state on carriers of other classes, and by imposing a tax upon motor transportation that would in a measure compensate for their use of the public highways. In the meantime the Corporation Commission continues to grant permits for the operation of motor transportation lines, both freight and passenger, many such permits being for lines which will be in direct competition with existing facilities. The commission is made the judge of the necessity for the service for which application is made, and by the granting of permits to lines competing with existing facilities in effect holds such facilities to be inadequate to the public demand for service.

Pennsylvania Extends Philadelphia Electrification

An extension of the electric service of the Pennsylvania Railroad on its Fort Washington branch was placed in service on Feb. 27. This is a branch about 6 miles long, extending from the Chestnut Hill line to White Marsh. It is equipped with the same general type of electrification as that now in service on the Chestnut Hill branch.

Maine Commission Announces Bus Regulation

Rules and regulations governing the operation of motor vehicles used for the carrying of passengers for hire over regular routes upon any public street or highway within the state of Maine, were announced recently by the Public Utilities Commission to become effective on April 1.

The rules which apply to any automobile, automobile truck or trackless motor vehicle require that a certificate from the Public Utilities Commission be obtained, the application to give the name of the owner, the make of the motor vehicle, seating capacity, rated horsepower, factory number, state license number, where the motor vehicle is to be operated, the fares to be charged, the time of leaving designated points, and the names of any other form of transportation with which the application may compete.

In addition to the mechanical requirements the operating schedule of the vehicles must be maintained and none of them will be allowed to carry passengers in excess of the rated seating

capacity. The vehicle must also be stopped before crossing the tracks of any steam or electric railroads at grade.

All rates of fare and practices are to be subject to the approval of the Public Utilities Commission.

Ship by Traction Urged by Illinois System

The Illinois Traction System, Peoria, Ill., is running in *Traction World*, the St. Louis Chamber of Commerce magazine, a series of advertisements describing its freight activity. The advertisements are the medium of a message to the shippers, the message being that traction is the new field for nation-wide shipments, and that it guarantees per-



PERSONAL Service to Shippers

The volume of freight shipped by Traction is showing a wonderful increase, but the Illinois Traction System will never grow so large that it will not watch over each individual shipment with a personal interest.

There is nothing quite so satisfying for the shipper as to know he is getting this personal service. There is nothing like clasping the hand of the shipper and knowing his particular problems. It is to the essence of the railroad that it does know them.

There is nothing more substantial in industry or railroading than to properly take care of the business entrusted to it.

LET US PROVE TO YOU THIS

Personal Traction Service

FOR SATISFACTION SHIP BY TRACTION
W. H. Wylie, Traffic Manager, Illinois Merchants Bank Building, Chicago, Illinois



Illinois Traction System

Typical Ad Showing Facilities of Electric Line

sonal service, standard equipment, steam line connections, and joint through rates. Under the slogan "for satisfaction ship by traction," W. H. Wylie, the traffic manager, tells the shippers that he wants to prove to them what the personal traffic service is. One advertisement shows the increase in the volume of freight shipped by traction. Another ad gives the territory of the Illinois-St. Louis field for the shipper and the manufacturer. Still another describes the complete carrying facilities of the traction system, which "gives effective accommodations to shippers of all classes of commodities," explaining the switching arrangements with other carriers that make it possible to reach all industries in St. Louis, East St. Louis, Peoria and other points in traction territory.

Philadelphia Rapid Transit Must Pave in Swarthmore

The Philadelphia Rapid Transit Company, Philadelphia, Pa., lost its case recently when the State Supreme Court ordered the company to comply with the terms of a franchise calling for the paving of Yale Avenue from curb line to curb line in the Borough of Swarthmore and the township of Nether Providence, Delaware County. The Borough of Swarthmore some years ago granted a franchise to a railway to operate over Yale Avenue. Subsequently the Philadelphia Rapid Transit succeeded to the other company's rights. A provision in the franchise called for the keeping of Yale Avenue in good repair by the railway. Increased use of the avenue by automobiles resulted in damage, and the borough notified the Philadelphia Rapid Transit to fix the roadway. Upon complaint to the Public Service Commission that body ordered the company to repair "only that portion of the highway occupied by its rails and ties." The Superior Court reversed the ruling of the commission and the case was then appealed to the Supreme Court.

9,000 Pass Users in Fort Wayne

How popular the weekly pass has become with the public using the lines of the Indiana Service Corporation in Fort Wayne in just two years is shown by the fact that from a first week sale of 2,967 now practically 9,000 passes are issued each week. When the idea of issuing a weekly pass was conceived in Fort Wayne the officials of the local corporation had little more than the history of the pioneer Racine installation to guide them, but, by careful management and widespread advertisement the system immediately grew in favor. As a result thousands of passes are now being sold weekly to shopmen and others who otherwise would probably have continued to use the cars sparingly at the regular fare of 7 cents cash or 6½ cents token. To many of these persons the use by them of the pass has meant the possibility of from four to six rides every day, warm lunches and some time away from the factories and shops and all at a cost of only 14 cents daily.

The economy in the use of the pass was immediately impressed upon the shop and factory workers as well as those in downtown offices and stores through a system of newspaper and car advertising and as a result the sale of passes at \$1 each mounted until now the 10,000 mark appears at hand.

As a result of the careful study of the weekly pass privileges it has been found that the average fare per revenue passenger has been reduced from 7 cents of two years ago to 5 2/5 cents

for the second year of pass usage. More than 20,000,000 passengers were handled on the city lines in Fort Wayne during 1923 and it is expected that this figure will be exceeded by more than 5,000,000 during the present year through greater use of the pass.

Jitney Men at Houston Seek Court Intervention

Seven jitney drivers at Houston, Tex., through their attorney, have filed a petition in the District Court asking that the city be enjoined from enforcing the terms of the ordinance adopted by popular vote on Jan. 19, and providing that the jitneys cease operation on April 1.

The jitney men claim in their petition that thirty-three days elapsed between the final adoption of the ordinance calling the election and the date when the election was held, and that constitutes a violation of the charter provision governing such elections.

Another contention is that the Mayor failed to post notices at some of the polling places thirty days in advance of the election; that the form of the ballot was confusing and misleading, and that the ordinance is void on the ground that in effect it grants a franchise to passenger carrying vehicles of more than fifteen passenger capacity.

The City Attorney has prepared another ordinance, which may be passed by the Council without submission to the people, and which will legislate the jitneys off all routes in the city. He has been working on this ordinance several days in anticipation of the injunction suit.

In case the city is restrained from enforcing the ordinance of Jan. 19, the Council is expected to pass the one which is now being drawn up by the City Attorney.

The ordinance of Jan. 19, under which the settlement was arranged, was passed by a vote of two to one.

Small Chance for Transit Legislation in New York

Three bills introduced by Senator Walker, which give to New York City "home rule" powers in the regulation of public utilities, including transit, as well as the right to own and operate transit lines and other public utilities, and three bills introduced by Senator Twomey vesting similar powers in all cities throughout the state were passed by the New York Senate on March 26. The bills were passed by a party vote of 26 to 24 and with no attempt by the Democrats to defend the measures when they were attacked by the Republicans.

Included in the number was a bill that would give to New York City the right to own and operate buses and trackless trolley lines.

A bill reorganizing the Public Service Commission abolishes the present commission of five members, removable only by the Legislature, and substitutes a commission of three subject to removal by the Governor. To this body would be transferred all the present powers of the Transit Commission not taken over by the New York City authorities under the Smith-Hylan transit legislation.

Indications are that the Legislature will remain deadlocked over the legislation, for the Assembly has still to speak. The differences between the two parties over what is best to be done has thus been explained:

The only difference between the two party positions is this: The Republican

Party says that ultimately the transportation facilities in the city of New York shall be self-sustaining. This is contemplated by the Republican measure in the Assembly.

The Democratic Party says: Charge whatever deficit may result from municipal operation back on the taxpayers of the city. The Republican Party takes the position that ultimately in the aggregate, the transportation roads in New York must be self-supporting. It may take three, four or five years, but we insist that the service on the whole must be self-supporting.

The only question is: Which principle shall we adopt? Are you going to make transportation pay for itself or charge it on the taxpayers? We are willing to stand on that issue. The only class of persons which should have the assistance of public funds are those known as the indigent class. Patrons of New York's transportation facilities cannot be classed as indigent persons. There is a question of principle at stake.

If the Democrats are sincere they will accept the principle that the ultimate service should be self-sustaining. They know if they would accept this principle that they would get their legislation from this Legislature, but they would lose their political issue.

Increase in Free Rides a Menace

Commissioner Paul H. Maloney of the Department of Public Utilities has discovered that the number of free rides by the New Orleans Public Service, Inc., had grown to 1,673,271 during the year ended Jan. 31, 1924, representing a possible revenue of \$117,129. The free rides were taken by the heads of the city department and their clerks and stenographers, uniformed policemen, firemen and members of religious orders.

In January, 1924, the number of free rides was 5,000 a day, an increase of 5 per cent over the average for January, 1923. Commissioner Maloney regards every free ride as a tax upon those who pay their fares. It is his intention to learn the sources of request for passes for men and women in the employ of the city.

The indeterminate permit under which the New Orleans Public Service, Inc., is operating in New Orleans provides that only uniformed policemen and firemen shall ride free.

Sane Comment on Safety

R. E. Luellen, safety engineer, editor of *Safety*, a magazine devoted to the interests of the Union Traction Company of Indiana and its employees, commented in the issue of that paper for February on the fatal collision at Alfont on Feb. 2. Under the title "Let Us Be Undismayed" he said:

OUT of a clear sky has come a bolt which shattered our wonderfully fine record of having carried 76,349,109 passengers without fatality occurring to a single one through the sole fault of the employees of this company. In four years seven months and twenty days we carried that number of people and during that time we operated our cars over a total of 37,761,041 miles. Our cars crossed railroad tracks at grade 12,950,630 times, and trains safely met and passed at sidings in single track interurban operation 1,450,053 times.

It was a splendid record, the best our company had ever attained. . . . It meant so much to us! It gave us a greater pride in our company and in ourselves. It stimulated us to greater carefulness, greater effort. It gave us something to work for. It permitted us to feel that our company and we were making progress of a definite sort. We could go to our work or take passage on our cars with a feeling of security and safety.

Then, as unexpectedly as a flash of lightning from a clear, blue sky, came the smiting, blighting bolt, at first stunning and numbing our senses, then almost crushing us to earth with the weight of work and care it brought.

The wonderful record has been broken, but the cause of SAFETY, the worth of SAFETY WORK, has not failed.

Let us turn our faces to the sun. There has not been the storm of public criticism and denunciation which there would have been if we had not done the tremendous amount

of safety work which we have done and have in various ways let the public know we have done and what we accomplished. The attitude of the thinking, fair-minded public, I am sure, is typified by what one representative business man said to me recently. He took occasion to stop me on the street and said to me, "I know you fellows have been hit an awful blow. You certainly have my heartfelt sympathy. Perhaps you feel now that your safety work has resulted in failure, but I want to tell you that I don't feel that way and I don't believe fair-minded people do. GO RIGHT AT IT AGAIN AND DO IT BETTER THAN EVER!"

There's the keynote. Let's go right at it again and DO IT BETTER THAN EVER! Let us remember that more than 99 per cent of us HAVE NOT FAILED. Let us set ourselves resolutely, grimly, if need be, to the task of building up from the ruins of the old record a NEW, BIGGER and BETTER record. In this new structure the bricks will be our ACTS; they will be put in place by SUPERVISION, and the mortar to cement them into the strong, rugged structure of SAFETY must be the RULES. It cannot be otherwise.

Building this new structure is your job and my job and the job of every Union Traction employee. Let us do it well, never forgetting for an instant the lesson this failure has taught.

The CAUSE of SAFETY, the WORTH of SAFETY WORK, has not failed!

Grade Crossing Legislation Likely in New York

Legislation has been prepared to carry out the provisions of the recommendations of Governor Smith for grade crossing elimination in New York State. One bill amends the railroad law by transferring all of the powers now vested in the Public Service Commission with respect to control over crossings to the Superintendent of Public Works, the Highway Department retaining, of course, the jurisdiction it now has in such matters. It is the opinion of the administration that the passage of this bill will facilitate greatly the issuance of a final order for crossing elimination as the request for the elimination and the action on it would be taken by the same department of state government. The general provisions of hearing and determination remain about the same in the amended law as now prevail.

Another provision of the bill does away with alteration of existing grade crossings and provides, in effect, that whenever any such crossings are altered they shall be converted into overhead or underground crossings. The present provisions of law is retained requiring expenses incurred by railroad corporations in any one year shall be as equitably distributed as practicable throughout the state so that one railroad will not be called to make a much larger expenditure than another railroad system for crossing elimination.

The constitutional amendment would pledge the credit of the state for the state's share of the elimination program to the extent of \$100,000,000.

The Republican leaders are for the constitutional amendment lending the state's credit to the project, but are opposed to the transfer of jurisdiction.

Red Egg Symbol Shows Real Originality

The doctrine of association of ideas is not new in advertising, but clever applications of it deserve mention. To J. S. Bleecker, when he was general manager of the Columbus, Newark & Zanesville and the Indiana, Columbus & Eastern Railways, occurred the thought that if there was merit in associating a cigarette with the comparatively infrequent camel, why not try to associate the electric railway with the popular and ubiquitous egg? To make the egg symbol still more representative of vitality, it was decided to color it a vivid red. Thus came the slogan of the "Red Egg Lines." The egg is found not only on the company's rolling stock in red, but also nestles within the "S" and the "E" that form part of the good-will periodical entitled "Safety and Service."

The adoption of this original symbol gave Mr. Bleecker the opportunity for a prize contest on "Why Is Our Transportation Service Like an Egg?" Most of the replies were serious or witty, with little evidence of the flippancy that an egg evokes among some persons. One customer wrote: "Because both imply careful transportation"; a second, "Because no adequate substitute has ever been found for either"; a

third, "Because both were laid for the benefit of mankind" (second prize); a fourth, "Something to crow about" (third prize). The first prize was won by a patron who compared the railway and the egg as embodiments of the principle of life.

The prizes were \$50 for the first, \$35 for the second and \$15 for the third. The winning answers were published in Vol. 1, No. 4 of "Safety & Service."

Mr. Bleecker, who has also done notable work in Ohio to set forth fairly the position of rail and bus, is still connected with the railways named through the management organization of Day & Zimmermann, Inc., Philadelphia. Some facts on the activities of the "Red Egg Lines" were given in the ELECTRIC RAILWAY JOURNAL, issue of March 15.

British Columbia Property Tells the World

A series of advertisements has been appearing in all the Vancouver, B. C., papers telling the story of the gas, light and power and railway service supplied by the British Columbia Electric Railway Company, Ltd. The "ads"

of the British Columbia Electric Railway are told that on any occasion and in any weather the street car will furnish dependable service. In each "ad" the company asks the customer the question, "Is your service satisfactory? If not, please let us know."

Traffic Improvement Plans Now in Effect in Grand Rapids

Recommendations with regard to speeding up traffic on the downtown streets of Grand Rapids, Mich., have been made by Gerald J. Wagner, consulting electrical engineer for the city. After repeated conferences on the subject of how to cope with the rush hour traffic, it was decided in every way possible to keep the motorist from Monroe Avenue along which practically every street car line in the city passes. In addition loading platforms are being installed in the downtown section which will enable two cars to load at once and men are placed at certain loading platforms from whom passengers can purchase tickets before boarding cars. Policemen at intersections, though governed by the signal lights, are to be permitted greater latitude in handling traffic tangles on their corners.

