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ELECTRIC RAILWAY JOURNAL

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ELECTRIC RAILWAY JOURNAL

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The Reaction on the Contrib

IN A SHOP that had been a fruitful source of Maintenance Notes, a JOURNAL editor recently appeared on the scene looking for further material of the same interesting and helpful character. On greeting him the master mechanic offered this comment:

"We have been kept busy trying to live up to the reputation that seems to have gotten around that we are conducting a very progressive shop. That's a good reputation to have, but it's easier to improve a poor shop than it is a good one. However, we have a couple of new schemes to tell you about."

This is a by-product of the JOURNAL'S work that is not generally considered. The editors are anxious to describe methods that have produced good results. If, in addition, the publishing of stories about new maintenance practices leads the men originating them to make further effort in order to maintain their reputation for progressiveness, the JOURNAL is certainly serving railway officials and the public in an effective way, for it means a continuously improving record of costs and service.

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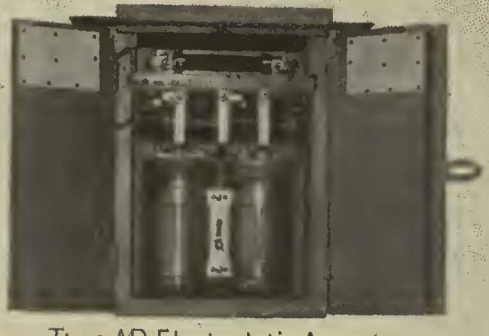

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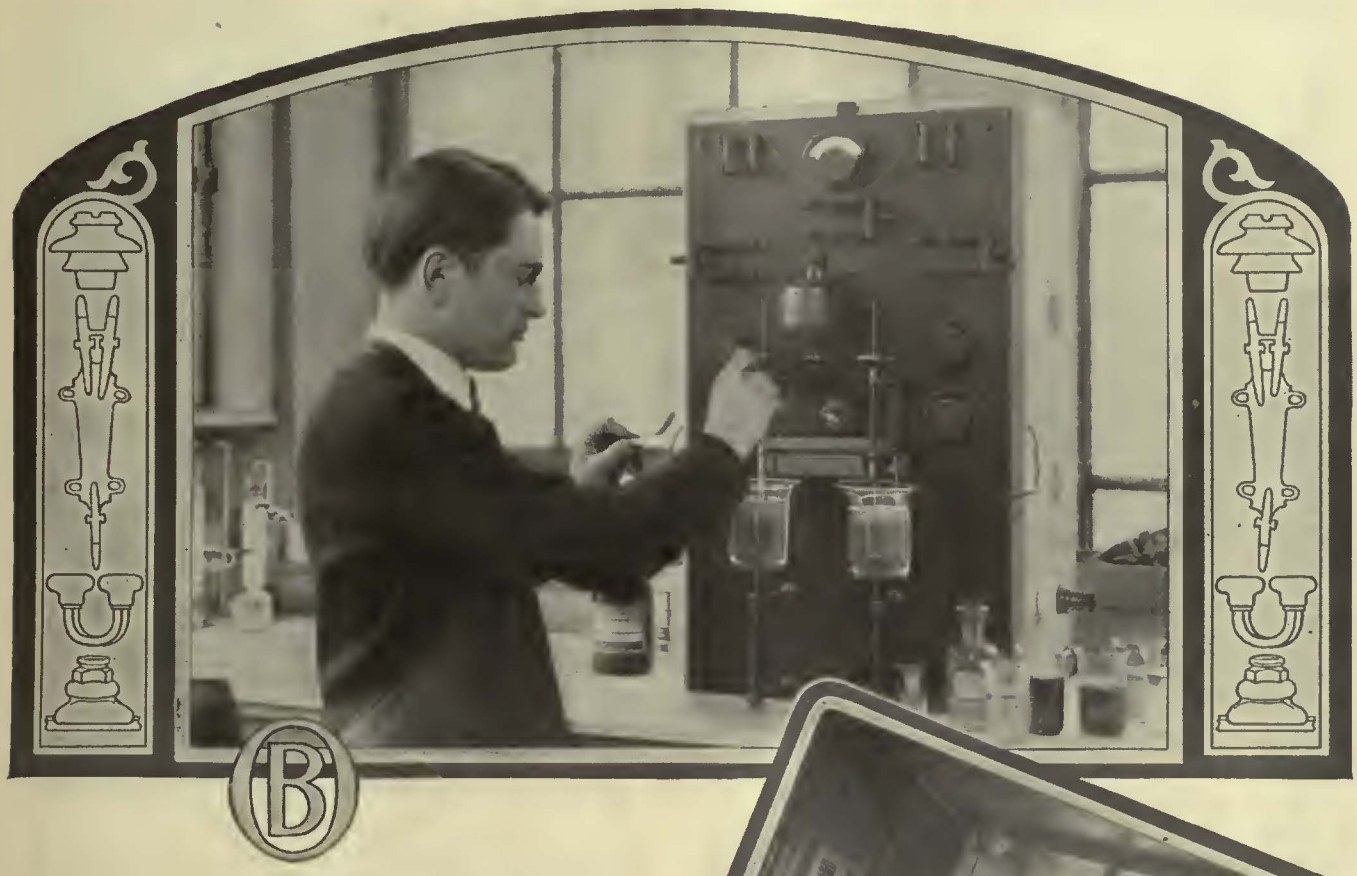

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That question is answered accurately each day—on each foundry heat of O-B Bronze. The man shown above is making an electrolytic determination of the amount of the copper and lead in O-B Bronze.

This test as well as checks on the other constituents of the bronze by chemical analysis are made on samples taken from each foundry heat.

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Greatest Adaptability

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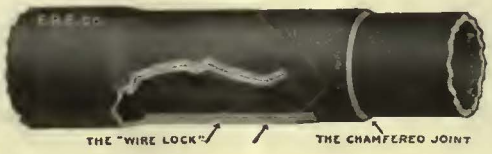

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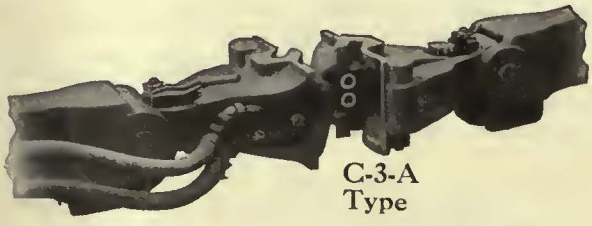
COUPLERS



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WESTINGHOUSE TRACTION BRAKES

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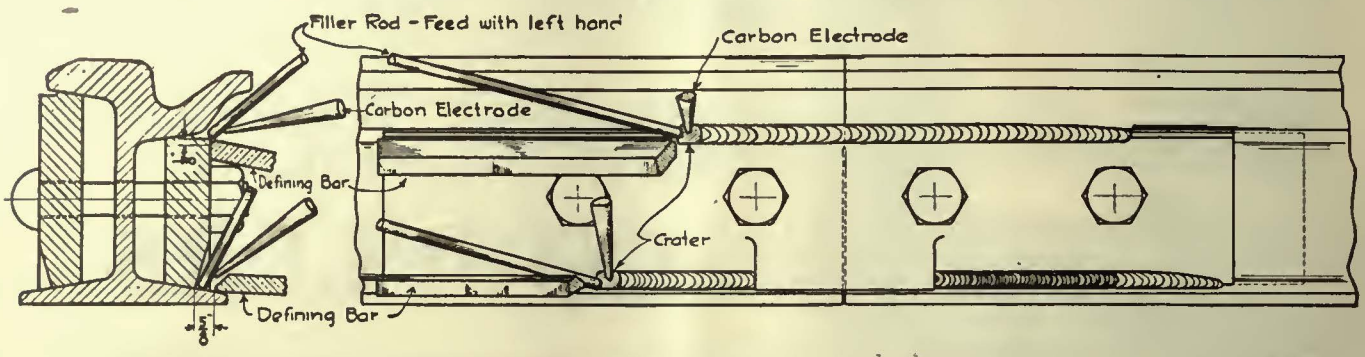

IN a rail bond, for instance, the mere fusion of rail, plate and filler rod is not necessarily a good weld, that will stand up under service. Aside from the proper set-up of the joint, the properties of the seam metal must be such that it will withstand the stresses to which it is subjected.

In the Una Process of welding this fact is not left to chance, but the details of the welding process, as well as the composition of the filler rod determine the properties of the weld metal.

The length of each seam, the fillet effect, the staggering of the seams and plates shown in the sketch, serve a very definite purpose in producing a joint with the life of the rail itself.

By means of the carbon arc it is a simple matter to pre-heat the rail and plate as the seam is welded. Then the post-heating of the seam metal with a long arc (similar in many respects to the results obtained in the heat-treatment of steel) is merely a matter of seconds. To strengthen the seam and to still further refine the metal at the points subjected to greatest stress is easily accomplished by double welding.

Each detail of the Una Process is based on the results of research and testing. There is a definite reason for each step. The Una Process of joint welding produces a weld that withstands the stresses of the joint in service.

A recent bulletin "Operating Instructions for the Preparation, Welding and Grinding of Una Joints" discusses in detail the Una Process of Welding. Every welding operator should have a copy.

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RAIL WELDING & BONDING COMPANY, Cleveland, Ohio

Manufacturers of

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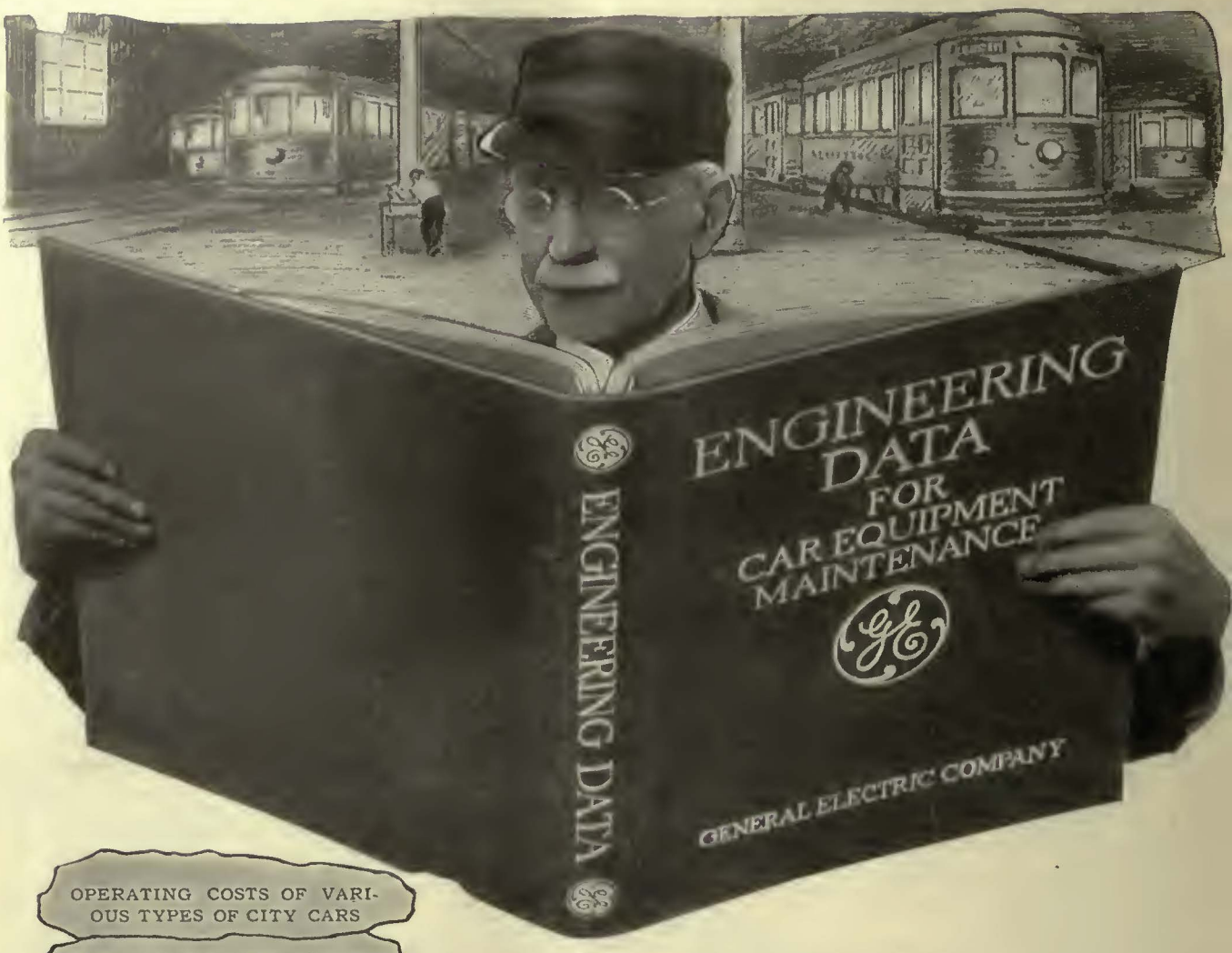

OPERATING COSTS OF VARIOUS TYPES OF CITY CARS

Caring for D-C. Aluminum Car Arresters During the Winter

Testing of Railway Motors

ADJUSTMENT OF DRUM CONTROLLER FINGERS

Roof Wiring for Circuit Breakers

Repair of Railway Motor Commutators

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The electric railways have long appreciated the assistance afforded them by the special G-E Renewal Parts Catalogs supplied for years with G-E Equipment.

They regard their big G-E Railway Supply Catalog as an aid particularly in establishing proper standards.

Much other information, in various forms, has gone out as helpful suggestions to those directly in charge of the upkeep of equipment. This particular service will be continued, but is being still further improved. It is now centralized in the G-E Engineering Data Book which becomes your permanent guide to proper operation of car equipment and its maintenance.

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GENERAL ELECTRIC

New York, April 19, 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 16

Possible City Operation for New York, but with Service at Cost

AT THE present time it is somewhat difficult to forecast all the effects of the rapid transit bill passed in the closing hours of the hectic session of the New York State Legislature, recently adjourned. It came about through a compromise effected by the Governor between the divided houses of the Legislature, which resulted in the passage of a measure giving a modicum of home rule to New York City. It is something of an empty victory for Mayor Hylan, for while his opponents apparently weakened at the last moment and permitted the bill to pass, it allows far less transfer of authority to the city than had been demanded. The compromise plan, however, had the approval of Governor Smith, and he presumably will sign it.

The salient feature of the act is the creation of a new Board of Transportation of three members, to be appointed by the Mayor, who will have authority to undertake the planning and construction of new rapid transit railroads. These lines may be operated by the city if it so elects, under conditions which are outlined in the bill. If such operation is undertaken it must be at a 5-cent fare for the first three years. But if, at the end of this period, the 5-cent fare is not sufficient to make the lines self-supporting, including interest, depreciation and amortization on a ten-year basis of any traction bonds issued, a rate of fare must be adopted that will cover the cost of the service. It is obvious that a large deficit can be incurred in this initial three-year period of operation, judging by the results of the companies now attempting to give service on a 5-cent fare on the old-established lines with the densest traffic in the world, and constructed when costs were much lower than at present. Thus in effect an increase in fare has been legislated—if, indeed, any substantial subway construction is actually done. This prospect of higher fares will hardly be an incentive to the Mayor to push construction. He will more likely continue to stall.

It is unfortunate from the standpoint of real rapid transit that there is nothing in the act requiring the operation of any new lines that may be built in conjunction with those existing. Newspaper stories have it that it is the plan of the present city administration to make its new construction entirely independent, financially and physically, from the old systems, so that it will not have any connection with the private companies. This naturally will lead to the duplication of facilities and fares, so that the relief promised so often in political speeches if the "traction barons" were beaten would be much like the disintegration of the surface systems resulting from the Mayor's activities in that direction.

On one point the Mayor was beaten decisively. He asked for control over the existing lines and abolition of the State-appointed Transit Commission created under the Miller plan of 1921. Here his opponents did not yield, leaving the old lines in control of the Transit Commission. Thus there will be two commissions instead of one, and, if the construction program is carried out, three rapid transit systems instead of two, neither of which things is likely to work for the best interests of the city. But it appears that at least the construction of new subways is now put squarely up to the Hylan administration.

How Much Oil per Bearing?

THE amount of oil required properly to lubricate an armature, axle or journal bearing of an electric railway car is very small, and yet it is extremely difficult to keep these parts continually lubricated. If the bearing housing has a satisfactory height of oil when the car leaves the shop, this oil is drawn up through the waste by the turning of the shaft or axle, so that after a run of an hour or two, this oil height is frequently reduced to one-third of its original value. All of the oil does not go to flood the bearings, however, and if the car is withdrawn from service, the oil will return nearly to its original level, as the bearings cool off. Modern motors are designed with an overflow pocket to take care of any waste oil.

When a car goes into service after oil has been added to the bearing chamber to bring the level to a maximum height, the amount of oil used at the start will be much greater than at the end of its run. The article by C. Bethel in this issue gives some very interesting data in regard to the relations between lift and feed of oil with wool waste. The maximum lift which can be depended upon to give a safe oil supply is found to be 3 in. While most modern railway motors are provided with an oil well separate from the waste packed portion, in most cases it is unsafe to run the motor until the oil level nears the bottom of the oil well. This fact has led some railways to make tests to determine the most economical as well as the safe height to keep the oil. In considering economy, however, the amount of oil used should be kept well above the danger point of hot bearings.

In a test on the eight identical armature bearings on the same car the amount of wear resulting was measured under use of varying amounts of oil. The amount of oil supplied per bearing varied from 1.96 gills to 0.42 gill per 1,000 miles. The wear on the bearings supplied with 1.75 gills or more of oil per 1,000 miles showed no appreciable wear, while the bearing with 0.42 gill showed wear of 0.038 in. after one month of operation, or 3,600 miles. In other words, one-sixth to one-quarter of its life had been used up.

Cost of One Hot Bearing Would Buy Oil for Entire Life of Car

ANOTHER point that is sometimes not thoroughly appreciated is the total cost involved in a hot bearing. A careful analysis on one railway shows the average cost for a hot armature bearing to be $89. This amount includes only the actual cost of making repairs, and does not take into consideration the loss in revenue due to withdrawing the car from service, or the loss of good will from inconveniencing passengers and interrupting service. Other analyses indicate an average cost of $100 to $125 for a hot bearing.