Peculiar Angle Given to Accident Case in Los Angeles

Before the Superior Court in Los Angeles is the question of the possible necessity for an amendment to one of the State laws of California, passed in 1872, which controls the carrying of passengers by a public conveyance corporation. The matter arose at a trial of a suit by a woman against one of the traction lines in Los Angeles for damages alleged to have been suffered on a crowded car.

The question is whether a railway can be held liable for damages by permitting more passengers to enter a car than can be accommodated with seats.

Attorneys are reported to see ahead a possible need for traction lines to reorganize their entire system, provided the court's decision favors the plaintiff. The plaintiff claimed she was a passenger on a crowded car in 1923 and suffered serious injuries when the car lurched suddenly and threw her against a rear section. She alleges the company was negligent in permitting the car to become overcrowded and with not properly providing passengers with seats.

The company asserts that if the plaintiff boarded an overcrowded car she did so voluntarily and, therefore, assumed the risk of injury with her own knowledge. Probably the injury was to be anticipated, the defendant contended, at the time the plaintiff boarded the car.

The two sections of the Civil Code of California affecting the control of street car traffic, and the status on which is involved the suit, follows:

A common carrier of persons must provide every passenger with a seat. He must not overload his carrier by receiving or carrying more passengers than its rated capacity allows.

A common carrier of persons must provide a sufficient number of vehicles to accommodate all passengers who can be reasonably expected to require carriage at any one time.

Posters Typical of the British Columbia Campaign

were set up at a job plant and furnished to the newspapers in the form of electros. Besides giving some general information on its daily carrying capacity on the electric railway the posters enumerate the many advantages gained by riding on the electric cars. They have a message for the shopping fiend, the social belle, the matinee addict and the anxious churchgoer. The patrons

Application to Make Improvements in St. Louis Denied

Applications of Receiver Rolla Wells of the United Railways, St. Louis, to build 100 center-exit cars, known as Type 700, and to double track the Missouri Electric Railway's main line from St. John's station to the Woodson Road, St. Louis County, was denied by Federal Judge Faris on March 20. Judge Faris acted on the recommendation of acting Special Commissioner Fred L. Williams, who held that the contemplated expenditures would be in the nature of permanent improvements and should not be paid for out of the earnings of the company while it is in receivership. Holders of the bonds of the St. Louis & Suburban System opposed the improvements. The cars would have cost \$1,050,000 and the double tracks \$15,000 for the Wellston-St. Charles line, a distance of three-fifths of a mile.

Thomas E. Francis, attorney for Receiver Wells, argued that the proposed cars were in the nature of repairs, as they were intended to replace cars now in service, and that the new track on the St. Charles line was necessary to preserve that property's earning powers.

The United Railways shop at Thirty-ninth Street and Park Avenue is now working on the last fifty of 200 similar cars built since Receiver Wells took charge of the property, and it was intended to obtain permission for the construction of the additional cars in time to permit ordering of the necessary lumber, motors, etc., so that the shop forces could continue their present schedule of work.

Granted Bus Permit Between Los Angeles and Santa Monica

The California Railroad Commission on March 3, 1924, granted a permit to the Pacific Electric Railway to operate bus lines between Los Angeles and Santa Monica. It is stated that the railway proposes to have the line in operation in time to take care of the heavy summer travel to the beaches. Twenty-five passenger buses or larger will be used. The schedule of fares announced by the company to be put into effect was: One way, 38 cents; round trip, 60 cents, with a minimum charge of 6 cents for rides between fare breaks, or points in different zones. Special rates have been arranged for patrons desiring to purchase commutation books.

The Mayor of Santa Monica has made it plain that he will not vote for a franchise for any transportation line into the city which charges more than a 5-cent fare. The Pacific Electric local fare is now 6 cents.

During last December the California State Railroad Commission conducted a five-day hearing in Los Angeles in the matter of a bus line permit for the operation of motor bus service between Santa Monica Bay District and Los Angeles. The territory, a distance of 19 miles, at present is without motor bus service. Passengers between Los Angeles and Santa Monica are served by the Pacific Electric interurban lines, there being two separate interurban routes between the two cities. Three

companies sought permit to render motor bus service, the Pacific Electric Railway, the Bay Cities Transit Company, which now serves the Santa Monica Bay District with a local bus system, and the United Stages, Inc. The Pacific Electric Railway also operates a system in Santa Monica.

Freight Station at Indianapolis Nearing Completion

Work is progressing rapidly on the interurban electric railway freight station on Kentucky Avenue, Indianapolis. The buildings are near completion and the tracks are being laid. It is possible that the companies may be able to use part of the station and new tracks before May 1. When this station is completed it will probably be the largest station of its kind in the world. It will be occupied jointly by the Interstate Public Company, the Union Traction Company, the Indianapolis & Cincinnati Traction Company and the Terre Haute, Indianapolis & Eastern Traction Company.

North Shore Line Announces Summer Bus Tours

Extensive motor tours into the vacation lands of Wisconsin are to be undertaken by the Chicago, North Shore & Milwaukee Railroad this season. Four tours of seven, four, three, and one day duration each are planned. The territory into which these tours will run includes some of the most beautiful spots in the Middle West.

Last season the North Shore Line operated motor coaches between Chicago, Ill., and Lake Geneva, Wis., with success and the extension of this service is a result of last year's experience. The Lake Geneva tour will be made this year.

On the seven-day tour coaches will leave Chicago Monday morning and reach Green Bay Thursday evening. The return to Chicago will be made by Sunday night. This round trip will be 959 miles. The cost of the tour will be \$89, including hotel, meals and boat trip. Two other routes will cover practically the same territory with shorter side trips. They will be of five and three-day duration respectively. A regular one-day trip from Chicago to Lake Geneva and return, including a boat trip on Lake Geneva, will correspond with the trip conducted a year ago. The longer trips are to be made once a week, the coaches leaving Chicago every Monday, from June 16 to Sept. 22, inclusive.

A four-color folder is being prepared as part of the tour advertising program. In it the attractions of the territory will be outlined. This folder is to be illustrated with attractive scenes of the territory visited. It will also contain prices and other details of interest to the prospective traveler. The tour prices include lodgings and all meals, a feature which it is expected will appeal to the public as it will relieve the tourists of much of the detail usually encountered on vacations.

As in the past, the North Shore Line will continue its operation of motor coaches for special charter parties.

Jitney Injunction in New Jersey Creates Precedent

Vice-Chancellor Backes of New Jersey has granted to the Board of Public Utility Commissioners an injunction restraining Frederick D. and Louis Sheldon from operating a bus line through Dover and Wharton, alleging defiance of the board's order to cease. This is the first time that the commission has resorted to injunction to compel compliance with its orders. The decision by the vice-chancellor is regarded as establishing a precedent.

Counsel for the bus operators held that the order of the utilities board to cease operation, amounted to confiscation of property rights. The board had revoked its approval of the license granted the Sheldons because of violations of conditions imposed.

After reviewing the facts in the case and calling attention to the recent law by the Legislature imposing certain penalties for disregard of the utility commission's orders, the opinion by the vice-chancellor states:

The jurisdiction of equity to protect the rights of the State is one of common exercise, usually upon the relation of the Attorney-General. But where, as here, the duty of protecting the public interest as against the unlawful operation of public utility jitneys is vested by the State in the board, the authority to vindicate the public right is conferred by necessary implication, if not by express terms, and the functions of the Attorney-General are bestowed. Proceedings at law by certiorari or mandamus are obviously inappropriate. The board's action may be reviewed by certiorari or mandamus issues only to enforce legal rights, not to restrain unlawful acts.

Bus Plan for Aberdeen Abandoned

The City Council of Aberdeen, Wash., has abandoned its plan to grant a permit to a proposed stage line operator to compete with the Grays Harbor Railway & Light Company on its South Aberdeen Cosmopolis line. The decision followed the securing of promises from the railway to pave permanently the space between its tracks at different points; to double-track its line for a distance of 2,700 ft., and to place sufficient cars on the route to provide fifteen-minute service or better. A. E. Bertrand, manager of the company, assured the Council that important improvements to the company's traction system would be made during the present year.

The Mayor of Cosmopolis and other city officials had appeared before the Aberdeen City Council and registered complaints against the railway service, declaring that competition was necessary in the district. Business men from South Aberdeen joined in the appeal for better service and urged the granting of a permit to the bus operators, who had applied for a permit to operate between Cosmopolis and Aberdeen. Following the bus men's application the City Council of Aberdeen, had instructed City Attorney A. E. Cross to prepare a measure repealing a portion of the ordinance which granted to the Grays Harbor Railway & Light Company exclusive operating rights over streets on which tracks of the company are laid between F Street and the limits of the city at the Cosmopolis line.

News Notes

Public Hearing on Fare Petition.—The Maine Public Utilities Commission on April 1 will hold a public hearing on the petition of the Androscoggin & Kennebec Railway, which asked for an approval of an increase in its single fare from 9 to 10 cents. A schedule increasing the fares on the Androscoggin & Kennebec Railway from 7 to 9 cents, became effective Sept. 1, 1920.

Rates Reduced.—A change in mileage book rate on the Salt Lake & Utah Railroad, Salt Lake City, Utah, which will reduce the cost of the 1,000-mile book from \$25 to \$22.50, will become effective April 7. The mileage scrip will be honored by the Salt Lake & Utah Railroad, Bamberger Electric and Utah-Idaho Central Railroads.

Will Hold Election on Car Purchase.—An election is scheduled for May 20 in St. Petersburg, Fla., calling for a bond issue of \$135,000 for the purchase of fifteen cars to be operated by the Municipal Railway of St. Petersburg.

Will Acquire Bus Line.—The Compton Transportation Company has applied to the California Railroad Commission for permission to sell its bus rights, properties and equipment used in the operation of the Long Beach-Huntington Park line to the Pacific Electric Railway. The application states that \$43,707 will cover the sale. The sale does not include the Long Beach-Venice line.

Wage Hearings Started.—Hearings in the arbitration between the Worcester Consolidated and the Springfield Street Railways and the union were begun March 24. The first witness heard was Arthur Sturgis, Washington, D. C., who presented budgets pertaining to the cost of living, intended to support the petition of the men for a wage increase from 58 to 80 cents an hour.

Law Would Forbid Sale of Transfer.—A bill has been introduced in the General Assembly of Maryland passage of which would make it a misdemeanor for any person to sell or give away a transfer or for any person to use a transfer issued to any other person. The measure provides a fine of not less than \$10 for the first offense and a fine of not less than \$100 or six months imprisonment, or both, for the second or subsequent offenses.

Establishes Truck Line.—The Fitchburg & Leominster Street Railway has established a motor truck line between Winchendon and Fitchburg, Mass., accommodating freight patrons of the road in Winchendon, Westminster and Gardner and replacing the old electric express formerly operated by the Northern Massachusetts Street Railway.

Electric Railway Man Will Arrange Transport.—E. W. Ford, vice-president of the Memphis Street Railway, Memphis, Tenn., has accepted the chairmanship of the transportation committee of the Confederate reunion to be held in Memphis June 4, 5 and 6. He will arrange all schedules and rates, or-

ganize the transport resources of the city and hold them in readiness for emergencies. Arrangements will also be made to handle record automobile traffic.

Measure Fixing Size of Crew Defeated.—The bill before the Kentucky House for two-man cars in Louisville was defeated on March 11, forty to thirty-six.

Course Helpful to Many.—At the University of Colorado, Boulder, Prof. C. M. McCormick, with the use of moving picture slides, will endeavor to make clear many points connected with the short course for electric railway motormen. This is the second year the university has given this course, and while it is intended principally to school the men who handle cars, there is much about it that any one interested in elementary electrical engineering will find helpful.

Office to Be Moved.—The general offices of the Columbus, Newark & Zanesville Electric Railway will be moved from Springfield to Zanesville on April 1.

Lost Tickets Subject for Argument.—The Montreal Tramways, Montreal, Que., has objected to a decision of the Tramways Commission ordering it to establish a reserve fund of \$500,000 to provide for the item of unredeemed tickets. An appeal has been entered with the Quebec Public Service Commission stating that this item should continue to be dealt with as at present, and shown as a liability in the annual statement. In the last annual report of the company the item of unredeemed tickets is shown as a liability amounting to \$519,346. The matter will be discussed during the sitting of the Quebec Public Service Commission to be held in Montreal some time during the month of April.

Another Bus Service Started.—The Seattle Municipal Railway, Seattle, Wash., will operate a bus service on Beach Drive, between Orleans Street and West Dawson Street, connecting with the railway line at Orleans Street. West Seattle residents donated half the \$6,500 cost of putting the bus in operation.

Voters Approve Rehabilitation.—The Canadian National Railway franchise for the rehabilitation of local and interurban electric lines at Niagara Falls, Ont., was approved by the voters of the city at a special franchise election March 19. Work on the new system will be started at once. An initial 7-cent fare will be charged and all future fare adjustments will be on the service-at-cost basis.

Jury Disagrees on Platform Employee's Theft.—The jury in Niagara County Court at Lockport, N. Y., disagreed in the case of Francis Reilley of Buffalo, former striking platform employee of the International Railway, Buffalo, on trial for alleged participation in the theft of dynamite. The theft occurred three days before the dynamite outrage on the Buffalo-Niagara Falls high-speed interurban line of the International at Ellwood Station during the strike. Reilley is the first of eleven men under indictment in the state courts for alleged par-

ticipation in the theft and hauling of the dynamite from the town of Lockport to Buffalo.

Named National Councillor.—H. F. Dicke, general manager of the Utah Light & Traction Company, Salt Lake City, Utah, and vice-president of the Salt Lake City Chamber of Commerce, has been named national councillor of the organization to attend the twelfth annual meeting of the National Chamber of Commerce at Cleveland, Ohio, from May 5 to 12.

Rerouting Plan in Abeyance.—At the first reading of the plan submitted by Commissioner W. E. Cann for rerouting the lines of the Community Traction Company, Toledo, the City Council indicated that it was at present unwilling to finance improvements by increasing the capital value of the company as provided in the Milner Ordinance. It is anticipated that it will be several weeks before the plan will go through if it is adopted as a whole or in parts.

Will Start Bus Operation.—The Connecticut Company will install at once bus service on the Compo Beach line in Westport, Conn.

No Action by Council.—It is not decided whether the City Council of Everett, Wash., will protest the proposed elimination of the transfer privilege on the bus system of the Puget Sound International Power & Railway Company, as proposed in a new tariff. The railway operates the bus system in place of its former traction lines. It proposes the elimination for ninety days, claiming that it is unable to furnish this privilege for the 5-cent fare charged. All but one line is involved in the proposed change. The busmen's wages have been increased. After a week's hearing in the wage controversy between the company and the busmen's union, the arbitration board has granted a wage increase of 5 cents to 7 cents to busmen, according to time of service. The award is retroactive to Feb. 1. The increase asked by the busmen was 19 per cent. The company offered the men 3 per cent more. Busmen will now receive 55 to 61 cents an hour, instead of 48 to 56 cents.

Will Pay with Check.—The Market Street Railway, San Francisco, Cal., has adopted the plan of paying its employees by check instead of cash.

Boulevard Stop System Effective in April.—The City Council of Los Angeles, Cal., enacted an ordinance on March 13, effective April 13, applying the boulevard stop system to some streets devoted to street car lines. The boulevard stop system was tested on two main thoroughfares for several months, but protected only automobile traffic. The ordinance requires that all vehicles crossing certain streets must stop before passing the line of intersection. In the summary of Los Angeles traffic conditions made by George Baker Anderson, manager of transportation of the Los Angeles Railway, at the Midyear Meeting of the American Electric Railway Association and published in the *ELECTRIC RAILWAY JOURNAL* of March 8, page 372, mention was made of the boulevard stop plan then being of benefit only to traffic of largely non-necessity type.

Foreign News

Through Service in London

Through electric trains will be running between Hendon, Middlesex, and Moorgate Street in the city of London, England, by the middle of April. This is made possible by the completion of the connecting line between the Charing Cross and Hampstead Railway and the City & South London Railway, the connecting line being from Euston to Camden Town, and the opening of the reconstructed northern section of the City & South London line from Euston to Moorgate. Reductions in time of trips between various points will be from 5 minutes to a half hour.

In the rejuvenation of the City & South London Railway, the whole of the tunnels between Euston and Moorgate have now been enlarged to the standard diameter of the other tube lines. All the platforms have been lengthened to accommodate the longer trains. The Angel Station has been practically rebuilt and high speed lifts are being installed, while Moorgate is to have a larger station equipped with escalators and having a capacity of 10,000 passengers an hour.

Java Electrification Progresses

According to United States *Commerce Reports* rapid progress is being made by the railway authorities of Java with the electrification of the principal lines of that island. Completion of the work of constructing the power house at Tjibadak near the city of Solkaboemi, Java, and the transmission line from the power house to Batavia, a distance of 100 km., is expected to take place by June of the coming year. In addition to supplying power to the Batavia Loop Line the plant at Tjibadak, which will distribute at 70,000 volts, will also supply current for the city of Batavia and for Solkaboemi. The present plant of the Batavia Electric Light Company will be kept as a reserve station. It is said that the current will be very cheap, but the rates have not yet been made public, nor is it definitely known whether the electric light company will reduce its rates, which are rather high at present. The company has an exclusive franchise.

French Deficits to Be Lowered by Electrification

The French Minister of Public Works makes known the following figures as showing the deficits in railway operation in France during the last three years:

OPERATING DEFICITS OF FRENCH RAILWAY SYSTEMS, 1921-1923

Systems	1921	1922	1923
	Francs	Francs	Francs
State.....	642,000,000	383,000,000	460,000,000
Alsace-Lorraine.....	78,000,000	82,000,000	50,000,000
Nord.....	247,000,000	119,000,000	188,000,000
Est.....	159,000,000	7,000,000	55,000,000
Paris, Lyons, Mediterranean.....	407,000,000	244,000,000	180,000,000
Paris-Orleans.....	369,000,000	237,000,000	215,000,000
Midi.....	186,000,000	156,000,000	140,000,000

Of these companies the Midi, the P.L.M. and the Paris-Orleans have the most extensive electrical projects under way, principally in the Alps and Pyrenees. Various short-line feeders are already in operation and others are about to be put into service. It is claimed that with lighter, shorter, more frequent trains on short lines and the general saving in coal resulting from the electrification schemes which will be in operation throughout in from three to five years these deficits will be completely annulled. Incidentally, the present week fares and freight have been raised on all French railways, 50 per cent for the former and 12½ per cent for the latter.

Receipts of Paris Lines

The Metropolitan subway section of the Paris Transports en Commun during the calendar year of 1923 had receipts of 160,786,133 francs, corresponding to the sale of first and second class and workmen's return tickets to the number of 468,845,616.

The Compagnie Générale Parisienne de Tramways, the street car section of the all-inclusive Transports en Commun of the Paris district, increased its profits in 1923 by 1,245,590 francs as compared with 1922, the total profit of 1923 being 4,370,222 francs. It is proposed to use this entire profit for retiring priority shares, after first raising dividends 1 franc per share. Priority shares thus earn 16 francs and ordinary shares 13.50 francs. It may be mentioned that this profit really comes from the sale of property, rather than from operating.

Progress in Austrian Electrification

The electrification costs of the Austrian Railways from the middle of 1919 up to the close of November, 1923, as announced by the Austrian Federal Railways was 375,000,000,000 crowns, of which 270,000,000,000 were expended on the Arlberg line, 80,000,000,000 on the Salzkammergut railways, and 25,000,000,000 on the Mallnitz and Stubach plants. The budget for 1923 allocated 223,000,000,000 crowns for railway electrification. This amount was recently increased to 300,000,000,000 crowns in order to carry on the building activities to advantage. The same amount is set aside in 1924.

The operation of the electrified Innsbruck-Landeck section of the Innsbruck-Telfs line was commenced in July, 1923,

and a trial run was successfully made on the Telfs-Landeck section in December last. Operation on the Innsbruck-Bludenz line after completion of the Spullersee plant is scheduled to take place in 1925. The cost of the locomotives to be used on the Innsbruck-Bludenz line will have to be carried over to 1925. Upon completion of the contemplated building activities 270 km. of Austrian federal lines will be electrified by the commencement of 1925.

A partially electrified operation will result in a considerable economy of coal, as the saving for 1924 alone is estimated at 25,000,000,000 crowns or \$360,000. Progress has been made in electrifying several stretches of the Austrian railway and some of the most difficult tasks were accomplished during the summer of 1923, according to recent commerce reports.

African Electrification in Prospect.—The Congo Railway will be rebuilt. The work has been started on two sections. Supplementing the original proposal, according to the *African World*, the line will now be electrified, using the trolley system. It is believed that four years will be required to change over the line, which is at present narrow gage and 400 km. long.

Railway Proposed in Spain.—A committee from one of the industrial centers of Spain recently waited on the government in Madrid to secure authorization for the construction of an electric railway between Corunna and Santiago, and at the same time to request the government to guarantee interest of 5 per cent on capital already invested. Construction will begin as soon as authorization is granted.

Nice Tramway Gains.—The Compagnie de Tramways de Nice, France, had receipts for the calendar year of 1923 of 12,689,636 francs, as compared with 11,231,110 francs in 1922. For at least seven months of the year this line caters to a vast tourist traffic, it being estimated that in the height of the season the normal population, some hundred and fifty thousand, more than doubles itself.

Another Tramway Into London.—The construction has been authorized of an extension to the tramway of the London County Council across Southwark Bridge with a northern terminus at Queen Street Place, within almost a stone-throw of the Bank of England and the Mansion House. The extension still must obtain the sanction of Parliament.

Electrification Planned for South Manchuria.—A project is being worked out to electrify the lines of the South Manchuria Railway, which operates a system of railroads between Fusan, Seoul, Mukden, Dairen and Changchun. The engineers have calculated that the fall in the Yalu River at a point 100 miles north of Antung is sufficient to develop 100,000 kw. of electrical power. It is likely that the section of the road between Mukden and Dairen, about 200 route-miles, will be the first to be electrified. The intention is also to supply power, light and heat from the hydraulic plant, using the surplus power in the development of agriculture.

Financial and Corporate

\$12,815,416 Divided in Chicago

This Amount Split Between Two Companies Before Payment of One Made to City

Residue receipts of the Chicago Surface Lines for the year ended Jan. 31, 1924, were \$12,815,416. This sum was divided on the basis of \$7,689,249 to the Chicago Railways and \$5,126,166 to the so-called South Side Lines. These amounts include, of course, the city's 55 per cent of the net divisible receipts as defined in the 1907 settlement ordinance.

As of Feb. 1, 1923, the total purchase price at which the city could recapture the properties was \$160,944,225, while on Feb. 1, this year, that price stood at \$162,161,129. During the seventeen years of the ordinance period the companies have increased their facilities for serving the public by capital expenditures of \$106,386,000, or a yearly average of more than \$6,250,000.

Comparisons of statistics of the Surface Lines system at the end of the first year of unified operation (Jan. 31, 1915) and at the close of the tenth year (Jan. 31, 1924) follow:

Item	1915	1924	Per Cent Increase
Gross earnings	\$31,966,049	\$57,655,170	80.36
Operating expenses	\$19,889,276	\$44,839,753	125.45
Total wages paid	\$12,379,615	\$29,744,012	140.27
Revenue passengers carried	627,731,550	824,850,103	31.40
Total rides	1,115,312,129	1,467,344,286	31.56
Average fare per revenue passenger	4.99c	6.91c	38.48
Average fare per ride	2.81c	3.88c	38.08
Trainmen in service	8,847	11,745	32.76

During the ten-year period of unified operation \$52,017,331 has been paid out for public benefits. Since the 1907 ordinances a total of \$85,752,727.08 has been paid out for similar purposes.

In June, 1920, revenue passengers on the system reached a new daily average high peak of 2,238,760. After that business fell off and this record was not reached until March of last year. It was again passed in April, May, June, October, December and January—the highest mark being October, with 2,327,181. The highest traffic day was Dec. 15, 1923, when 2,690,857 revenue passengers were hauled, total rides on that day being 4,688,158.

In the combined system are included 1,063 miles of single track. The rolling stock equipment consists of 3,904 cars, of which 3,417 are passenger cars.

During the year 219 passenger cars were added to the equipment divided as follows:

169 double truck two-man cars (of which 69 were built at company shops);

43 double truck one-man cars (built at company shops);

7 trail cars (to replace an equal number destroyed in Devon Avenue car house fire).

The shops are now constructing twenty-three double truck two-man cars.

As an illustration of increased use of equipment the following figures for various years are of interest:

Year Ending	Av. Miles per Car
1-31-24	37,400
1-31-23	37,152
1-31-22	37,226
1-31-21	37,122
1-31-20	36,195
1-31-19	35,871

Henry A. Blair, president, in reviewing the affairs of the company, says that since the coming into office of Mayor Dever and a new Council of fifty

members the fairest relations have prevailed between the new administration and the management of the companies and that the outlook is for a continued square deal. Public relations have also been improved during the year. Reference is also made to the wage arbitrations during the year and to the award to Amalgamated men of 3 cents an

EARNINGS STATEMENT OF THE CHICAGO SURFACE LINES FOR TWELVE MONTHS ENDED JAN. 31

Earnings:	1923	1924
Passenger cars (including M. C.)	\$55,495,310	\$56,985,687
Chartered cars	9,594	7,942
Newspaper cars	15,868	13,618
Freight earnings	1,864	3,023
Hospital car service	5,078	5,870
Advertising	253,677	260,804
Rents of buildings, etc.	100,244	141,349
Sale of power	89,340	95,993
Interest on deposits	119,032	126,864
Miscellaneous	13,054	13,019
Gross earnings	\$56,103,061	\$57,655,169
Expenses:		
Way and structures	\$2,556,627	\$2,682,066
Equipment	3,788,170	3,858,865
Renewals	4,488,244	4,612,413
Power—maintenance	316,449	361,955
Power—operation	3,175,390	3,321,683
Conducting transportation—trainmen	19,662,636	19,640,721
Conducting transportation—other	2,912,780	3,030,585
Traffic	42,097	44,208
General and miscellaneous—damages	2,356,328	2,421,517
General and miscellaneous—other	1,859,348	1,695,740
Taxes	3,258,000	3,170,000
Total expenses	\$44,416,069	\$44,839,753
Residue receipts	*\$11,686,992	*\$12,815,416
Divided:		
Chicago Railways 60 per cent	*\$7,012,195	*\$7,689,249
South Side Lines—40 per cent	*4,674,797	*5,126,167

* Includes city's 55 per cent of net divisible receipts, as defined by ordinances.

hour more during the year starting June 1, 1923, and an additional 2 cents an hour during the year which will begin on June 1, 1924. So far as the bus is concerned, Mr. Blair indicates that the principle appears to be pretty well established in Illinois at least that it would be contrary to public policy to authorize competing lines where the existing carriers are furnishing an essential service.

On June 1 the company established its own insurance department. After a thorough inspection of the various properties and a comparison of insurance rates and schedules, an average rate reduction in policies of nearly 50 per cent was made effective on the date of expiration, Oct. 4, for a period extending to Feb. 1, 1927. The actual saving in premium was at the rate of \$94,685 a year, or \$310,883 for the period. Savings were also effected in cost of burglary, holdup, automobile and

REVENUE PASSENGER STATISTICS OF CHICAGO SURFACE LINES

Year Ended	Weekday Average	Saturday Average	Sunday* Average	Total for Year
Jan. 31, 1924	2,354,139	2,521,487	1,623,414	824,850,103
Jan. 31, 1923	2,204,425	2,356,385	1,563,911	762,629,211
Jan. 31, 1922	2,129,217	2,251,293	1,560,310	750,515,622

* Includes holidays.
Trainmen's strike Aug. 1 to 6, 1922, inclusive.

STATISTICAL DATA OF CHICAGO SURFACE LINES FOR THE FISCAL YEARS ENDED JAN. 31

	1918	1919	1920*	1921†	1922	1923‡	1924
Rate of fare	5 Cents	5 Cents	5 Cents	6 Cents	8 Cents	8 Cents	7, 6 2/3 Cents
Revenue passengers	692,815,889	685,300,718	743,745,584	769,025,413	750,515,622	762,629,211	824,850,103
Passenger receipts	\$34,566,601	\$34,186,578	\$43,417,639	\$54,726,740	\$59,706,412	\$55,495,310	\$56,986,687
Total earnings	35,114,633	34,710,097	43,963,438	55,327,384	60,343,733	56,103,061	57,655,169
Operating wages	12,854,406	14,768,088	19,854,173	28,204,341	29,676,981	27,163,996	27,458,736
Other operating expenses and taxes	10,247,289	10,963,848	13,399,841	15,096,050	16,839,168	17,252,072	17,381,016
Residue receipts	12,012,937	8,978,160	10,709,423	12,026,992	13,827,583	11,686,992	12,815,416
Less: Joint account expenses	648,205	478,831	181,862	164,733	449,000	620,000	885,000
	\$11,364,731	\$8,499,329	\$10,527,561	\$11,862,258	\$13,378,583	\$11,066,992	\$11,930,416
5 per cent on purchase price	\$7,661,542	\$7,802,574	\$7,893,292	\$7,974,289	\$8,024,104	\$8,039,343	\$8,076,369
55 per cent to city	\$2,036,754	\$383,216	\$1,448,848	\$2,138,383	\$2,944,963	\$1,665,207	\$2,119,616
45 per cent to companies	\$1,666,435	\$313,539	\$1,185,421	\$1,749,586	\$2,409,516	\$1,362,442	\$1,734,231

* 5-cent fare in effect 2-1-1919 to 8-7-1919; 7-cent fare in effect 8-8-1919; to 11-30-1919; 7-cent, 6½-cent and 6-cent fare in effect 12-1-1919 to 12-26-1919; 6-cent fare in effect 17-27-1919 to 1-31-1920. † 6-cent fare in effect 2-1-1920 to 6-30-1920; 8-cent fare in effect 7-1-1920 to 1-31-1921. ‡ 8-cent fare in effect 2-1-1922 to 6-14-1922; 7-cent fare and 6½-cent fare 6-15-1922 to 1-31-1923.

other forms of insurance. An inspection system was put in effect to maintain the highest standards in general housekeeping and fire prevention.