The cost of $89 for one hot armature bearing would pay for 523 gal. of oil at 17 cents. Here is what this means. With an average consumption of 1 gill of oil per 1,000 miles per bearing, and considering a two-motor equipment with four armature bearings, four axle bearings, and eight journal bearings, this amount of oil would be sufficient to lubricate the car bearings while it operates over 1,000,000 miles, or through a period of 25 years—the life of the car, or more. Lubrication costs, viewed in terms of hot bearings, are startling. The point serves to emphasize the value of using good lubricating materials and plenty of them.

How Not to Repair Special Trackwork

THEY'RE digging up the intersection at X Street and Y Avenue again. That's the sixth time it has been opened in the past year, just to tighten up a few bolts, weld a little metal on the manganese inserts, weld on a few more plates, and patch things up generally so that the cars can get across the intersection without jumping the track. Once again the crossing will be placed in shape to serve for a few months more.

Every time the track is torn up the cars are delayed while the men working on the job climb out, and the men are delayed while the cars go by. And street traffic must go around the opening and the piles of earth and paving dug out of the track.

Anybody with half an eye can see that the hard centers are worn, battered and broken practically beyond effective repair. They have been welded and rewelded until they look like they had a severe case of smallpox. The body of the special work is worn so that no insert could be made to fit. The men don't even try to make them fit, but just weld in a little metal so they will stick together.

If the road were to be abandoned, this policy wouldn't be questioned. But there is every indication that street cars will continue to be needed indefinitely, and this intersection is where two important thoroughfares in a big city cross. How many more times the intersection can be patched up before it finally falls to pieces so that it has to be taken out is hard to tell, but judging from the past the evil day will be put off as long as possible.

The worst of it is that too much track repair work is done this way and the track superintendent thinks he is doing a good job and saving money for his company.

But if cost figures could be assembled it is probable that it would be found that enough has already been spent here to pay a large part of the cost of a new intersection. There comes a point in depreciation beyond which it is poor economy to continue to spend money in making further repairs instead of a replacement. Obviously, when it has become necessary to open up an intersection six times in one year, this point has long since been passed. This is true from the point of view of the track man alone, but in addition to that, were enough of an appropriation made to do a real job, the result would be reflected in lower maintenance of cars, fewer delays to the service and enhanced good will of riders and other users of the street.

Pittsburgh Company Sets Out to Sell Its Product

THE term "selling transportation," as applied to American electric railways, is apparently finding its most concrete expression in the recent establishment of a "commercial department" by the Pittsburgh Railways, to function along the lines of an executive organization and with broad scope and powers, as set forth elsewhere in this issue.

The fare schedules in the Greater Pittsburgh district are probably the most diverse in America because of the nature of the territory and the variety of communities served. No better example could have been found for the application of commercial principles because apparent inequalities will always exist under any fare plans that can be devised. It is therefore well that the solution of the many problems should be left to an organization which starts from the angle of more net from sales instead of more net from skimped service, and one that is freed of all production responsibilities.

Quite naturally, the commercial department absorbs the publicity and public relations work that is found today on many other electric railways as a sort of appendage to the general manager's or transportation superintendent's office. In Pittsburgh the temporary smoothing over of a complaint will go hand in hand with whatever fare and service changes can remove that complaint permanently. This means plainly that the commercial department is an executive organization responsible for many decisions and functioning in relation to the general manager, as does the sales manager of a department store, for example, to the general manager of that store. The latter does not set the prices for the sales manager. He merely demands that the net result shall be in black instead of red. So will it be in Pittsburgh. The commercial department is the one that within a wide range of discretion will set rates and standards of service. The transportation department's job is that of producing the goods requested with least expenditure in men and equipment.

The variety of things started by the commercial department in its first ten weeks of activity shows what it is to have an organization of genuine sales responsibility. This department must be ever on the *qui vive* for business, and it must have no more hesitation about trying new rates at frequent intervals than has the merchant who not only varies his prices with quality, quantity and the seasons, but also with the days of the week. It is just this flexible adjustment to its business opportunities that has been so sadly lacking under the rigid fare and service plans of this country. Now that one of our greatest city and interurban systems has shown that it means to use merchandising principles in selling rides, the industry may have some practical demonstrations of this much talked of theory that will be very helpful.

Packing Railway Motor Bearings for Oil Lubrication

Wool Waste Is Most Satisfactory for Packing, but Care Must Be Used to Insure Feeding the Proper Quantity of Oil—Essentials Are to Keep Shell Tight and Clearance Small—Proper Design of the Oil Grooves Is Necessary

By C. Bethel
Railway Motor Engineer Westinghouse Electric & Manufacturing Company

A Long Strand Wool Wick Such as This Should Be Prepared for Feeding Oil to the Bearing Window

RECENT tests, both in the laboratory and in service, made to determine the main factors affecting the operation of waste-packed bearings have had results defining quite clearly the factors necessary for successful bearing operation. When the bearing is correctly packed with a good grade of long strand wool waste, the oil level is kept within the correct limits, and reasonable care is taken to exclude dirt and to maintain the clearance, the useful life of the bearing can be greatly extended.

The condition of the bearings in a railway motor determines more than any other one thing the amount of general maintenance necessary. With bearings in good condition and with close clearances the motor maintenance resulting from abnormal vibration will be low. Taking advantage of all that is now known regarding the action of waste-packed bearings, a material improvement in bearing life should be obtained over average practice.

Modern waste-packed bearings are rugged and reliable; in fact, they are so simple that the underlying principles of their operation are likely to be overlooked. Although bearings are commonly regarded as performing satisfactorily if they run cool, this is not a reliable index of good bearing operation. Sufficient oil may reach the bearing to keep it from getting hot, but still a rapid wear of the bearing may take place. The mileage of railway motor bearings has been found to vary from 50,000 to 250,000. Some of this difference is, of course, due to differences in service, but most of it is due to variations in lubrication and bearing practice. The waste-packed bearing consists of a babbitt-lined bronze shell which is pressed into the motor housing and is provided with a window into which the waste is packed. This waste communicates with an oil chamber in the housing and carries oil by capillary action to the journal. This is the only source of oil supply.

A certain amount of wear will be present with the best of lubrication. This wear is an inverse function of the amount of oil supplied to the bearing. Therefore, first consideration should be given to the oiling of the bearing. The amount of oil required to lubricate the bearing properly depends on the size of the bearing and the work that it does. The amount of oil that the bearing actually gets depends on (1) the kind of waste used; (2) the height of lift, i.e., the distance from the oil to the window; (3) the kind of oil used, and (4) the quantity of waste carrying oil to the window.

Many tests made to determine the capillary characteristics of different grades of waste and other packing materials have brought out a number of interesting characteristics. For example, the ability of four common materials to lift oil is in the following order: (1) Lamp wick; (2) cotton waste; (3) felt, and (4) wool waste, the latter being the poorest in this respect. This

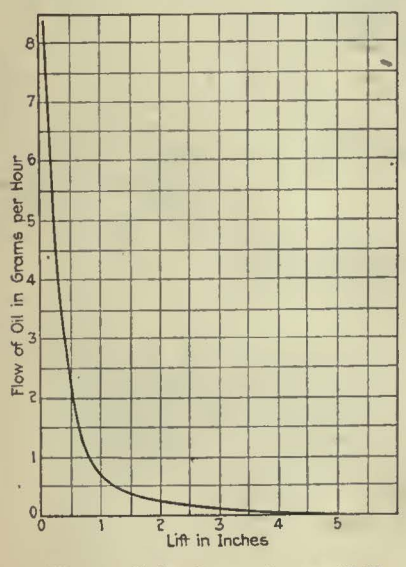


Fig. 1—This Curve for a 40-Hp. Motor Shows the Decrease of Oil Flow with the Lift

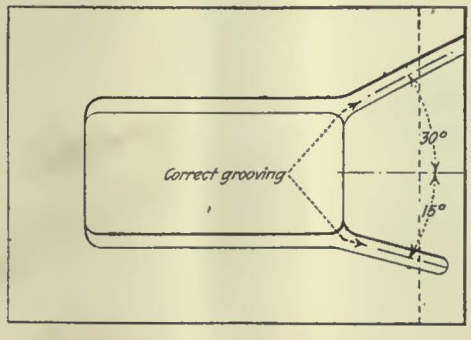


Fig. 2—An Arrangement of Oil Grooves with Edges of Windows Chamfered that Has Proved Satisfactory