The balance in the reserve for renewals on Feb. 1, 1923, was \$12,366,120. The similar balance on Feb. 1, 1924, was \$13,141,525. The balance in the special reserve on Feb. 1, 1924, was \$1,396,117, so that the total balance on Feb. 1, 1924, was \$14,537,642. This balance is a cash balance and is on deposit in various banks.

Surplus of Hudson & Manhattan Larger

The report of the Hudson & Manhattan Railroad, operating under the Hudson River between New York and New Jersey, for the year ended Dec. 31, 1923, shows a surplus of \$1,356,355, after taxes and bond interest including adjustment income bonds compared with \$835,731 in the preceding year. After allowing for 5 per cent dividend requirements on the preferred stock the balance of surplus available is equivalent to \$2.73 a share on the \$39,994,890 of outstanding common stock, compared with \$1.43 in 1922.

President Oren Root says that while the net return from railroad operations shows a satisfactory increase during 1923 it is still very much less than the 5.75 per cent determined by the Interstate Commerce Commission as a fair return upon the aggregate value of the railway property of carriers as defined in Section 15-A of the interstate commerce act.

The income account for 1923 compares as follows:

	1923	1922
Operating revenue.....	\$8,228,522	\$7,862,419
Expenses and taxes.....	4,634,287	4,494,372
Operating income.....	\$3,594,235	\$3,368,047
Other income.....	1,553,954	1,291,365
Non-operating income.....	279,245	264,154
Total income.....	\$5,427,434	\$4,923,557
*Bond interest, etc.....	\$2,425,979	\$2,432,726
Balance.....	\$3,011,455	\$2,490,831
Adjustment in bond interest..	1,655,100	1,655,100
Surplus.....	\$1,356,355	\$835,731

* Exclusive of interest on adjustment income bonds.

Fewer Passengers Being Carried in Grand Rapids

A decrease of 954,819 passengers during 1923 on the Grand Rapids Railway is reported in an audit received by City Manager Locke from James B. Hogarth, Chicago. Every line carried fewer passengers in 1923 than in the previous year, totals for the two years being 23,103,961 and 24,058,780 respectively.

Gross receipts for 1923 were \$1,818,318, and after deducting \$1,119,114 for operating expenses, \$135,543 for taxes and \$171,696 for depreciation, a net income of \$391,543 was reported.

The auditor investigating for the city determined that \$457,857 was necessary to provide the 8 per cent which the city has agreed the company should receive. The report also showed that the deficit found by Mr. Hogarth corresponded with the company's own audit, which the city wished to check following a recent fare raise of from seven to six rides for 50 cents.

Mr. Hogarth said he believed that when the riding habit grows there should be a reflection at once in the affairs of the company of an ability to lower the present rate of fare.

Only in March and April was there an increase in the number of passengers over the previous year. Tickets were purchased by 83 per cent of the riders, while the rest paid the alternative straight 10-cent fare.

The valuation on which the company is permitted to earn a return increased during the year from \$5,605,704 to \$5,814,509.

Labor Troubles Affect Mexican Results

The net income of the Mexico Tramways for the year ended Dec. 31, 1922, was \$2,097,918 in Mexican currency. In 1921 in Mexican currency the net earnings amounted to \$2,335,436. This fact was disclosed in the ninth annual report recently submitted to the shareholders. The total expense from operation plus maintenance and taxes was \$10,244,498 in 1922, compared with \$10,139,854 in 1921. An allowance of \$600,000 was made for depreciation in 1922. The total number of first and second-class passengers was 109,286,678 in 1922 and 110,708,925 in 1921.

In accordance with the program of the company developed in connection with the reorganization two half-yearly coupons on the first mortgage bonds of the company were paid during 1922. Interest still in arrears at the end of 1922 on the first mortgage bonds is \$3,278,450, while the unpaid interest on the 6 per cent mortgage bonds is \$3,627,443.

In an appendix G. R. G. Conway, managing director resident in Mexico, stressed the labor agitation which he said had a marked influence on the growth of the jitney competition. To meet this competition he said it would be necessary to rearrange a number of its existing routes and also to add very considerably to the rolling stock.

Rochester Reports Surplus for Quarter

Operations of the Rochester lines of the New York State Railways for the quarter ended Jan. 31 show a surplus of \$25,118. So reports Commissioner of Railways Charles R. Barnes. The report covers the operations both of the street car and bus and trackless trolley lines in the city. The bus and trolley bus routes are operated by the Rochester Co-ordinated Bus Lines, Inc., a subsidiary of the New York State Railways.

The operation of buses, which began on Nov. 1, 1923, show a deficit of \$2,836.

On the Dewey Avenue motor bus line 23,156 cash and 11,988 transfer passengers were carried during the quarter. The trackless trolleys carried 163,256 cash and 82,480 transfer passengers. In all 18,563 bus miles were run on the bus line and 42,513 on the crosstown trolley bus system.

The total revenues were: Dewey Avenue bus line: \$4,467; trolley bus line, \$10,134.

Advice of Court Sought on St. Louis Valuation

Definite court action toward accepting the Missouri Public Service Commission's valuation of \$53,620,059 was taken by Counsellor Rolla Wells, receiver for the United Railways, St. Louis, on March 22. On that day an application was filed in the United States District Court asking the court for advice on the advisability of withdrawing a petition for a review of the state board's valuation.

Both Mr. Wells and the city of St. Louis had applied previously for a Circuit Court review of the commission's findings, but several days ago it was announced that the receiver and financial interests connected with the United Railways had decided to ask the court for instructions with respect to accepting the valuation in view of the desirability of lifting the receivership as promptly as possible and of avoiding litigation that probably would consume at least another two years.

A motion has also been filed in the Federal Court on looking toward a consolidation of the various foreclosure suits now pending against the company. This motion was submitted on March 24 without argument as counsel for the Suburban bondholders, who have been contending for a separate valuation of that part of the United Railways, cannot say what their attitude will be until the valuation matter has been finally disposed of.

Motions to dismiss the foreclosure suits also were submitted without argument. Federal Judge Paris several days ago overruled a similar motion. The dismissal motions raise the question of the court's jurisdiction. As the court has already held that it has jurisdiction the new motion will probably be overruled also.

P. R. T. Proposals Accepted at Meeting

The stockholders of the Philadelphia Rapid Transit Company, Philadelphia, Pa., at a recent meeting adopted several resolutions recommended by the management. One provided for the renewal of the present agreement between the company and T. E. Mitten, upon the same terms, but with Mitten Management, Inc., rather than with T. E. Mitten personally. Another resolution approved the payment of a co-operative wage dividend of not more than 10 per cent of the annual wage for 1924, to be paid employees after the payment of the regular 6 per cent dividend to the stockholders. A third resolution gave the consent of the stockholders to the proposed increase of the company's indebtedness from \$15,000,000 to \$25,000,000. Another approved a guarantee given by the company to an issue of \$3,500,000 of first mortgage, 6 per cent real estate bonds of C. Benton Cooper, dated Jan. 1, 1924, undertaken in connection with the sale of these bonds. The final resolution gave consent to the company's becoming guarantor of notes, and other obligations that may be issued in connection with the development of the bus business of the Philadelphia Rural Transit Company.

\$8,496 Increase in Duluth-Superior Net

The gross revenue of the Duluth-Superior Traction Company, Duluth, Minn., for the year 1923, after adjusting the passenger revenue to include receipts from the use of conditional redeemable coupon tickets, shows an increase of \$121,589, or 6.71 per cent as compared with the figures in the report for the year 1922.

Operating expenses for 1923 show an increase of \$95,622 over 1922. This increase is due to increased service and better upkeep of the equipment and track.

General taxes in the city of Duluth

CONDENSED INCOME STATEMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

	1923	1922
Operating revenue	\$1,904,606	\$1,784,774
Operating expenses	1,500,987	1,405,365
Net revenue	\$403,618	\$379,408
Taxes	134,991	116,489
Operating income	\$268,627	\$262,919
Total non-operating income	28,730	26,973
Gross income	\$297,357	\$289,892
Interest of funded debt, etc.	174,247	175,277
Net income transferred to profit and loss	\$123,110	\$114,615
General mortgage sinking fund payment	25,284	20,614

STATISTICAL STATEMENT OF DULUTH-SUPERIOR TRACTION COMPANY

	1923	1922
Total revenue	\$1,933,337	\$1,811,747
Total operating expense including depreciation	\$1,500,987	\$1,405,365
Net revenue	\$432,349	\$406,381
Revenue passengers carried	31,343,815	32,036,900
Transfers redeemed	5,354,872	5,366,154
Operating, per cent of revenue, taxes included	84.62	84.00
Per cent on preferred stock, paid	6.00	5.00
Per cent on common stock, paid	1.00	.00

and the federal corporation income taxes increased \$18,501 over the previous year.

The net income for 1923 transferred to profit and loss shows an increase of \$8,496 over the year 1922.

In accordance with the order of the Railroad Commission of Wisconsin the company began to collect a 10-cent cash fare and to sell tickets at the rate of five rides for 30 cents in Duluth on Oct. 1, 1923, but it was deemed too early for the purpose of the annual report to attempt to state with any degree of accuracy the effect of this rate upon the earnings.

Birmingham Sale Continued

The sale of the Birmingham Railway, Light & Power Company's property, Birmingham, Ala., which was advertised to have taken place on March 24, was continued until March 31 on the grounds that the receivers of the company thought best to make final settlements of some franchise extensions with the Birmingham city commissioners, and also some other agreements with the city. All of these

matters are now straightened out, it is announced, and the sale will take place on the last day of March.

The sale of the Tidewater line, which is included in a separate company, but which is under the same control as the Birmingham Railway, Light & Power Company, was also advertised for sale. The sale of this line was likewise continued until March 31.

The bulk of the stock of the Birmingham Railway, Light & Power Company is owned by the National Power & Light Company, and this company is expected to bid on the purchase of the entire concern, it is announced.

The Tidewater line runs from East Lake to Ensley, a distance of about 15 miles. Much of the territory along the line is thinly settled, hence the traffic over this line is not heavy.

Extension of Maturity Date Proposed

Holders of the 6 per cent five-year first mortgage bonds of the Michigan Railroad, Jackson, Mich., due on May 1 this year, will probably receive an offer in the next few days for an extension of maturity date on the bonds in exchange for a bonus of between 20 and 25 per cent in preferred stock.

Earnings of the company, it was pointed out, while sufficient to meet all interest payments and provide a sinking fund, which has taken care of a large part of the bonds, were insufficient to make attractive to investors an issue of refunding bonds just at this time.

The bonds were issued on May 1, 1919. They are outstanding to the amount of \$4,050,000, and are a first mortgage on approximately 159 miles of electric railroad from Grand Rapids to Kalamazoo to Battle Creek, and from Bay City, through Saginaw, to Flint.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were sold this week 100 shares of the Interborough Consolidated Corporation preferred, \$2 a lot.

Bond Issue Authorized.—The Holyoke Street Railway, Holyoke, Mass., at its recent annual meeting authorized the issuance of \$200,000 in bonds, maturing in 1935, to pay for improvements and equipment since 1915.

Trolleys Will Go.—Notices have been posted by the York Utilities Company, York Beach, Maine, which state that the railway between Kennebunk and York Beach will be discontinued after March 31. S. T. Dow, manager of the road, has also sent letters to this effect to the Selectmen of Kennebunk, Wells and York. This section of the York Utilities Company line has not been a paying proposition for a number of years.

Track Abandoned Permanently.—The Massachusetts North Eastern Railway has permanently abandoned the 14 miles of track from Nashua, N. H., to Pelham. The Nashua Street Railway, under a three months lease, will run cars to Hudson Center, and Pelham officials have been in consultation with the Nashua company endeavoring to have it extend operations through Pelham. The New Hampshire Public Serv-

ice Commission has given the Nashua company six months to buy the roadbed at \$3,000 a mile. If this offer is not accepted the road will be torn up.

Prior Preferred Stock Offered.—The National City Company, New York, is offering at 98 and accrued dividend yielding more than 7½ per cent \$500,000 of the 7 per cent accumulative prior preferred stock of the Portland Railway, Light & Power Company, Portland, Ore. The stock is known as Series A. The proceeds will reimburse the company for construction expenditures, including those in connection with its new hydro-electric station.

Reduction in Taxes Ordered.—In line with the decision recently rendered by Federal Judge John G. Sater, reduction of taxes of the Columbus, Delaware & Marion Electric Company, Columbus, Ohio, amounting to \$180,000, was ordered by Judge G. M. Wright, Marion. Recently Judge Sater held that public utilities should not be forced to pay taxes proportionately greater than those assessed against real estate in the district in which they operate. The property value was accordingly cut from \$3,106,120 to \$2,851,828. The company owns and operates city railway service in Marion and Delaware.

Town Takes Over Road.—The 7-mile stretch of electric railway between Athol and Orange, Mass., was taken over by the town of Athol March 22 and operation under a municipal commission of three members was commenced March 24. The plan of selling twelve tokens for 50 cents will be maintained. Each token is good for one zone, but nothing less than two tokens are collected, however short the ride. The taking over of the road has been delayed several times. It was necessary, finally, to introduce a bill in the Legislature to allow the town to operate the road, as it lies partly in Orange.

Asks Rehearing on Dues.—The Denver Tramway, Denver, Col., has asked for a rehearing in the matter of dues on its franchise. The United States Circuit Court of Appeals had decided against the property, ordering the company to pay the city the sum of \$205,000 in back dues. When the city started the suit the tramway owed it \$60,000, the amount increasing \$5,000 monthly. The company paid it until it went into the hands of a receiver. It has been trying to place franchise dues in the same class as any ordinary bill. The court has decided against this practice.

Operation Will Cease March 30.—D. P. Abercrombie, receiver for the Connecticut Valley Street Railway, Greenfield, Mass., says that the line from Greenfield to Northampton will cease operation on March 30. At the annual town meeting on March 17, voters of Greenfield authorized the selectmen to negotiate with the receiver for the purchase of the line from Greenfield to Turners Falls, co-operating to that end with the town of Montague.

Taxes Increased.—The Athens Railway & Electric Company, Athens, Ga., has paid to the city of Athens taxes amounting to \$3,000 on its gross income for 1923. The tax was about \$300 more than was paid in 1922.

Abandonment Recommended in Atlanta.—Recommendation that the railway on Jackson Street between Auburn and Forrest Avenues, on Mills and on Richardson Streets, Atlanta, Ga., be abandoned has just been made before the streets committee of the City Council by Preston S. Arkwright, president of the Georgia Railway & Power Company. This course was urged in a statement to the effect that the company is unable at present to meet the city assessments towards paving these streets. Mr. Arkwright said that paving assessments levied against the railway this year bid fair to reach a total of \$360,000. He said that if the company paved Kelly Street, Edgewood Avenue, Richardson Street, South Boulevard, Copper Street, Jackson Street and Peachtree Road, outside the city, it would cost \$360,000 and possibly more. Yet that was what the city wanted the company to do.

Repurchase Proposed.—The Montreal Tramways & Power Company, Montreal, Que., is said to intend to exercise its option for the repurchase of the Canadian Light & Power Company. The latter company is at present owned by the Montreal Public Service Corporation (now the Quebec & New England Hydro-Electric Corporation). It will be recalled that minority shareholders criticised the sale of these properties by the Tramway & Power Company during the controversy of a few months ago. It came out at that time that the Montreal Tramway & Power Company had sold the Canadian Light, Heat & Power Company to the Public Service Corporation in order that the company could pledge the common stock and bonds as security for a bond issue. A recapture clause was put in the agreement of sale and the Montreal Tramway & Power Company has until July 2 to repurchase the securities that were transferred and pledged. The directors, it is learned, have decided to exercise their option and thus bring the Canadian Light & Power Company, with its 20,000 hp. plant at St. Timothee, directly under their control.

\$39,000 Surplus in Worcester.—Gross earnings of the Worcester Consolidated Street Railway, Worcester, Mass., for the year ended Dec. 31, 1923, increased \$144,736. The company finished the year with a surplus of \$39,000, approximately the same surplus as was reported a year ago. Operating expenses increased \$155,659 over the previous year. Gross revenues for the year were \$4,544,132, compared with \$4,399,396 in 1922. The operating expenses for 1923 totaled \$3,601,755, compared with \$3,446,095 in 1922.

Partial Discontinuance Authorized.—The Pacific Electric Railway, Los Angeles, Cal., has been authorized by the Railroad Commission to suspend, until further order, operation of its passenger service on the Laurel Canyon line of its western division, between Gardner Junction and along Sunset Boulevard to the end of the line. Bus service paralleling the rail service is now being given on Sunset Boulevard by the Los Angeles Motor Bus Company, in which the railway is interested, and discontinuance of railway service has been requested by the Board of Public Utilities of Los Angeles.

Personal Items

T. H. Kendrigan Elected New England Club President

Thomas H. Kendrigan, superintendent of the Manchester Street Railway, was elected president of the New England Street Railway Club at its business session on March 27. Except for a short term of service in the textile industry Mr. Kendrigan's entire career has been spent in the railway business. He began street railway work as a motorman on the former Lowell, Lawrence & Haverhill Street Railway. This was in May, 1899. After two years on this property he took a similar position on the Manchester Street Railway, but at the end of one year he changed to the claim department. In 1912 he was appointed superintendent of the Manchester Street Railway, though still



T. H. Kendrigan

retaining the duties of claim agent. Both positions he has occupied ever since.

Mr. Kendrigan was born in Ireland on Jan. 3, 1860. His parents removed to Manchester when Mr. Kendrigan was a child. He was educated in the public schools of that city. As was indicated previously, he was first employed in the textile industry in Manchester and later was employed in the Pacific mill at Lawrence, Mass., as a loom repairer from 1895 to 1899. He then began his railroad career. Mr. Kendrigan has always taken an active part in the work of the New England Street Railway Club. Last year he was vice-president of the club, representing New Hampshire.

Louis O. Hoff has succeeded Roy S. Preston as commissioner of public property in Pekin, Ill. He has charge of the Pekin Municipal Railway.

M. Williams is now treasurer of the Peoria Railway Terminal Company, Peoria, Ill., succeeding H. E. R. Wood.

E. J. Hinely has been appointed purchasing agent of the Savannah Electric & Power Company, Savannah, Ga., filling the vacancy caused by the death of F. M. Martzall. Mr. Hinely's appointment is a promotion. He had

served in the storeroom as a stock clerk for a number of years.

A. C. Babson has been added as one of the vice-presidents of the Northern Indiana Power Company, Kokomo, Ind.

J. H. Seabright has succeeded B. R. Kuss as claim agent of the Gary & Valparaiso Railway, Gary, Ind.

V. H. Sayre has replaced R. N. Weaver as freight claim agent of the Ford Dodge, Des Moines & Southern Railroad, Boone, Iowa.

S. B. Severson, at one time president and general manager of the Manhattan & Queens Traction Corporation, New York, N. Y., has been appointed general manager of the natural gas subsidiaries of the Cities Service Company with headquarters in Buffalo.

F. H. Bird has succeeded Arsene Pujol as vice-president of the Lake Charles Railway, Light & Water Works Company, Lake Charles, La.

George Kelly has succeeded C. W. DeForest as chief engineer of the Cincinnati, Newport & Covington Railway, Covington, Ky.

T. J. Clements has replaced E. A. Turpin as superintendent of transportation of the Miami Beach Electric Company, Miami, Fla.

F. W. Woodstock has succeeded Nicholas G. Roosevelt as vice-president of the Washington-Virginia Railway. Mr. Woodstock's headquarters are in Philadelphia.

V. A. Sisler has replaced R. W. Crowell as purchasing agent of the Washington Railway & Electric Company, Washington, D. C.

W. E. King, formerly engineer way and structures of the Washington & Old Dominion Railway, Washington, D. C., is now chief engineer.

John W. Stanley has succeeded Allen Blanchard as master mechanic of the Hartford & Springfield Street Railway, Warehouse Point, Conn.

C. P. Landry has succeeded E. D. Loper as master mechanic of the Columbus Electric & Power Company, Columbus, Ga.

Fred C. Morton is now general superintendent of the Savannah Electric & Power Company, Savannah, Ga.

T. B. Webber, formerly secretary of the Kankakee & Urbana Traction Company, Urbana, Ill., has taken on the duties of vice-president as well. In the latter capacity he succeeds U. G. Fowler, who also performed the duties of treasurer.

F. A. Jordan has succeeded J. P. Dick as purchasing agent of the Atlanta Northern Railway, Atlanta, Ga.

John T. Jackson of New Orleans has been appointed special master in chancery in the New Orleans Railway & Light Company case by Judge Rufus Foster of the United States Court for the Eastern District of Louisiana. Mr. Jackson is a member of the firm of D. B. H. Chaffe, who held this office up to the time of his death, a few weeks ago.

J. M. Pneuman, well known in the Mid-Western electric railway field, has entered the commercial field as manufacturer's agent for electric railway supplies and equipment, operating from Berea, Ohio, a suburb of Cleveland. He will handle the products of the Columbia Machine Works & Malleable Iron Company. Mr. Pneuman's experience with electric railways started in 1902 as motor and controller inspector with the Brooklyn Rapid Transit Company, on the elevated division in East New York when electric service supplanted the steam. Leaving in 1906, he went with the Westinghouse Electric & Manufacturing Company at East Pittsburgh as wireman on New York, New Haven & Hartford Railroad locomotives and from that time until 1912 served in different capacities at East Pittsburgh and Stamford, Conn., in the electrification of the New Haven road in the rolling stock department. He has also been identified with the Allen & Peck Corporation as master mechanic of the Annapolis Short Line, Maryland, and with the Buffalo, Lockport & Rochester Railway. A few years ago he started in the practice of consulting engineering, which he has followed up to the present time.

Obituary

F. M. Martzall, formerly purchasing agent of the Savannah Electric & Power Company, Savannah, Ga., died recently.

F. A. Blanchard, lubrication engineer, for the past five years with the Texas Company in the electric street railway division, died in the Elizabeth, N. J., General Hospital on March 13, following an operation. Mr. Blanchard was connected with the S. L. Moore Engineering Company at Elizabeth, N. J., for a number of years before he became connected with the Texas Company.

Transportation Then and Now in Louisville

The Louisville Railway, Louisville, Ky., over the past several days has given an exhibit of progress in the form of an old mule car used in 1880 and one of its new double-truck Kuhlman cars that has just been received. The car of 1880 cost \$1,000. It was 18 ft. over all and weighed 4,500 lb. It had a seating capacity of twenty-four persons and was drawn by one or two mules. The 1924 car cost \$13,000. It is 45 ft. 1 1/2 in. over all, weighs 39,000 lb., seats forty-six persons and has four 40-hp. motors.

So that the public could see and appreciate the progress made in car development, the company placed one of the new cars and the little old mule car on a siding track in the heart of the downtown district. The company had made a picture postcard containing a view of the two cars and called it "Forty-four Years of Street Railway Transportation." In small type printed on the card the public was asked to compare the type of car built in 1880 with the new car just purchased. Facts concerning the cost, weight and seating capacity of each car were also given.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

G. E. Enlarges Its Repair Shops

A recent review of the supply and repair parts required in connection with the great variety of apparatus manufactured by the General Electric Company has led to the establishment of a wider and more adequate group of service and repair shops.

In addition to the service and repair shops maintained at all General Electric factories, thoroughly equipped shops have been installed and are in operation at the following points: Atlanta, Chicago, Los Angeles, New York, Kansas City, Minneapolis, Oakland, Philadelphia, St. Louis and Seattle. The personnel and facilities of these shops prepares them for any form of service work on machines up to 500 hp. In some of the larger shops apparatus of any size can be handled.

These shops are also prepared to furnish competent men on short notice in case of accidents or for any emergency work. An enlarged system of distributing replacement and supply parts is also in effect.

Galvanizing Plant Being Built for Bates Company

The Bates Expanded Steel Truss Company, Chicago, manufacturer of Bates poles used in electric railway and light service, is building a new galvanizing plant with all equipment of the latest design at East Chicago, Ind. Heretofore, such work has been done for it by outside companies. By doing this work in its own plant the company hopes to speed up deliveries.

A complete handling scheme is expected to decrease production costs and materially improve the shipping service. Five overhead electric carriage cranes are part of the new equipment. The plant is expected to be in actual operation by June 1.

Wire Company to Move

Plans to move all the machinery of the Atlantic Insulated Wire & Cable Company from Stamford, Conn., to Rome, N. Y., have been announced. Transfer is to be made next summer. This addition will make the Rome Wire Company one of the largest manufacturers of rubber-insulated wires and cables in the country.

The Rome company purchased all the capital stock of the Atlantic company in 1922 and since that time the plant of the latter has been continued under its former management, manufacturing rubber-covered wire and cable. The recent death of Edward Sawyer, who had been president of the Atlantic Insulated Wire & Cable Company since its organization, led the officers of the Rome Wire Company to the conclusion that it would be desirable to consolidate the company's operations at Rome.

The land and buildings at Stamford were sold to the Atlas Powder Company on March 5 and under the terms of the sale the Rome Wire Company agrees to remove all machinery prior to Oct. 1. The Atlantic company has been operating with about 200 employees. It has been a large purchaser of copper wire, buying practically all of it from the Rome Wire Company.

Mack Reports Good Bus Business

Mack Trucks, Inc., which recently placed on the market a specially designed passenger-carrying bus, reports the development of this branch of its truck business has been so rapid that directors foresee the necessity for enlarging factories and increasing facilities to handle the amount of business expected in the future. Partly on this account stockholders are being asked to approve an increase in the number of shares of common stock from 320,000 to 500,000. It is not proposed to issue additional shares at present, but it will be possible to take care of expenditures on this account in the future from sale of the proposed authorized shares to stockholders pro rata. Thus a flexible means will be provided to permit the company to work out expansion policies, without depending on current earnings or depriving stockholders of the dividends warranted by current business conditions.

Industrial Lull Causes Decrease in Orders

Sales of the General Electric Company for the first quarter of 1924 are estimated at \$66,000,000. This compares with \$80,010,045 for the first quarter of 1923 and \$74,452,442 for the last three months of 1923. Operations are now about 75 per cent of capacity, having been curtailed as a result of the decline in orders. The reduction in sales is attributed largely to a lull in industrial business.

Metal, Coal and Material Prices

Metals—New York	Mar 25, 1924
Copper, electrolytic, cents per lb.	13.60
Copper wire base, cents per lb.	16.375
Lead, cents per lb.	9.00
Zinc, cents per lb.	6.712
Tin, Straits, cents per lb.	52.25

Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hsmpton Roads, gross tons	\$4.675
Somerset mine run, Boston, net tons	2.30
Pittsburgh mine run, Pittsburgh, net tons	2.125
Franklin, Ill., screenings, Chicago, net tons	4.825
Central, Ill., screenings, Chicago, net tons	1.55
Kansas screenings, Kansas City, net tons	2.50

Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	\$6.75
Weatherproof wire base, N. Y., cents per lb.	18.00
Cement, Chicago net prices, without bags	\$2.20
Linseed oil (5-bbl. lots) N. Y., per gal.	\$0.93
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	12.25
Turpentine, (bbl. lots), N. Y., per gal.	\$1.03

Rolling Stock

Monongahela-West Penn Public Service Company, Fairmont, W. Va., has received two new interurban cars for use between Fairmont and Clarksburg. They will accommodate seventy-two passengers instead of fifty-six, as the present cars do, and are provided with side doors.

Wheeling Traction Company, Wheeling, W. Va., has decided on the details for the twenty-one new cars being built by the Cincinnati Car Company at Winton Place, Ohio. The specifications follow:

Date order was placed.....Feb. 27, 1924
Date of delivery.....
Starting June 15, five per week
Builder of car body.....Cincinnati Car Company

Type of car, Pass. motor; one-man; two-man double-end
Seating capacity.....44
Total weight.....32,000 lb.
Bolster centers, length.....21 ft. 6 in.
Length over all.....42 ft. 6 in.
Truck wheelbase.....5 ft. 6 in.
Width over all.....8 ft. 6 in.
Height, rail to trolley base.....10 ft. 6 in.
Body.....Semi-steel
Interior trim.....Cherry
Headlining.....Agasote
Roof.....Arch
Air brakes.....Westinghouse semi-automatic, dead-man latch; Safety Car Devices Co.
Armature bearings.....Sleeve Axles,
Standard Motor Truck Company, 4 1/2 in. Bumpers,
Channel iron; anti-climber; West Penn Railways
Car signal system.....Faraday buzzer
Car trimmings.....Oxidized bronze Bearings,
Center and side roller; West Penn Railways
Conduits.....Flexiduct
Control.....Westinghouse K-35-KK
Curtain fixtures.....Curtain Supply Company
Curtain material.....Pantasote double-faced
Designation signs,
Hunter illuminated side and dash Door-operating mechanism,
National Pneumatic
Fare boxes.....Cleveland
Fenders.....Consolidated Car Fender Company, Type H-B
Gears and pinions.....Nuttall helical
Hand brakes.....Cincinnati geared
Heater equipment.....Consolidated; truss plank
Headlights,
Crouse-Hinds incandescent and 250W
Journal bearings,
Sleeve, 3 1/2 in. x 7 in., MCB
Journal boxes.....MCB
Lightning arresters
Westinghouse condenser type
Motors,
Westinghouse 510-A; four per car, inside hung
Paint.....Enamel
Sanders.....Ohio Brass air operated
Sash fixtures,
National Lock Washer Company
Seats.....Hale & Kilburn
Seating material.....Rattan
Slack adjuster.....Gould Type B
Step treads.....Kass Safety Tread
Trolley retrievers.....Ohio Brass Company
Trolley base.....U. S. No. 13
Trucks,
Standard Motor Truck Company, pressed steel
Ventilators.....Nichols Lintern Type A
Wheels.....Rolled steel—26 in. diameter

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., has received from the Inter-State Car Company five new 40-ft. box cars.

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind., has received from the Inter-State Car Company six stock cars which were rebuilt.

Track and Line

Eastern Wisconsin Electric Company, Sheboygan, Wis., will repair, straighten

and level its trackage to eliminate bumps now present on the lines.

Northern Ohio Traction & Light Company, Akron, Ohio, which recently purchased at public auction the properties and equipment of the Cleveland, Alliance & Mahoning Valley Railway, Ravenna, Ohio, has plans underway for the expenditure of \$225,000 in improving lines and service of that line.

Louisville Railway, Louisville, Ky., expects to build a double-track loop and siding at Eastern Parkway and Brook Street, to handle the crowds at Parkway Field, the baseball park completed last year.