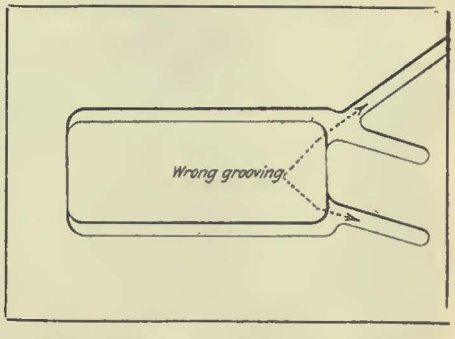
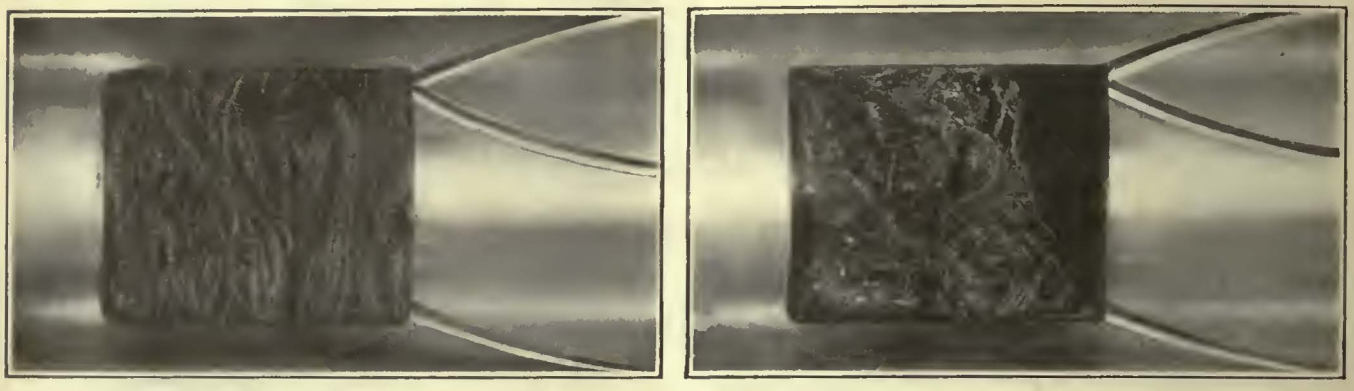


Fig. 3—With the Incorrect Grooving Shown It Is Not Possible to Drain the Chamfer Properly



At Left—Section Through Bearing Showing Appearance of the Long Wool Strands When Correctly Packed. At Right—In an Incorrectly and Loosely Packed Bearing the Waste Is Seen to Be in Balls Rather than in Wick-Like Strands. Note that the Waste Does Not Fill the Window Completely

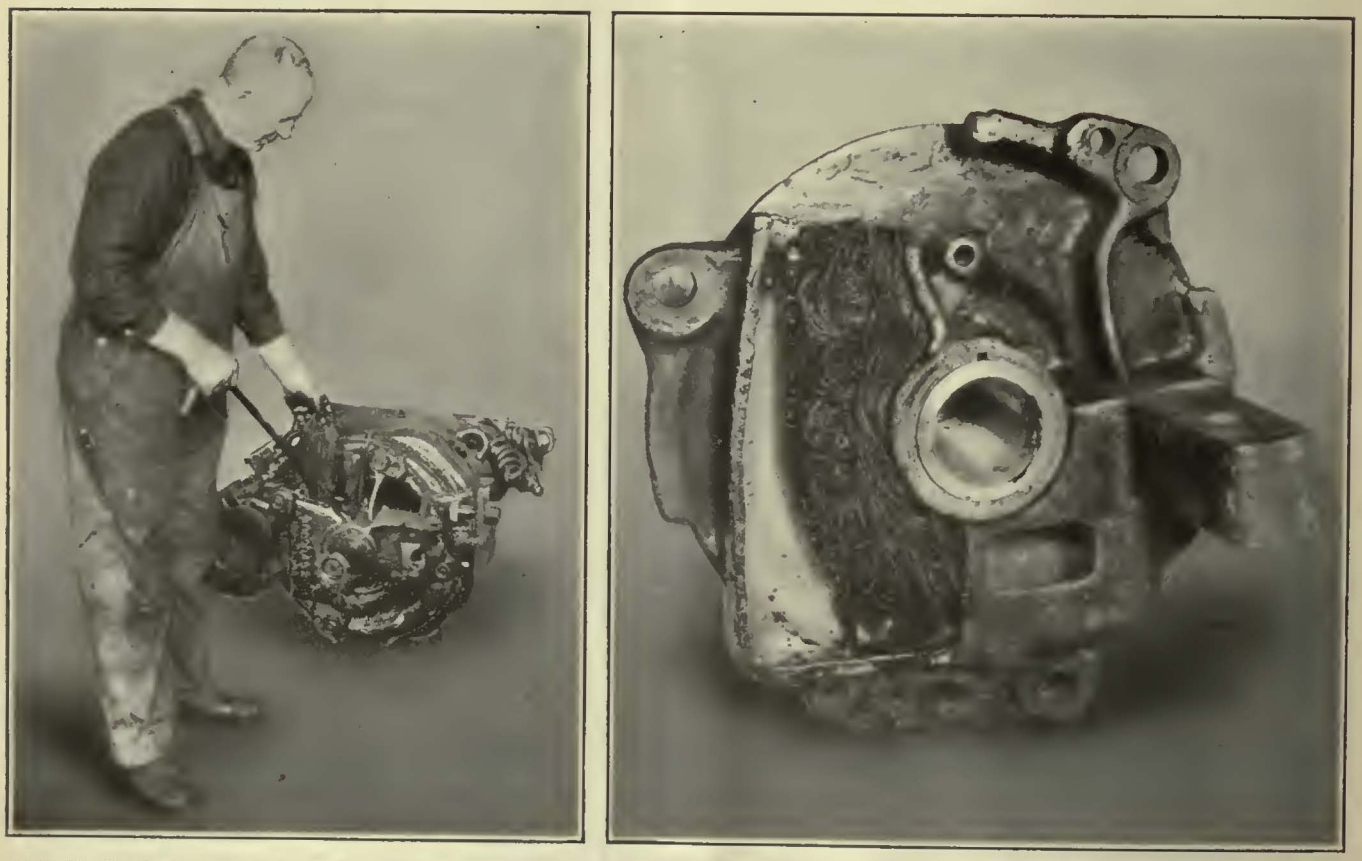
is shown by the comparative distances the oil is lifted after a considerable time, as shown in one of the accompanying illustrations.

Felt has been used successfully in some bearings, particularly where there is a positive, independent oil feed which keeps it well saturated. An example of such use is on electric locomotive jackshaft bearings. But in the usual type of bearing, where the packing both lifts the oil and applies it to the journal, felt is unsatisfactory, as it will glaze when the oil supply becomes lean. Cotton materials are unsuitable as a packing for bearings because they glaze so readily.

Wool waste is the only material that has been successfully used as a packing material. This is because of its mechanical characteristics. It does not glaze as readily as the other materials and it is not so inert, hence it is not so liable to be jolted away from the journal. Since wool waste is desirable on account of its mechanical characteristics, it is important that its relatively poor capillary properties be compensated for as far as possible by securing a long strand wool waste, free from adulteration.

The capillary characteristics of wool waste are shown by the curve in Fig. 1, where the quantity of oil lifted is plotted against the height of lift. This curve is for medium car oil operating at bearing temperatures (viscosity, Saybolt, 54 at 100 deg. C.). The important points illustrated by it are:

1. The maximum possible lift is 5 in.
2. Maximum lift for the minimum safe oil supply is about 3 in.
3. The minimum lift for reasonable economy in oiling is about ¾ in.
4. For further decrease in lifts the oil feed increases quite rapidly. The feed at ½-in. lift is twenty times that at 3-in. lift.



At Left—Packing a Railway Motor Bearing Correctly, Showing How the Wick Should Be Put in Place. At Right—A Correctly Packed Pinion End Housing. The Outer Shell Has Been Cut Away to Show the Wick in Place

Amounts of Waste Taken from Bearing Housings—at Left, from a Correctly Packed Housing; at Right, from an Incorrectly Packed Housing

5. The correct lift for this grade of oil is from 1 to 2 in. For the pinion end bearing of a 40-hp. motor in average service this will give an oil consumption of approximately 1 gill per 1,000 miles.

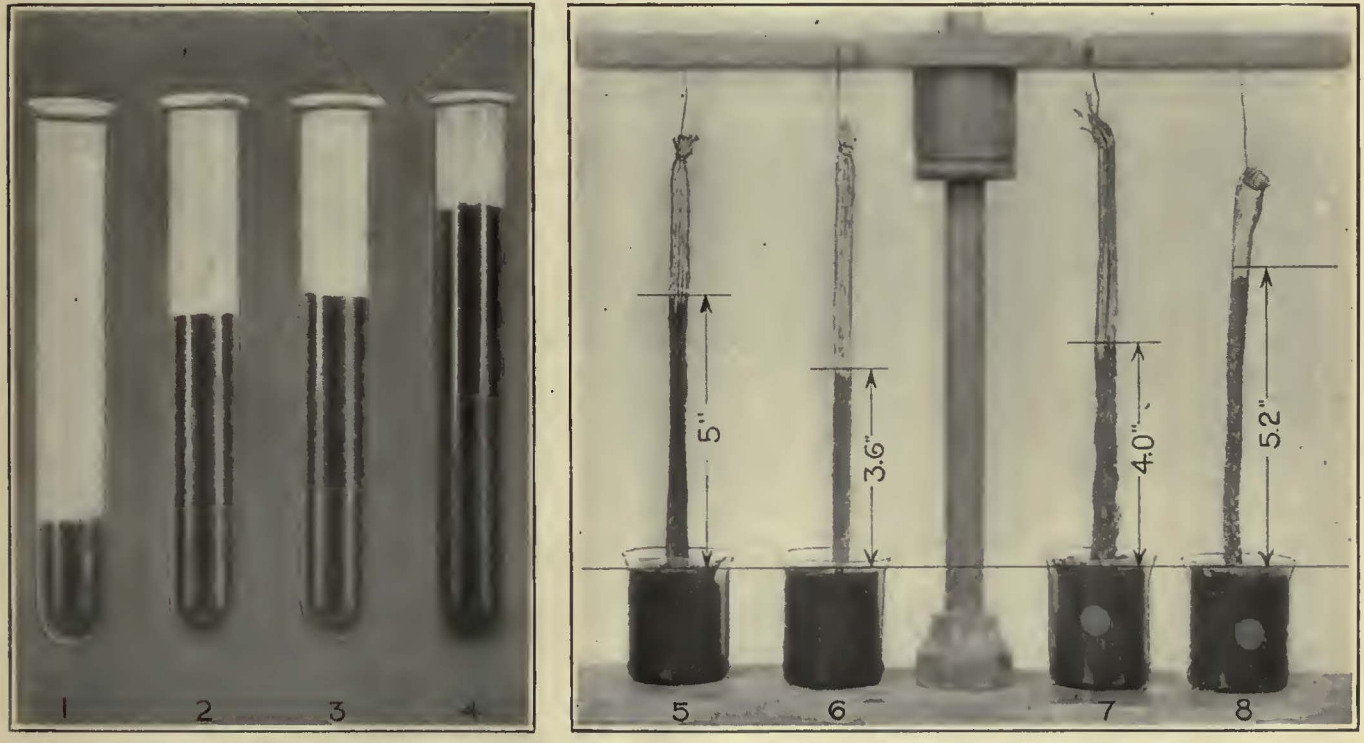
The curve shown represents conditions for a medium oil. Other tests show that viscosity is an important factor in oil feed. A heavy car oil gave a feed of only about one-half that of the medium oil. This indicates the importance of changing promptly from summer to winter oil at the right time, as otherwise a feed that is too lean will result in cold weather. Even then the oil may become very heavy in cold climates. In such cases a shorter lift should be used, ranging from about ½ in. to about 1½ in. It may even be advisable to use shorter oiling periods during the winter months to maintain these levels. These practices must be worked out for each case.

The quantity of waste used was found to be just as important as the quality, for the oil feed was very nearly proportional to the amount of waste in the wick. The amount of oil fed to the bearing also was found substantially proportional to the amount of waste in contact with the journal, showing that anything short of a full window is cutting down on the necessary oil supply, a point often overlooked.

These capillarity tests showed that another fundamental characteristic of waste-packed bearings is the time required to lift oil a given distance. This varies slightly with different materials. To obtain the maximum possible lift of 5 in. previously given for wool waste required sixty-six hours for the particular oil used. This explains why the oil feed is so low at the long lifts, and why it is important to prevent the oil level from running too low.

Method of Packing the Bearing Is Important

The importance of properly packing the bearing is not generally appreciated, and bearings often are put in service with imperfect packing. A number of points should be watched in packing a bearing correctly. A good grade of long strand wool waste should be used, and it should not be pushed into the housing in balls,



The Test Tubes Contain Amounts of Medium Grade Oil that Various Materials Will Lift Under the Same Conditions. At Right—The Actual Heights to Which a Medium Car Oil Rose After 66 Hours Immersion of the Lower End of the Wick

1 and 5, Wool strands. 2 and 6, Black felt. 3 and 7, Cotton wick yarn. 4 and 8, Lamp wick.

but a continuous wick should be formed from the oil chamber to the journal. The window in the bearing should be filled completely with waste, which should be packed down firmly, and a separate wad of waste should be placed on top of the main body of the packing to keep out dirt. A number of these points are shown in the illustrations.

The first step in packing the bearing is to prepare a wick from a bunch of oiled waste, as illustrated. This wick should be long enough to reach from the bottom of the oil chamber up to and across the bearing window. After this has been placed in the housing the waste chamber should be filled up by tamping waste in behind the wick, using care to force the wick firmly against the window. In some housings, especially on the larger motors, and on the pinion ends of most motors, the window extends a short distance inside the

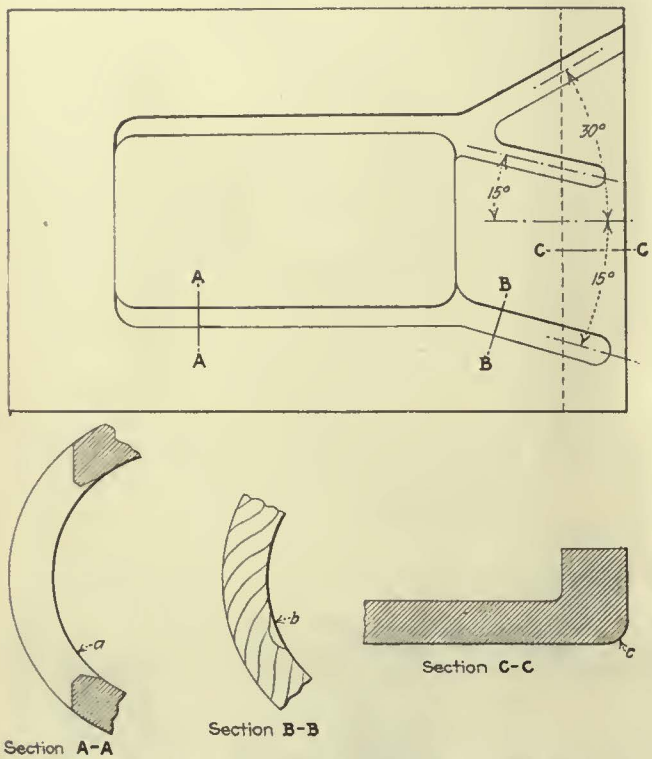


Fig. 4—This Design of the Grooves Has the Advantage that They Can Be Easily Cut to Drain the Chamfer

plane of the housing wall. In packing such housings the waste should be tamped inward so as to fill the window completely.

The function of the wick is to provide a direct path from the oil chamber to the window, and also to prevent areas of imperfect packing in the window such as are often obtained where balls of waste join.

The bearing inspector should be furnished with the limiting oil levels for each of his motors, and then oil should be supplied at such intervals as will maintain these limits. It is common belief that it is perfectly safe to run the motor until the oil level nears the bottom of the oil well. This is not the case, as reference to the curve of oil feed will show. True, the bearing may run without overheating, but unnecessary wear certainly will result. The difference between the minimum level specified and the bottom of the well is provided as a factor of safety—something to fall back on in case a motor is overlooked at the regular oiling period.

The oiler should gage the oil and then pour in enough to bring the level to the upper limit. A little experience will tell him how much to put in to do this, and usually one gaging is sufficient. The oil should be poured in through the filling hole, as when pouring oil on top of the waste any dirt present will be washed right into the bearing. Should the oil level in the housing become very low, however, the standard practice should be departed from and some oil poured into the waste chamber. This is best done by removing a part of the waste so as to get the oil as near the window as possible. If the regular procedure were followed a hot bearing might develop before the waste had time to raise the new supply of oil to the window.

When a motor has been dismantled for bearing replacements or overhaul, the bearing should be repacked with waste thoroughly saturated with oil and the journal smeared with oil before it is assembled again. This simple precaution will often prevent hot bearings, as the capillary action of the waste is often too slow to get sufficient oil to an initially dry journal to keep it from getting hot, especially if the motors go into hard service immediately.

Careful Design of Oil Grooves Is Essential

There is no such thing as a flow of oil in waste-packed bearings, as that term is understood for oil ring bearings. Only a very small amount of oil is wiped into the journal by the waste. When the journal first begins to turn, oil is carried only to that portion of the bearings which is spanned by the window, unless the journal has been previously smeared with oil. The oil then works very slowly out from the window. Starting with a dry bearing of a 40-hp. motor, it may take as long as fifteen minutes for the oil to travel from the window to the ends of the bearing.

A great problem is to keep the shell tight in the housing, and a sufficient length of the shell must be left to give the desired press fit. Therefore, oil grooves are used to aid in carrying oil from the window toward the ends of the bearing. Since the oil flow is rather meager it is important to obtain the correct location of the grooves to get the maximum aid in distributing the oil. If the grooves are not properly made and located they will prove a detriment rather than a help.

A good system of grooves is shown in Fig. 2. Notice that the top and bottom edges of the window are chamfered, as in Fig. 4, forming a trough in which the oil accumulates and feeds the oil grooves. The grooves should be cut from the chamfer so as to drain it completely. Otherwise imperfect lubrication will result. The grooves shown in Fig. 3 will not function properly because they do not lead from the chamfer. Tests have been made which show that grooves which are correctly cut as shown in Figs. 2 and 4 will deliver about four times as much oil to the bearing as can be delivered by the imperfectly cut grooves shown in Fig. 3. In cutting the grooves care should be taken to round off the corners as shown at *b*. Fig. 4. If sharp corners are left they will scrape the oil from the journal. As a rule, the window is close enough to the outer end of the bearing to render grooves unnecessary at that end.