Indiana Service Corporation, Fort Wayne, Ind., has purchased a 20-acre tract of land just inside the city limits which is to be used as a location for an entirely new maintenance of way department. The tract will be connected to the city lines, two of the interurban lines and the Lake Erie & Western Railroad, thereby providing unlimited switching accommodations for the loading and unloading of cars and carrying materials to and from the yards. The improvements completed will cost more than \$100,000.

Power Houses, Shops and Buildings

Escanaba Power & Traction Company, Escanaba, Mich., with the recently acquired Escanaba Paper Company, plans to construct and install new equipment at its hydro-electric plant at Groos, Mich. The improvements are estimated to cost \$100,000.

Connecticut Company, New Haven, Conn., has authorized H. R. Stamm, New Haven, to prepare plans for a repair and service station for buses at Waterbury, Conn. The building will be one-story high, 43 ft. x 175 ft.

Milwaukee Northern Railway, Cedarburg, Wis., has completed plans for the erection of a new and combined interurban passenger, freight and express terminal in Sheboygan to cost approximately \$75,000. The passenger station will occupy an area of 36x60 ft. and will be one story high. The express and freight depot will occupy an area of 40x100 ft. The improvement will involve the installation of considerable track and overhead equipment.

Trade Notes

Zenas W. Carter has joined the Erickson Company, New York, advertising agency. For the past two and a half years Mr. Carter has been engaged on the special bus promotion program for the White Company. This work has been described as "the promotion of an idea to develop the opportunity for sales." The complete co-ordination of the White Company's branches and salesmen on this promotion program aroused the interest of the entire electric railway industry in the operation of buses. Included in the special work on which Mr. Carter has been engaged previously was the development and management of the national program of promotion for the Material Handling

Machinery Manufacturers' Association. He also originated and developed the publicity and sales plans of the Granite Paving Block Manufacturers' Association. During the war Mr. Carter was chairman of the war service committee on metal lath, stationed at Washington, D. C.

General Electric Company, Schenectady, N. Y., announces the establishment of the Richard H. Rice Memorial Scholarship in memory of the manager of the Lynn Works, who died suddenly at Bolton, Lake George, Feb. 10, 1922. The scholarship, a permanent one, is to be at Stevens Institute of Technology, where Mr. Rice was graduated and was a trustee. All sons of Lynn Works employees may compete.

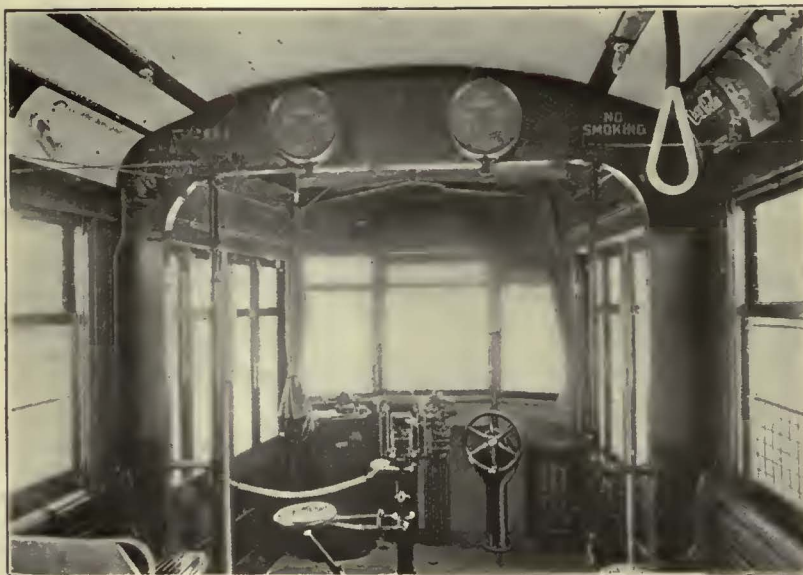
Portland Cement Association, Chicago, Ill., announces the appointment of C. D. Franks as assistant general manager in administrative charge of association work in the districts covered by the Minneapolis, Milwaukee, Des Moines, Chicago, St. Louis and Indianapolis offices. Until June 1, 1924, Mr. Franks' headquarters will be the Merchants Bank Building, Indianapolis. After that date his headquarters will be 111 West Washington Street, Chicago. L. C. Miller succeeds Mr. Franks as district engineer in charge of the Indianapolis office. The Indianapolis office of the association, located in the Merchants Bank Building, is in charge of the association work in Indiana and Kentucky. A new association office is open in Charlotte, N. C. John E. Tate, heretofore district engineer in charge of the New Orleans office, has been appointed district engineer in charge of it.

New Advertising Literature

Crouse-Hinds Company, Syracuse, N. Y., has issued Bulletin No. 2053, an eight-page illustrated pamphlet, on "interlocking safety switch and plug."

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently published a fifty-six-page booklet entitled "High Voltage Porcelain Insulators—Their Design and Manufacture." This publication, which is known as S. P. 1690, has been issued for the purpose of presenting to engineers responsible for the design, installation and maintenance of high-voltage transmission systems information describing the design and manufacture of porcelain insulators. The booklet opens with a short chapter on the development of the art of pottery, which is followed by a description of the various manufacturing processes used in making porcelain. A succeeding chapter gives technical data on the experimental investigation of porcelain mixes. A study of the design of high-voltage insulators is next included, from the standpoint of electrical theory and from that of ceramics. This is followed by a chapter concerning the design of pin-type insulators, with photographs, sketches and drawings illustrating all the points included. A similar chapter on suspension insulator design and a brief description of the Westinghouse million-volt laboratory concludes the booklet.

*Notice the
hand-brake
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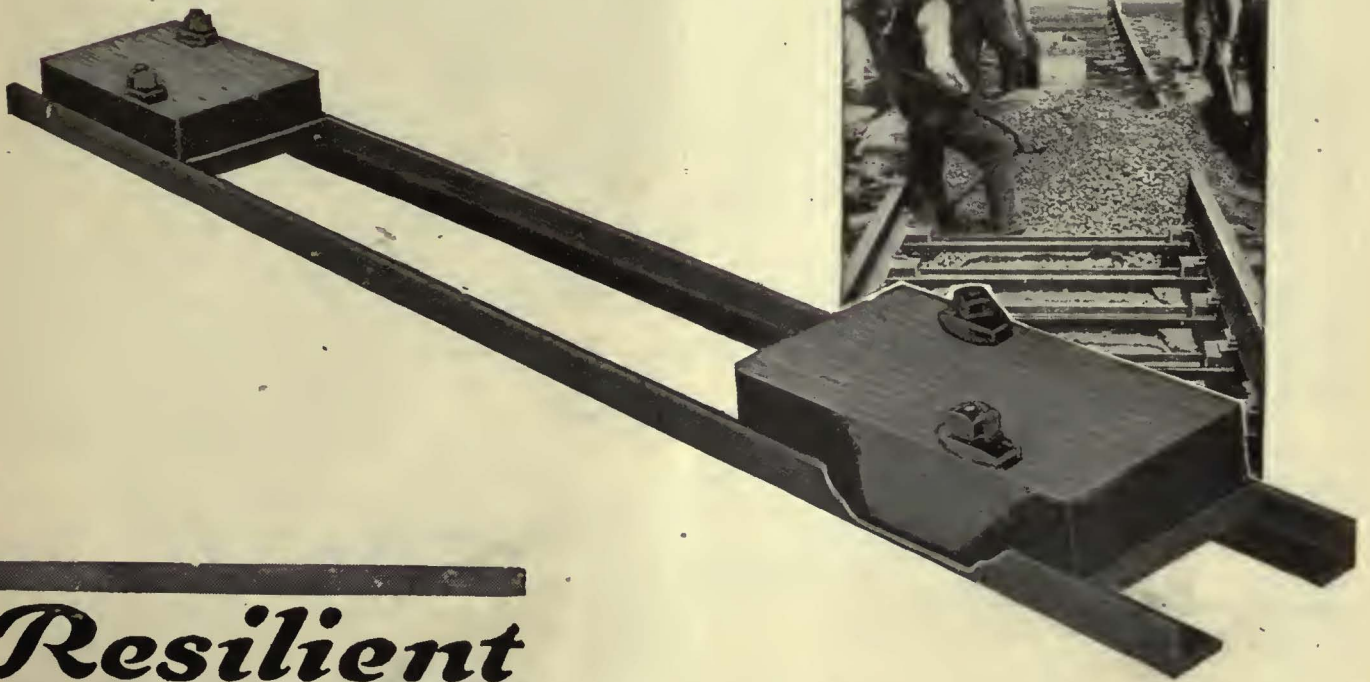
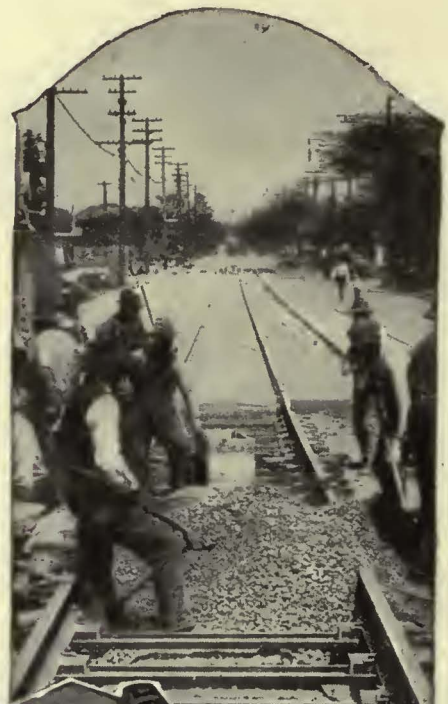
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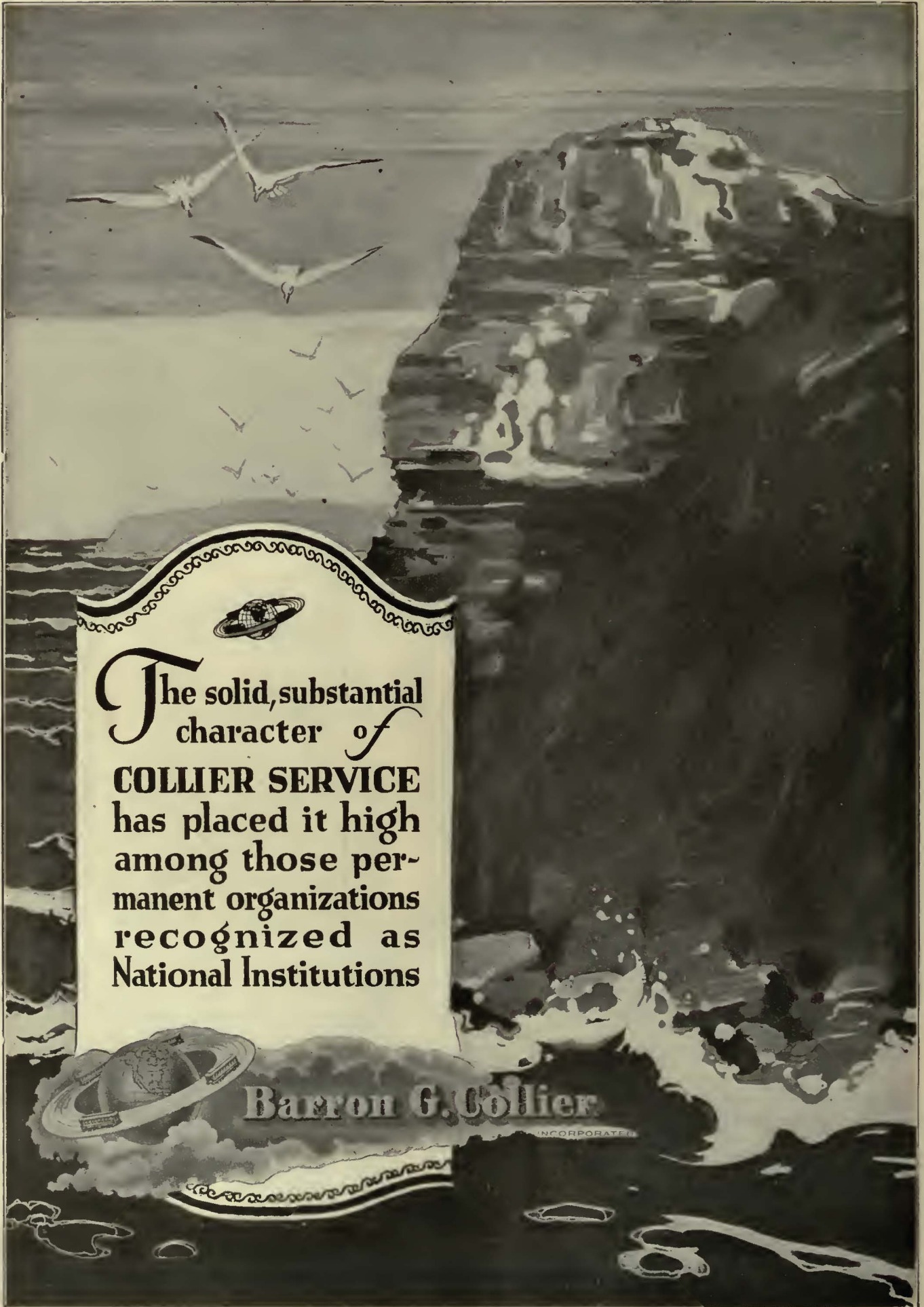
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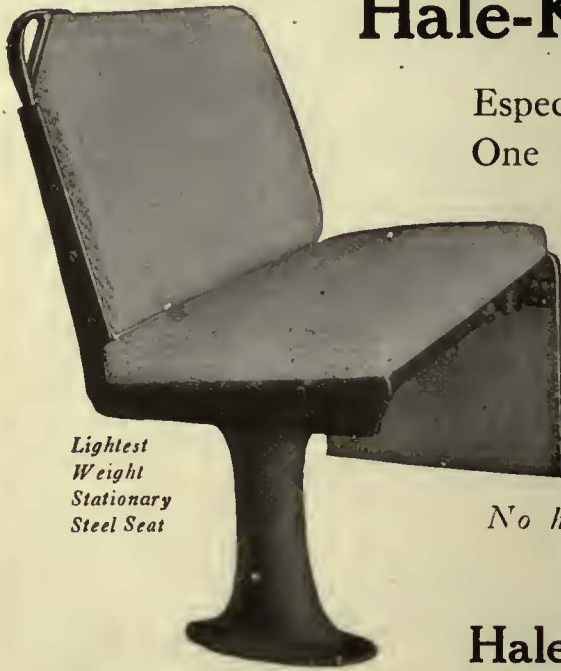
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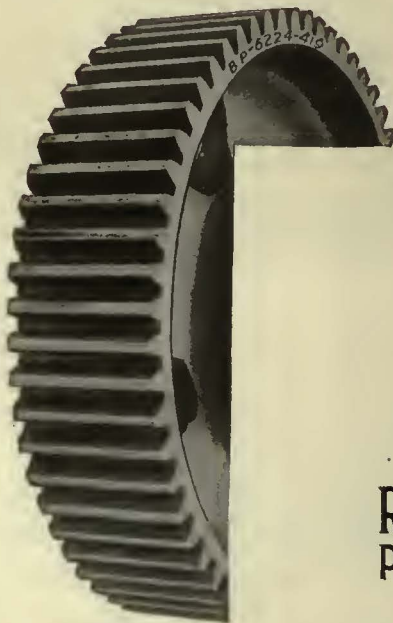
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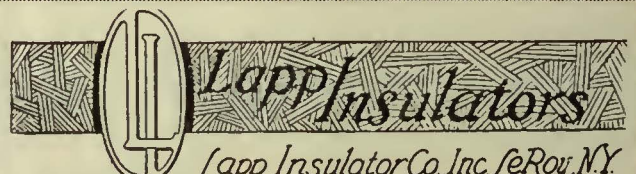


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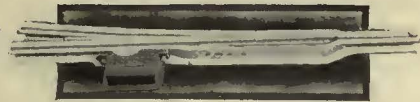
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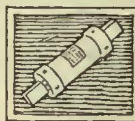
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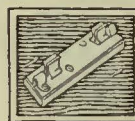
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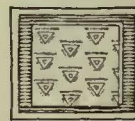
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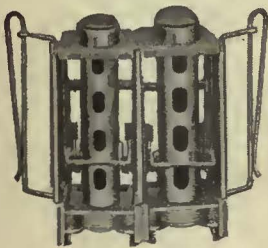
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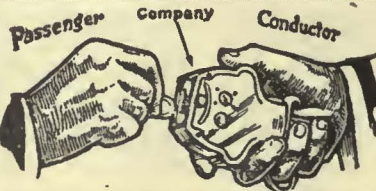
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Draw Line Material and Railway
Specialties
Genesco Paint Oils
Turnstile Car Corporation—
Turnstiles
Dunham Hopper Door Device

Anderson Slack Adjusters
Economy Electric Devices Co.,
Power Saving and Inspection
Meters
Ft. Pitt Spring & Mfg. Co.
Springs
C.-H. Electric Heaters
Garland Ventilators
E-Z Car Control Safety Devices
Lind Aluminum Field Coils
Flaxlinum Insulation
Yellow Coach Mfg. Co., Buses

Waterproofed Trolley Cord



Is the finest cord that science and skill can produce. Its wearing qualities are unsurpassed.