A large radius at the collar end of the bearing is very essential to the lubrication of this end of the bearing because most hot bearings start at this end. If the corner is sharp there is no place for the oil to go when the wiper is pressing against the bearing flange; in fact, the oil must flow against a slight pressure. With a large radius, a place is provided for the oil to

drain into without resistance and a more positive feed to the bearing flange is provided.

Bearings should be started in service with the minimum clearance that will permit the oil to flow freely between the journal and the bearing. Very little work has been done toward the determination of the thickness of oil films for waste-packed bearings, but experience has shown that satisfactory clearances between the journal and bearing, measured after the bearing is pressed into the housing, are 0.006 in. for journal diameters up to 3 in., 0.007 in. between 3 and 4 in., 0.008 in. between 4 and 5 in. and 0.009 in. clearance for journals between 5 and 6 in.

The importance of close bearing clearances, especially in maintaining the gear centers, cannot be overestimated. The main items of motor maintenance are due to mechanical failures or to electrical troubles induced by them. An analysis will show that vibration is the underlying cause of most of these failures, and that a main cause of this vibration is improperly meshed gears, due to worn bearings. This vibration increases at an accelerated rate as the bearings wear. If the bearing wear is reduced and close clearances maintained the upkeep of the bearings will be reduced, and the general motor maintenance will be lessened.

The maximum operating clearances depend upon the size of the motor. Take, for example, a 40-hp. motor with 3½ diametrical pitch gears. With a ⅛-in. wear of the axle bearing and a $\frac{1}{16}$-in. wear of the armature bearing there will be a spread of the gear centers approximately $\frac{3}{32}$ in., or about one-fifth of the gear mesh. Such clearances are quite common, and often they are greater, with correspondingly more severe vibration. Greater over-all economy can be obtained if the bearings on a 40-hp. motor, for example, are removed at clearances of $\frac{1}{16}$ in. and $\frac{1}{32}$ in. for the axle and armature bearings respectively. These clearances may be safely doubled for motors using 2½ and 2 pitch gears.

A large amount of bearing trouble could be eliminated and lower cost of bearing maintenance obtained if the job of packing and oiling the bearings were placed in the hands of skilled men, who could be held responsible for the condition of the bearings.

Well-Equipped Wrecker Proves Its Worth

AN EFFICIENT type of wrecking car is in use on the Union Street Railway, New Bedford, Mass. This car was specially built for the purpose and is equipped with the heaviest trucks and most powerful motors that the railway had available. Complete wrecking equipment, including a convenient work bench, is inside the car. A red band is painted on each tool to discourage removal from the emergency car for use elsewhere in the shops.

The car is equipped with a special derrick on the side, as shown in the accompanying illustration. This is used principally for swinging out pony trucks and placing them on the adjacent track. On the bumpers are several cast-iron sockets which serve as receptacles for the ends of push poles.

The crew comprises four men, including the master mechanic. A special bell call. No. 13 on the auto-call system in use in the shop, is used for emergency. Upon hearing this signal these men instantly leave all other work and proceed to get out the wreck car. There is an overall locker in the car so that men who respond to an unexpected call can don their overalls on the way to the job. Although the need is infrequent, the railway considers it an economy to maintain a thoroughly equipped wreck car.

Pony Trucks for Use In Case of Accidents Are Swung Off the Wreck Car by Means of a Derrick

Maintaining Automatic Sprinklers

Record of 95.7 per Cent of Fires Controlled in Sprinklered Buildings Can Be Increased to 99 per Cent with Proper Inspection and Maintenance

THE wide use of automatic sprinklers in all types of buildings has led the insurance committee of the Chamber of Commerce of the United States to include a leading article on the subject in its publication, *Fire Prevention Bulletin.* The following abstract gives information of value to electric railway men in the maintenance of sprinkler systems:

After a fire has been extinguished by sprinklers the control valve of the operating sprinkler system is closed and the water drained from the system. The sprinklers which functioned are then replaced and the valve reopened. A man should be kept at the closed valve until restoration of the protection, holding himself ready to turn on the water should fire again start.

It is advisable to force all air out of the piping when refilling it with water. This can be done by opening a small test valve which is usually found at the top of the sprinkler system. The valve should be closed when all of the air is exhausted and water begins to flow through it.

When continuous heating of buildings at all times, including idle periods, is not feasible, a dry-pipe automatic sprinkler system is often installed. In this type air replaces water in the pipes. It is under sufficient pressure to keep closed a device known as a dry-pipe valve. In the event of fire the air escapes through sprinklers which are opened by the action of heat upon their soldered links. When the air pressure is decreased sufficiently the dry-pipe valve opens and allows water to flow through the pipes.

Following a fire which has been controlled by a dry-pipe sprinkler system, the water valve is shut, the entire system drained and the fused sprinklers replaced. It is then necessary to reset the dry-pipe valve. This work should be done by a mechanic who is acquainted with the construction and operation of the valve. The system is next refilled with air to the original pressure

and the control valve opened so that the sprinklers may be ready to function at any time.

The National Fire Protection Association has compiled a record of fires in buildings protected by automatic sprinkler systems. The list comprehends a period of twenty-six years and a total of 28,814 fires in sprinkled properties, as tabulated below:

RECORD OF AUTOMATIC SPRINKLERS

	Number	Per Cent
Extinguished fires	19,007	66.0
Checked fires	8,583	29.7
Satisfactory control	27,590	95.7
Unsatisfactory control	1,224	4.3
	28,814	100.0

A large portion of unsatisfactory controls is due to improper maintenance. The reasons for and extent of this unsatisfacory experience are summarized by the National Fire Protection Association as follows:

CAUSES OF UNSATISFACTORY CONTROL

	Per Cent
*1. Water shut off from sprinkler systems	29.3
*2. Generally defective equipment and unsprinkled portions	20.0
*3. Defective water supply	9.3
*4. Freezing of water in sprinkler systems	3.3
5. Slow operation of dry-pipe valves or defective valves	2.7
6. Slow or defective operation of high temperature automatic sprinklers	1.8
*7. Faulty building construction, sealed spaces, unenclosed floor openings, etc.	5.1
*8. Obstruction to distribution of water from automatic sprinklers	5.7
9. Hazards of occupancy too severe for ordinary sprinkler system	5.7
10. Explosions crippling sprinkler systems	4.5
11. Exposure fires or conflagrations	5.8
*12. Miscellaneous	6.8

The items preceded by an asterisk (*) indicate the faults which may be corrected by property owners. Based upon the experience of this twenty-six-year period, these conditions are responsible for fully 75 per cent of unsatisfactory fire control by automatic sprinklers and, if remedied, the efficiency of performance of sprinkler systems should rise to 99 per cent.

Water shut off from sprinkler systems is by far the chief reason for unsatisfactory results. It is due mainly to indifferent maintenance, as indicated in a classification of 360 fires which were not controlled because water was shut off from the sprinkler systems. The causes for shutting off the sprinklers in 134 of these cases were unknown or were due to neglect or carelessness. In seventy-three cases the sprinklers were shut off to prevent freezing.

Whenever a sprinkler control valve is closed, shutting off water from all or part of a sprinkler system, some one should be stationed at the valve ready to open it in case of fire. In the event repairs are being made, it is not always necessary to keep water from the entire system while the work is being done. Temporary connections can sometimes be made which will supply water to at least a portion of the section which is undergoing repairs.

Some sprinkler valves are closed in the winter months to prevent freezing. In general dry-pipe valves should be used in such places. If any valves are closed for the winter months, they should be tagged and a record kept by the man supervising the system in order that they will not be forgotten in the spring.

Water control valves are often sealed. The seals should not be broken and valves closed without permission from some one in authority upon whom will rest the responsibility of seeing to it that the valves are opened again as soon as possible. On many properties inspections of all valves are made daily to insure that they remain open and in proper operating condition.

There are mechanical methods available for facilitating a constant check of sprinkler control valves. Some of them give an alarm whenever a valve is closed. One of these methods is the so-called central-station supervisory service which keeps the entire sprinkler system under constant supervision. Another system provides watchmen's stations at each sprinkler valve. These stations cannot be recorded if the valve is closed.

Such conditions as badly corroded or painted sprinkler heads should not be permitted. Inspection departments are usually glad to test suspicious sprinklers.

Among the sources of water supply are connections to public water systems, gravity tanks, pressure tanks and private pumps. The condition of the source or sources of water should be under constant observation in order that there may be no impairment of the supply. In general, tanks should be filled weekly. Pumps should be turned over periodically to determine their operating condition.

Buildings equipped with sprinkler systems containing water at all times should be heated throughout in freezing weather. Water in the ends of pipes near windows, especially if the latter are left open, is likely to freeze. This will burst fittings or the automatic sprinklers themselves, thereby crippling the system. In cases where dry-pipe sprinkler systems are used, care should be taken that they are absolutely free of water. Because of improper draining or condensation, small quantities of water sometimes remain in the pipes. A small drain can be opened which will permit the air pressure to expel the water. It is suggested that this be done by employees acquainted with dry pipe systems.

Alterations such as the installation of partitions, wide shelving, storage racks and platforms, benches, etc., may form serious obstructions to the proper distribution of water from sprinklers. This condition may be remedied by introducing frequent openings in the obstructing surfaces or by installing sprinklers below them. Alterations should be so made that water from the sprinklers can cover the entire area without hindrance.

Improper piling of stock is often a cause of insufficient water distribution. The full effective action of sprinklers requires about 24 in. of clear space below the sprinkler heads so they may form an unbroken spray of water from sprinkler to sprinkler and to the side walls and partitions.

This cause of unsatisfactory control is increasing in extent. An automatic sprinkler system is intended primarily to control fire at its place of origin, but this is not assured when individual sprinkler heads cannot completely distribute water over the entire area allotted to them.

Self-Inspection Systems

Owners of property equipped with automatic sprinklers will find it advisable to establish some form of self-inspection for all fire protection equipment, including automatic sprinkler systems and apparatus used for manual control of fire such as hose equipment, hydrants, extinguishers, etc. Whatever may be necessary properly to establish such a system can be ascertained from such sources as the engineering departments of fire underwriters, inspection departments, independent inspection bureaus and insurance agents. Some automatic sprinkler companies have service departments which assist in maintaining sprinkler equipments.

Correct Welding Procedure Retains Qualities of Manganese Steel

By Use of Arc Welding in the Field, Life of Manganese Steel Special Work Can Be Increased One to Five Years — Type of Welding Rod, Technique Employed and Speed of Cooling All Affect Physical Characteristics of Welded Material

By Howard H. George
Engineer Maintenance of Way Public Service Railway, Newark, N. J.

IT IS generally acknowledged that a good weld of any steel depends largely upon the skill and experience of the operator. This is particularly true of manganese steel, but the common difficulties are greater than with ordinary steel and there is the added trouble due to the effect of the heat in producing brittleness in the manganese casting. It has been found, however, that careful selection of the welding rod, manipulation of the arc and regulation of the speed of cooling of the weld will make repairs that have sufficient life to justify the use of the process in the maintenance of manganese steel special work.

The use of the electric arc for track welding goes back twelve or thirteen years. During this time its growth has been phenomenal. At first used only for welding splice plates or bars to the rails, its application soon spread to building up the heads of rails where cupped at the joints and then to the repair of manganese steel inserts in special trackwork, and also for welding breaks in solid manganese steel pieces. As usual with a new process, but little attention was given to the theory, and what was actually taking place under the arc was scarcely understood. The natural result was that many failures occurred in the early work, and many disappointing results were obtained.

As the process developed, more and more attention was given to analysis of questions such as the determination of what was actually occurring under the arc, the effect of the heat generated on the physical characteristics of the steel being repaired, the chemical and physical requirements of the welding rod and the comparative results obtained by different welding methods. The accurate determination of these and many other questions was found essential in order to improve the technique of arc welding. A comprehensive investigation of the arc welding process for rail joints is now under way by the welded rail joint committee organized under the direction of the American Bureau of Welding, and it is expected that this work will develop valuable data. The manufacturers of arc welding apparatus and also those manufacturing welding rods are now conducting independent investigations to determine what has been wrong with past practice and what should be done to correct these errors.

The industry must be prepared to make some radical changes in the near future in the method of application of the arc weld process now in general use, particularly with respect to joint work. This should not discourage the use of the process, which is merely going through the same form of development that has been experienced with practically everything connected with the operation and maintenance of the street railway. The changes resulting from the combined efforts of the various investigators naturally will be for better and not for worse.

Attention to Details of Process Important

Formerly, it was thought that all that was required in the welding process was to heat up the rail head or steel surface to be restored and fuse in with it some additional metal. It is now becoming generally recognized that successful welding requires a definite technique, including a certain polarity and a fairly definite manipulation of the arc. The temperature is also found to be an important factor. For a certain composition of rail steel or manganese steel casting, it is now understood that a reasonably definite chemical analysis of welding rod and, in the case of joints, of splice bars is essential. Also, in practice it is found that an electrode with positive polarity gives better welding characteristics and that the loss of carbon and manganese in the deposited metal is less. When welding with manganese steel either on manganese or on high carbon steel, it is advisable to form a rather wide deposit by a slight oscillation of the electrode so as to give a deposit approximately double the width of that obtained by drawing the electrode along a straight line. By this manipulation of the arc, the deposited metal is kept in a molten state for a somewhat longer period, allowing time for the escape of any gas which may be included in the deposit, and thus preventing the formation of blow holes. The manipulation produces a puddling effect and makes more certain the complete alloying in the deposited metal of the ingredients in the rod and its coating.

Welding Can Be Used for More than Temporary Repairs

Welding in the street with the manganese process has, up to the present stage of its development, generally been considered as a very temporary or emergency repair proposition. With the improved alloy steel rods now being developed, however, in many cases the results being obtained are considerably better than what might generally be considered as temporary repairs. This class of work is of double importance from an economical standpoint because of the great cost of special trackwork as compared with straight rail, and because of the delay sometimes experienced in securing delivery of replacement pieces. It is of course not practical to carry in stock sufficient renewal pieces to cover every emergency that may arise, by reason of the special

character of the various special trackwork designs. Ordinarily, when a switch tongue breaks, it is possible to renew the tongue from stock because of the limited number of types of tongues which are usually found on any given property and which need to be carried in stock. But with a combination frog or solid manganese mate, for instance, this becomes an entirely different matter.

It obviously is impossible to determine definitely what added life can be secured from a special piece such as a frog or mate, where the manganese insert has been built up by arc welding. This depends on such factors as the skill of the workman, method and materials employed, the extent of deterioration of the piece at the time repairs are attempted, general track conditions, and care taken in subsequent grinding of the surface after welding. Many otherwise satisfactory welds on manganese inserts have failed prematurely either because of neglect to grind promptly or failure to see that this part of the work was properly done, thus imposing stresses in the welded metal considerably beyond its ability to withstand, and hastening its failure. While in some cases repairs with every appearance of a satisfactory weld have failed within a very short period, it is not believed that this is the general experience with welded repair work.

Considering the cost of replacing the special piece as compared with the cost of temporary repairs with the arc weld process, it is generally felt that if an additional year of life can be obtained the expense of making repairs is fully justified. This increase in life is not unusual by any means. As a matter of fact, even though the work was done during the experimental period when the present improved welding rods were not known, and when the operator was not as well informed as to the requirements for a successful weld as he is at present, this additional year of life has frequently been exceeded, and two years of additional life often has been obtained. This latter figure probably should be more correctly considered as representing the average increase to be expected. Numbers of cases have been reported where the increase in useful life due to welding has gone as high as five years, and with our increased knowledge of the process and improvements in welding apparatus and materials, it is even reasonable to believe that this will be a usual expectancy.

In some cases arc welding repairs would be entirely justified even though they lasted but a few weeks, for this would give the engineers sufficient time to secure a new piece from the special trackwork manufacturer and would enable them to keep traffic moving during the interval without excessive damage to the remainder of the track or to the equipment.

Repairs Should Be Made Promptly

It is desirable that repairs be made when the failure of the manganese is in its early stages and before the balance of the structure has been affected by the excessive pounding of the car wheels over the broken insert or casting. It is quite probable, for example, that in the case of filling blow holes or sand holes which are occasionally encountered in casting, sometimes discovered before the piece has been put in service and sometimes developing shortly afterward, the work is more or less in the nature of patchwork but generally there is sufficient actual fusion of the two metals to justify calling the operation a weld.

The nature of the problem will be better understood when it is explained that when the manganese content is increased above 2 or 3 per cent the strength and durability normally decrease while the hardness increases. Manganese frogs and crossings contain between 11 and 13 per cent manganese. Opinion varies as to the chemical analysis of the deposited metal as compared with that of the welding rod. The manganese content of the welding rods now commonly used probably will vary from about 10 to 15 per cent.

Tests made by one company indicate that, using bare electrodes, the loss in manganese will vary from 1½ to 2½ per cent. These tests indicated that while a coating stabilizes the arc, with most of the coated rods available on the market the manganese loss was at least equal to that secured when using bare electrodes, due to absorption of the manganese by the fluxing material. The conclusion reached as the result of these tests was that since experience dictates that the manganese content of the wearing surface preferably should exceed 10 per cent, it is desirable to employ electrodes in which the manganese does not fall below 12 per cent. It has been found possible to secure in the deposited metal manganese content equal to or greater than that in the electrode by coating the rod with powdered manganese. The use of such a coating obviously permits the utilization of manganese steels having a wider range in manganese content.

Effect of Physical Treatment on Strength of Metal

It is considered essential that the heat of the arc be kept at the minimum required to bring the metal to the point of fusion and that the overheating of the steel be minimized as far as possible. The following abstract from a report made several years ago by the metallurgist of one of the large manufacturers of manganese steel trackwork castings will emphasize the necessity for this:

> In its cast condition, manganese steel is extremely brittle, so much so that, when broken, a test bar of untreated manganese steel will give almost no angle of bend. In order to confer upon the metal the toughness which is so important a property in all its applications, the casting after it is taken from the mold is heated in an annealing-furnace to a temperature of approximately 1,050 deg. C. or 1,920 deg. F. After being heated to this temperature, the steel must be quenched in cold water, and it is important that it be put in the water as soon as possible without allowing it to cool off slowly. If it cools, even in the air, below a certain definite temperature, before being put in the water, the casting possesses very little toughness and is quite unfit for service.
>
> If the toughened steel is again heated to a temperature over 300 deg. C., it becomes extremely brittle, quite as much so as in the cast condition, and it will be brittle after heating to these low temperatures whether it is cooled fast or whether it is cooled slowly. If heated after toughening to temperatures between 300 deg. C. and 700 deg. C., the same is true, the steel being brittle even if cooled rapidly. If heated after toughening to temperatures between 700 deg. C. and 1,050 deg. C. the steel will be brittle if cooled slowly, and will be more or less tough if cooled rapidly, the toughness increasing as the temperature is raised from 700 deg. C. to 1,050 deg. C.