**FOR POSITIVE SATISFACTION ORDER
SILVER LAKE**

If you are not familiar with the quality you will be surprised at its **ENDURANCE** and **ECONOMY**.

Sold by Net Weights and Full Lengths

SILVER LAKE COMPANY
Manufacturers of bell, signal and other cords.
Newtonville, Massachusetts

PROVIDENCE FENDERS H-B LIFE GUARDS

The Consolidated Car Fender Co., Providence, R. I.
Wendell & MacDuffie Co., 110 E. 42nd St., New York
General Sales Agents



Gets Every Fare PEREY TURNSTILES or PASSIMETERS

Use them in your Prepayment Areas and Street Cars

Perey Manufacturing Co., Inc.
30 Church Street, New York City

THE BEST TRUSS PLANK ELECTRIC HEATER EVER PRODUCED



No.
478E

GOLD CAR HEATING & LIGHTING CO., BROOKLYN, N. Y.

RAILWAY UTILITY COMPANY

Sole Manufacturers

"HONEYCOMB" AND "ROUND JET" VENTILATORS
for Monitor and Arch Roof Cars, and all classes of buildings;
also ELECTRIC THERMOMETEK CONTROL
of Car Temperatures.

141-151 West 22d St.
Chicago, Ill.

Write for
Catalogue

1328 Broadway
New York, N. Y.

SEARCHLIGHT SECTION

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Positions Vacant and all other classifications, 8 cents a word, minimum charge \$2.00.
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Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.
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E. F. J.

POSITIONS VACANT

SUPERINTENDENT for high-speed interurban line, consisting of 107 miles in central territory. One who has had experience covering the installation and operation of light weight, one man operated interurban cars, preferred. P-674, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

WANTED: Foreman for welding shop, experienced in gas and electrical welding in a Middle West town. In application give references and salary expected. P-670, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

AS CLAIM agent, or commerce attorney, age 38, married, Yale graduate in law, now employed, and have been for past five years, with short line, Interstate road; specially qualified in Federal and State laws pertaining to railways in practice before the I. C. C. and State Commissions, as well as in the adjustment of claims. PW-661, Electric Railway Journal, 10th Ave. at 36th St., New York.

AS M. M. or with chance for advancement. Experienced low and high voltage D.C. equipment, passenger and freight, city and interurban. Expert on motor and controller repairs. PW-672, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

GENERAL foreman, experienced on all branches of electric railroading, on city and interurban cars, and locomotives, equipment. PW-665, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

GRADUATE civil engineer desires permanent position, experienced in construction and design of subway and street railway tracks, valuation, rehabilitation, maintenance, welding, pavements and executive and contractors engineer. PW-675, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

MR. PRESIDENT! Do you require the services of a manager who is loyal and has character, ability, initiative and who can receive as well as issue instructions? Can show creative ability—visit me on the job. Want to reach the top. Present position very limited. PW-676, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

SUPERINTENDENT of city and interurban road operating fifty cars, seeks similar position affording greater opportunity for advancement. Successful in maintenance, operation and public relations. Age 35; salary \$3,600. PW-673, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT of transportation at present with large successful property that has been placed on sound basis largely through efforts of advertiser, solicits correspondence with managers of city, suburban and interurban properties that require a capable progressive superintendent; 19 years' experience under high-grade executives on large properties; quick to locate leaks and correct same; fully competent to take over all details and build up an organization that would be a credit to any property. Successful in dealing with public and labor in a manner that will get results; will consider any good size property that requires extra effort to get results. Best of references. Personal reasons for desiring a change. PW-664, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

WANTED to locate with city or interurban railway in equipment, distribution, purchasing, construction, traffic and transportation or other capacity requiring engineering ability. Over ten years' experience in railway and power manufacturing, installation, operating. Your proposition solicited. PW-651, Elec. Ry. Journal, Old Colony Bldg., Chicago, Ill.

RAILS WANTED

235 tons, 6-in. High T or Shanghai, 72 lb. to 95 lb. per yd.
 State Price, Condition, Location.

W-669, Electric Railway Journal
 1570 Old Colony Bldg., Chicago, Ill.

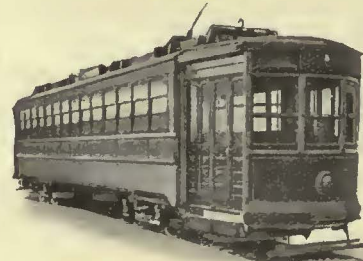
FOR SALE

Electric Locomotive

Standard G. E. 50-ton Locomotive in first-class condition. Locomotive may be seen in daily operation.

ALBANY SOUTHERN R. R. CO.,
 Rensselaer, N. Y.

FOR SALE



20 ALL STEEL CARS

Length over bumpers.....50 ft. 10 in.
 Length over corner posts.....36 ft. 6 in.
 Width over all.....8 ft. 7 in.
 Height over all.....11 ft. 7 1/2 in.
 Cars are complete and ready for operation including WH air brakes. Seat 52 people.

TRUCKS

Standard 050 4 ft., 10-in. wheel base.

ELECTRICAL EQUIPMENT

Consists of 4 WH-514 motors and K35 controllers for double end operation.

Code "Cun"

Transit Equipment Company

Cars—Motors

501 Fifth Avenue, New York.

FOR SALE

Deck Plate Girder Bridge

built for electric railway by American Bridge Co. 61 ft. long, 20 tons weight.

For particulars address

York Utilities Company

Kennebunk, Maine.

FOR SALE

50—G. E. No. 80-A Motors.
 50—Controllers, K-28-B; K-12.
 35—B-2 Compressors.

ELECTRIC EQUIPMENT CO.
 Commonwealth Bldg., Philadelphia, Pa.

Competent Men Are Watching—

for the opportunity you have to offer, Mr. Employer. You can secure the best available man for the work through an ad in the

SEARCHLIGHT SECTION

That's where they are looking for your announcement
 The cost is small.

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

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

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Anchor, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Elec. Service Supplies 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.
Johnson & Co., J. R.
St. Louis Car Co.
Westinghouse E. & M. Co.

Babbitt Metal
Ajax Metal Co.

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

Bearings and Bearing Metals
Ajax Metal Co.
Bemis Car Truck Co.
Brill Co., J. G., The
General Electric Co.
Gilbert & Sons B. F. Co., A.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Baldwin Locomotive Works
Stucki Co., A.

Bells and Gongs
Brill Co., The J. G.
Consolidated Car Heat'g Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Boilers
Babecock & Wilcox Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Track-work Co.

Bonds, Rail
Amer. Steel & Wire Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, Etc.)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adapters
Brill Co., The J. G.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
Amer. Br. Shoe & Fdy. Co.
Barbour-Stockwell Co.
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Brakes, Brake Systems and Brake Parts
Allia-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co.
National Brake Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Brushes, Carbon
General Electric Co.
Westinghouse E. & M. Co.

Brush Holders
Anderson Mfg. Co., A. & J. M.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Buses, Motor
Brill Co., The J. G.
St. Louis Car Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
St. Louis Car Co.

Cables, (See Wires and Cables.)
Cumbrio Tapes, Yellow and Black Varnish
Irvington Varnish & Ins. Co.

Carbon Brushes (See Brushes, Carbon)

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

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heat'g Co.
Westinghouse E. & M. Co.

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.
Wason Mfg. Co.

Cars, Gas, Rail
Brill Co., J. G., The
St. Louis Car Co.

Cars, Second Hand
Electric Equipment Co.
Transit Equipment Co.

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

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
Ajax Metal Co.
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
Bemis Car Truck Co.
St. Louis Car Co.

Castings, Malleable and Brass
Amer. Br. Shoe & Fdy. Co.
Bemis Car Truck Co.
St. Louis Car Co.

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

Catenary Construction
Archbold-Brady Co.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers Truck (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
St. Louis Car Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Elec. Service Supplies Co.

Colls Armature and Field
General Electric Co.
Westinghouse E. & M. Co.

Colls, Choke and Klinking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.

Intern'l Register Co.
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slitters
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Compressors, Air
Allia-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Tr. Br. Co.

Compressors, Air Portable
Ingersoll-Rand Co.

Condenser Papers
Irvington Varnish & Ins. Co.

Condensers
Allia-Chalmers Mfg. Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Kuhlman Car Co., G. C.
McGuire-Cummings Mfg. Co.
National Ry. Appliance Co.
St. Louis Car Co.

Controllers or Parts
Allia-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

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

Converters, Rotary
Allia-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
Anacoudia Copper Mining Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Roebbling's Sons Co., John A.
St. Louis Car Co.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
Brill Co., The J. G.
Ohio Brass Co.
St. Louis Car Co.
Westinghouse Tr. Br. Co.

Cranes
American Engineering Wks.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tis Co.

Crossing, Frog & Switch
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

Crossing, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.

Crossings
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Ohio Brass Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co.
Transit Equipment Co.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G.
Consolidated Car Heat'g Co.
General Electric Co.
Hale-Kilburn Co.
Nat'l Pneumatic Co., Inc.
St. Louis Car Co.

Doors & Door Fixtures
Brill Co., The J. G.
Consolidated Car Heat'g Co.
General Electric Co.
Hale-Kilburn Co.
Morton Mfg. Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Drills, Rock
Ingersoll-Rand Co.

Drills, Truck
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.

Ears
Ohio Brass Co.

Electrical Wires and Cables
Amer. Electrical Works
Amer. Steel & Wire Co.
Roebbling's Sons & Co., J. A.

Electric Grinders
Railway Track-work Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

Enamels
Beckwith-Chandler Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Arnold Co., The
Beer, John A.
Bibbina, J. Rowland
Buchanan & Lay Corp.
Day & Zimmerman, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelly-Cooke & Co.
Ong, Joe R.
Parsons, Klapp, Brinkerhoff & Douglas
Railway Audit & Inspection Co.
Richey, Albert S.
Sanderson & Porter
Stevens & Wood
Stone & Webster
White Eng. Corp., The J. G.
Wortham, Edwin

Engines, Gas, Oil or Steam
Allia-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co.

Fare Registers
Ohmer Fare Register Co.

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.

Fibre and Fibre Taping
Westinghouse E. & M. Co.

Field Colls (See Colls)

Flange-way Guards, Steel
Godwin Co., Inc., W. S.

Floodlights
Elec. Service Supplies Co.

Forgings
Brill Co., J. G., The

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp.

Frogs, Track (See Track Work)

Frogs, Trolley
Ohio Brass Co.

Funnel Castings
Wharton, Jr. & Co., Wm.

Fuses and Fuse Boxes
Consolidated Car Heat'g Co.
General Electric Co.
Westinghouse E. & M. Co.

Fuses, Cartridge, Non-Refillable & High Voltage
Johns-Pratt Co.

Fuses, Refillable
General Electric Co.
Johns-Manville, Inc.
Johns-Pratt Co.
Power Specialty Co.

Gaskets
Westinghouse Tr. Br. Co.

Gas Producers
Westinghouse E. & M. Co.

Gas-Electric Cars
General Electric Co.
Westinghouse E. & M. Co.

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.
Brill Co., J. G., The

Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allia-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Girders, Rail
Bethlehem Steel Co.
Lorain Steel Co.

Gong (See Bells and Gongs)

Greases (See Lubricants)

Grinders and Grind. Supplies
Railway Track-work Co.

Grinders, Portable
Railway Track-work Co.

Grinders, Portable Electric
Railway Track-work Co.

Grinding Bricks and Wheels
Railway Track-work Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

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

Hammers, Pneumatic
Ingersoll-Rand Co.

Horns, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
More-Jones Brass Metal Co.
Nuttall Co., R. D.
Star Brass Works
Thornton Trolley Wheel Co.

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Heaters, Car (Electric)
Consolidated Car Heat'g Co.
Gold Car Heat. & Lig. Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

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

Helmets—Welding
Railway Track-work Co.

Holsts, Portable
Ingersoll-Rand Co.

Hydraulic Machinery
Allia-Chalmers Mfg. Co.

Indicating Signals
Oskel Equipment Co.

Instruments Measuring, Testing and Recording
Elec. Service Supplies Co.
General Electric Co.
Johns-Pratt Co.
Westinghouse E. & M. Co.

Insulating Cloth, Paper and Tape
General Electric Co.
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okanite Co.
Stand. Underground Cable Co.
Westinghouse E. & M. Co.

Insulating, Silk & Varnish
Irvington Varnish & Ins. Co.

Insulation (See also Line Materials)
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.
Okanite Co.
Westinghouse E. & M. Co.

Insulation Slots
Irvington Varnish & Ins. Co.

Insulators (See also Line Materials)
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.

General Electric Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Cranes,
Hoists and Lifts)
Buckeye Jack Co.
Buda Co.
Elec. Service Supplies Co.

Joints, Rail
(See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Anderson Mfg. Co., A. &
J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc and Incandescent
(See also Headlights)
Anderson Mfg. Co., A. &
J. M.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.
Ohio Brass Co.

Lanterns, Classification
Nichols-Lintern Co.

Lightning Protection
Anderson Mfg. Co., A. &
J. M.
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.

Line Material (See also
Brackets, Insulators,
Wire, etc.)
Anderson Mfg. Co., A. & J. M.
Archbold-Brady Co.
Electric Ry. Equipment Co.
Elec. Service Sup. Co.
General Electric Co.
Hubbard & Co.
More-Jones Brass & Metal
Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Wharton, Jr. & Co., Wm.

Locomotives, Electric
Baldwin Locomotive Works
General Electric Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Lubricating Engineers
Galena Signal Oil Co.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena Signal Co.
Universal Lubricating Co.

Manganese Parts
Bemis Car Truck Co.

Manganese Steel Castings
Wharton, Jr. & Co., Wm.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

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

Manganese Steel Switches
Fuses & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Meters (See Instruments)

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses (See Buses,
Motor)

Motors, Electric
Allis-Chalmers Mfg. Co.
Westinghouse E. & M. Co.

Motors and Generators, Sets
Allis-Chalmers Mfg. Co.
General Electric Co.

Motor-men's Seats
Brill Co., J. G.
Elec. Service Sup. Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Barbour-Stockwell Co.
Bemis Car Truck Co.
Bethlehem Steel Co.
Hubbard & Co.

Oils (See Lubricants),
Omnibuses (See Buses,
Motor)

Oxy-Acetylene (See Cutting
Apparatus, Oxy-Acetylene)

Packing
Elec. Service Supplies Co.
Power Specialty Co.
Westinghouse E. & M. Co.

Paints and Varnishes (Insu-
lating)
Irvington Varnish & Ins. Co.
Mitchell-Rand Mfg. Co.

Paints, Varnishes, Preserva-
tives
Beckwith-Chandler Co.

Paints and Varnishes for
Woodwork
Beckwith-Chandler Co.
National Ky. Appliance Co.

Pavement Breakers
Ingersoll-Rand Co.

Paving Guards, Steel
Godwin Co., Inc., W. S.

Paving Material
Amer. Br. Shoes & Fdy. Co.

Plekpups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Plinon Paliers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.

Plinons (See Gears)

Plns, Case Hardened, Wood
and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Power Specialty Co.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Elec. Ry. Equipment Co.
Hubbard & Co.

Pole Reinforcing
Hubbard & Co.

Poles & Ties Treated
Bell Lumber Co.

Poles, Tira, Posts, Piling &
Lumber
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Poles, Trolley
Bell Lumber Co.
Elec. Service Supplies Co.
Nuttall Co., R. D.

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Elec. Ry. Equipment Co.
Elec. Service Sup. Co.

Porcelain Special High
Voltage
Lapp Insulator Co., Inc.

Portable Grinders
Buda Co.

Postheads
Okonite Co.

Power Saving Devices
National Ry. Appliance Co.

Pressure Regulators
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Vacuum
Ingersoll-Rand Co.

Punches, Ticket
Bouney-Vehalage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Rail Joint Co., The

Rail Joints—Welded
Lorsain Steel Co.

Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

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

Rail Welding
Railway Track-work Co.

Rattan
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Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Registers and Fittings
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Elec. Service Supplies Co.
Intern'l Register Co., The
Ohmer Fare Register Co.
Rooke Automatic Rg. Co.
St. Louis Car Co.

Reinforcement, Concrete
Amer. Steel & Wire Co.

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

Repair Work (See also Colla)
General Electric Co.
Westinghouse E. & M. Co.

Replacers, Car
Elec. Service Sup. Co.

Resistances
Consolidated Car Heat. Co.

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

Retrievers, Trolley (See
Catchers and Retrievers,
Trolley)

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

Sanders, Track
Brill Co., The J. G.
Elec. Service Sup. Co.
Nichols-Lintern Co.
Ohio Brass Co.
St. Louis Car Co.

Sash Fixtures, Car
Brill Co., The J. G.
St. Louis Car Co.

Sash, Metal, Car Window
Hale-Kilburn Co.

Scrapers, Track (See Clean-
ers and Scrapers, Track)

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Insulated
Elec. Service Sup. Co.

Seats, Bus
Brill Co., The J. G., The
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Car (See also Rattan)
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Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co.
Transit Equipment Co.

Shafts, Vestibule
Brill Co., The J. G.

Shovels
Brill Co., The J. G.
Hubbard & Co.

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Center and Side)

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Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskele Equipment Co.

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Crossing
Nachod Signal Co., Inc.
Wood Co., Chas. N.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc.

Slack Adjusters (See Brake
Adjusters)

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Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
More-Jones Metal & Brass
Co.
Nuttall Co., R. D.

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Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and
Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Soldering and Brazing Appa-
ratus (See Welding
Processes and Apparatus)

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Lorsain Steel Co.

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Amer. Steel & Wire Co.

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and Connectors)

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Bemis Car Truck Co.
Brill Co., The J. G.

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McGuire-Cummings Mfg. Co.
St. Louis Car Co.

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Steel Castings
Wharton, Jr. & Co., Wm.

Steps, Car
Brill Co., J. G., The
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskele Equipment Co.

Storage Batteries (See Bat-
teries, Storage)

Strain, Insulators
Ohio Brass Co.

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

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Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.
Power Specialty Co.

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

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Johns-Pratt Co.

Switches, Selector
Nichols-Lintern Co.

Switches, Tee Rail
Ramapo Ajax Corp.

Switches, Track (See Track
Special Work)

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Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Tamper Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insu-
lating Cloth, Paper and
Tape)

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Bethlehem Steel Co.
Ramapo Ajax Corp.

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Elec. Service Supplies Co.

Terminals, Cable
Std. Underground Cable Co.

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struments, Electrical Meas-
uring, Testing, etc.)

Thermostats
Consolidated Car Heat. Co.
Gold Car Heat. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

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Metal Safety R. R. Tie Co.

Ties, Mechanical
Dayton Mechanical Tie Co.

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Carnegie Steel Co.
International Steel Tie Co.

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Bethlehem Steel Co.

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Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.
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Wharton, Jr. & Co., Wm.

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Structures
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Westinghouse E. & M. Co.

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Wharton, Jr. & Co., Wm.

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Railway Track-work Co.

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St. Louis Car Co.

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Buda Co.
New York Switch and
Crossing Co.
Ramapo Ajax Corp.
Wharton, Jr. & Co., Wm.

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American Bridge Co.

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General Electric Co.
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Morton Mfg. Co.

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J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal
Co.
Nuttall Co., R. D.
Ohio Brass Co.

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Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
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General Electric Co.
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More-Jones Brass & Metal
Co.
Ohio Brass Co.

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Co.

Trolley Wheels & Harps
More-Jones Brass & Metal
Co.

Thornton Trolley Wheel Co.

Trolley Wheels (See Wheels,
Trolley)

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

Turbines, Water
Allis-Chalmers Mfg. Co.

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Elec. Service Supplies Co.
Perey Mfg. Co., Inc.

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Ohio Brass Co.
Westinghouse Tr. Br. Co.

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Ventilators, Car
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Nat'l Ry. Appliance Co.
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Welded Rail Joints
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welders, Portable Electr
Elec. Ry. Improvement Co.
Ohio Brass Co.
Railway Track-work Co.

Welding Processes and
Apparatus
Alumino-Thermic Corp.
Elec. Ry. Improvement Co.
General Electric Co.
International Oxygen Co.
Ohio Brass Co.
Railway Track-work Co.
Westinghouse E. & M. Co.

Welding Steel
Elec. Ry. Improvement Co.
Railway Track-work Co.

Wheel Guards (See Fenders
and Wheel Guards)

Wheel Presses (See Machine
Tools)

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Bemis Car Truck Co.
Carnegie Steel Co.

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Carnegie Steel Co.

Wheels, Trolley
Anderson Mfg. Co., A. & J.
M.
Elec. Ry. Equipment Co.
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More-Jones Brass & Metal
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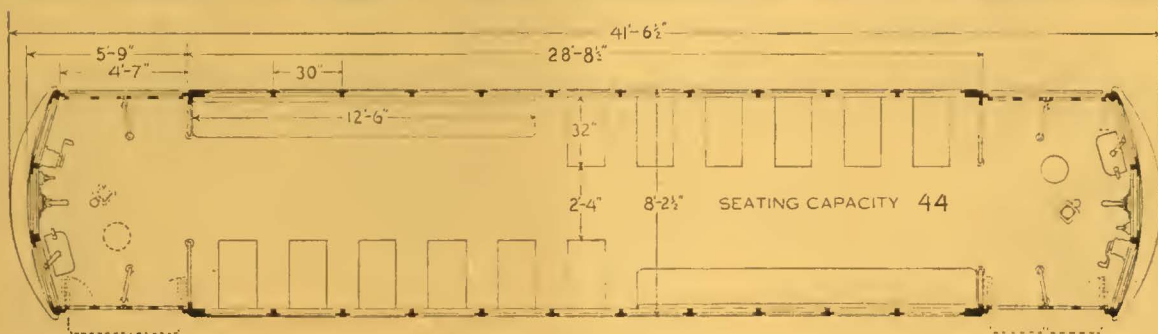
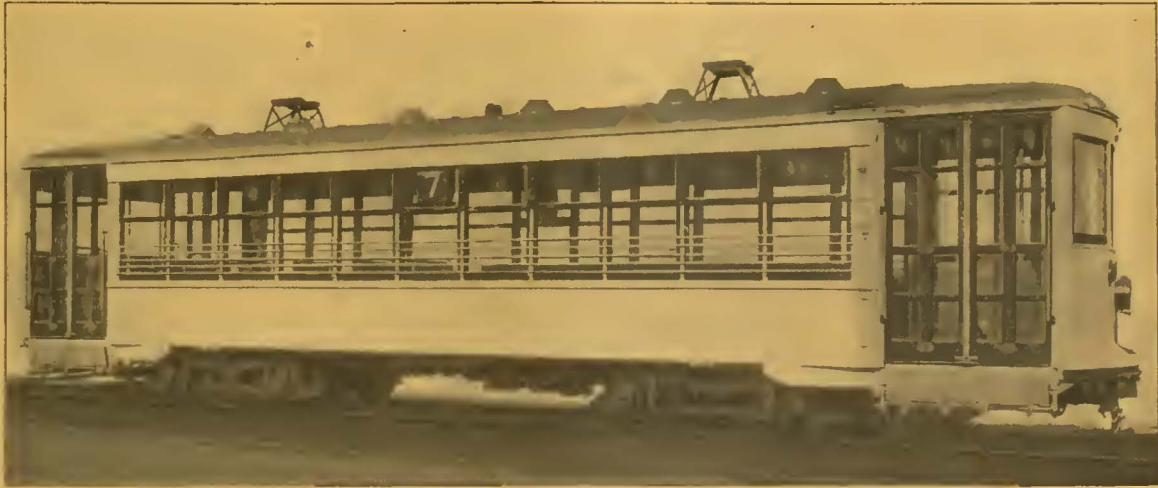


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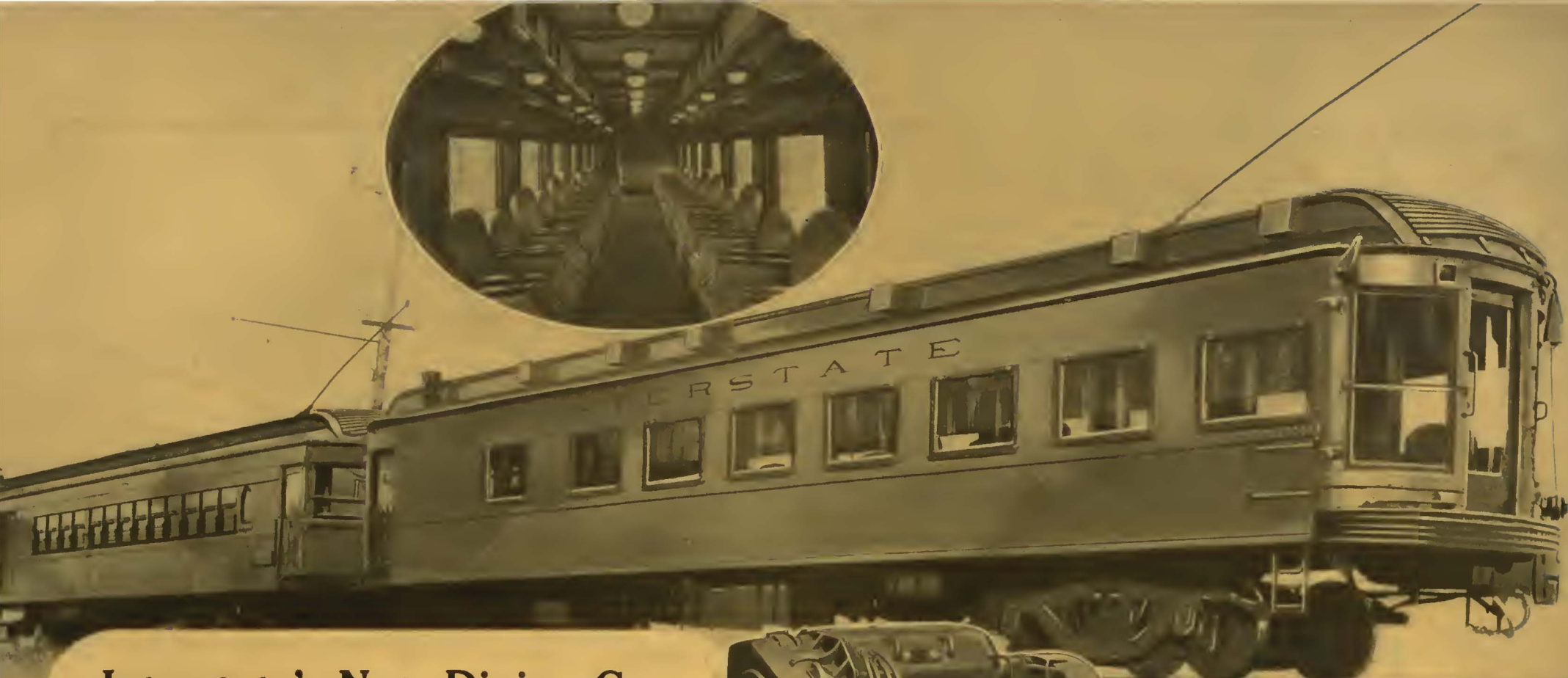
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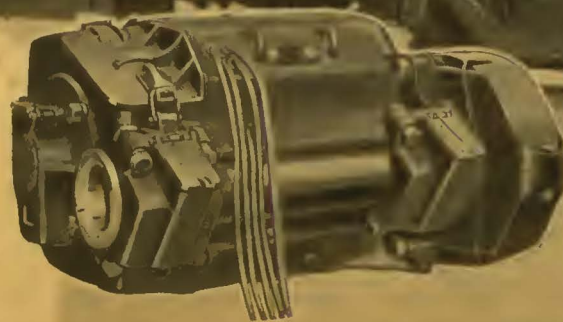
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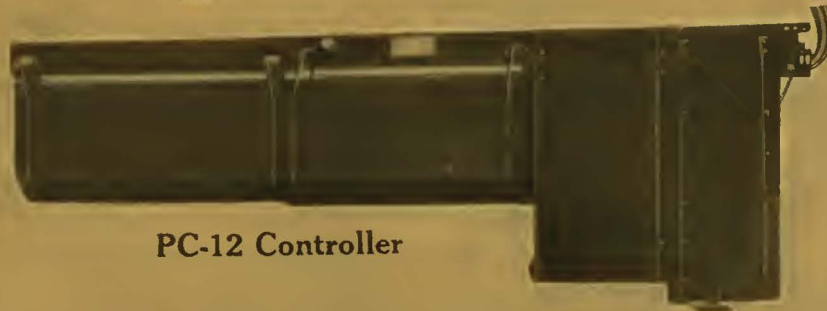
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