It is obvious, of course, that it is not practical to remove the piece and heat-treat it to give it the desired characteristic toughness. It is realized that the heat treatment of shop practice cannot be duplicated in the field, and that the next best thing is therefore to be desired. While in many cases the rapid cooling received by the arc-deposited metal in normal deposition is sufficient to give certain wearing qualities, it is nevertheless considered desirable, in the opinion of some engineers,

whenever practicable to quench each layer deposited at frequent and relatively short intervals. The normal water toughening treatment amounts to raising the temperature of the metal until the desired molecular structure is produced, and then fixing it at that point by increasing the normal cooling rate. Likewise, in the case of welding manganese the metal heated to a high temperature by the welding operation is suddenly cooled from a temperature as nearly as possible equal to that for the desired structure. Naturally this localized control of the heat is not the same as where the entire casting is brought up to the required temperature and suddenly quenched in cold water. It undoubtedly results in zones of very brittle manganese steel which, sooner or later, are responsible for many of the failures which occur. It does, however, constitute the best known practice for field operations at the present time.

It is essential in trackwork where welding is to be continued to dry the surface where the arc is to be established, as otherwise difficulty will be experienced in establishing the arc. It is also considered essential that the surface to be built up should be thoroughly cleaned. The means used to accomplish this will vary with the condition of the piece, a wire brush being sufficient in some cases, whereas a portable grinder may be required in others. All grease or other foreign matter must be removed, however, no matter what means may be employed.

Portable Pneumatic Equipment Reduces Track Reconstruction Cost

The Expense of Ballast Tamping and Pavement Cutting on the Pacific Electric Railway Has Been Cut in Half—Greater Rapidity Is Another Advantage—Better Work Is Done if the Men Are Allowed Intervals of Rest—The Apparatus Used in Los Angeles Is Described

By Clifford A. Elliott
Cost Engineer Pacific Electric Railway

FOR maintenance work on its tracks in paved streets the Pacific Electric Railway has used pneumatic tie tamping and pavement cutting tools for the last six years. The experience of this company indicates that the use of mechanical tools has reduced the expense of tamping and cutting by nearly half. Better results have been obtained and the life of the track has been prolonged. When working in congested streets the time saved has been an important item.

An illustration of rapid machine cutting work is furnished by a job done in January, 1924. This consisted of reconstruction of one of the company's double-track, combination-gage lines in the downtown congested district of Los Angeles, where a thirty-second car headway is operated. A total of 18,585 sq.ft. of 6-in. asphalt concrete pavement was excavated in twenty-one compressor days. It is estimated that under the handicaps connected with this job it would have required fifty working days to remove the pavement by old hand methods. Considering the traffic disturbances due to street cars and vehicles, this performance is considered very satisfactory.

When pavement was recently removed in order to lay a second track on Sixth and Front Streets (San Pedro), Los Angeles Harbor, 26,500 sq.ft. of paving was taken up in twenty-four working days. This involved 23,000 sq.ft. of 6-in. concrete base and 3-in. asphalt wearing surface, laid in 1916, and 3,500 sq.ft. of 9-in.

Three Air Compressors at Work Simultaneously in the Downtown District on Combination Gage Tracks, Where the Job Had to Be Done Without Interrupting a Thirty-second Headway

Pneumatic Paving Cutters Opening Up Pavement of 6-In. Concrete Overlaid with 3-In. Asphalt

Cutting Up a 9-In. Solid Concrete Pavement with the Pneumatic Cutters

solid concrete pavement laid in 1920. It required sixteen compressor days on the concrete base, asphalt-wearing surface type and eight days on the solid concrete type. In the case of the less solid type pavement 1,000 sq.ft. of pavement was removed in six hours. On the solid concrete job 600 sq.ft. was cut out in nine hours.

It is estimated that in general four pneumatic cutting tools can accomplish in approximately forty minutes what it formerly required four men approximately five hours to do. This naturally has an important bearing on the ultimate cost of track reconstruction. Average figures show that pavement can be removed on the Pacific Electric lines approximately 50 per cent cheaper by machine than by the old hand methods.

Based on wages paid the Mexican labor used in operating these pneumatic pavement cutting tools, the company finds that in handling emergency or small repair jobs, and using its light duty machine, the cost averages 10 to 12 cents per square foot of pavement removed and made ready for wasting. Similar work handled by old hand methods costs from 20 to 25 cents per square foot. In handling the large reconstruction track jobs, when the heavy duty machines are employed, the average cost of removing pavement is about 8½ cents per square foot. For tamping ballast in track during reconstruction the labor cost per tie is 40 per cent less than by old hand tamping methods.

A gas-driven Ingersoll-Rand type 12x10 "ER-1" air compressor mounted on a trailer was used for the Sixth Street job. Cutting of the pavement was handled by two shifts, one nine-hour day shift and one nine-hour night shift. The average cost per square foot for the less durable type of pavement was 5 cents, while in the solid concrete type the cost averaged 16 cents per square foot. This was an unusual job because cutting is necessary only when new lines are constructed in city streets laid with solid concrete pavement. This type of pavement is not ordinarily used in and about the tracks by the Pacific Electric Railway.

The operation of the air compressor for a nine-hour working day or night shift on the above-mentioned job was arranged as follows:

Four Mexican laborers operating cutting tools.
Two Mexican laborers as relief operators.
Two Mexican laborers as break-up or clean-up workers.
One mechanic operating air compressor.
One track foreman.
One flagman.

In organizing a paving cutting gang as outlined it has been found from experience that the laborers who operate the air guns are more efficient if they have, from time to time, a ten-minute or twenty-minute relief interval. For this reason the makeup of the paving cutting crew includes one laborer to act as relief for two air-tool operators. The relief man also handles the air hose, keeping it properly lined up or clear of traffic, for a given period of time before he takes his turn on the guns. This results in a revolving task for three laborers assigned to two air guns.

For light work the company uses an Ingersoll-Rand Imperial type four-tool, electrically driven air compressor. A direct-current 25-hp. motor operating at 500 volts furnishes the power. The air capacity is 120 cu.ft. per minute.

Supporting Rods at the Rear Steady the Truck When the Compressor Is in Operation

This Gas-Operated Compressor Used for Heavy Track Reconstruction Supplies Air for Eight Pneumatic Tools

This apparatus has been mounted on a 2½-ton motor truck. The layout on the truck, so far as the motor base and housing is concerned, is in accord with the Ingersoll-Rand standard mounting, but on the forward section of the truck the railway has provided tool cabinets for storing the pneumatic tools and the accessories of the machine.

Some features to improve the efficiency of the apparatus were added at the company's shop. Since the equipment is operated both day and night the truck has been wired and provided with electric lights. The current for the operation of the machine is taken from the trolley wire and a collapsible wooden pole has been designed and mounted on the rear of the truck. The pole is jointed and adjustable to any desired angle, corresponding to the distance of the machine from the track. When the pole is not in use it may be dropped to a position on the roof of the compressor. An adjustable clamp is used to connect the negative return wire to the rail. This clamp firmly secures the cable so that the vibration of passing cars will not interrupt the operation of the machine.

To reduce the vibration of the truck when the compressor is in service the rear of the body is supported

Steam Shovel Loading Broken Pavement When a Second Track Was Being Laid on Sixth Street

from the pavement. Two 1-in. iron rods extend from the base of the chassis to steel plates 4 in. x 4 in. and 1 in. thick resting on the pavement. Round holes are drilled partly through the plates. The rods rest, therefore, in a sort of ball joint, which gives solid support to the frame. As it is always essential to have the compressor level these rods take the place of jacks. This is particularly useful when the machine is working on a narrow street where the pavement slopes sharply.

For large construction and reconstruction jobs in paved streets the company has also another specially constructed air compressor. It is electrically driven and takes current from the trolley. This machine has sufficient capacity for operating twelve pneumatic tools. That is, twelve tie tampers may be operated simultaneously, but only six pneumatic cutting tools may be operated at one time. If the cutting of pavement and tamping of ballast are being performed at the same time the machine will operate two cutters and four tampers. The apparatus is mounted on a trailer and hauled from place to place by motor truck.

Another machine used is a gasoline-engine-driven compressor of 60 hp., mentioned above. This requires 25 gal. of gasoline and 1 gal. of lubricant per working day of nine hours. The outfit is mounted on a trailer and its capacity is eight pneumatic air tools working continuously. No tests have yet been made to determine how many tools of different kinds can be operated simultaneously by this compressor.

In calculating the cost of the work handled by these machines, depreciation, repairs, insurance and rental of the equipment are taken into consideration. It is estimated that the heavy duty, electrically operated compressor uses 14.92 kw.-hr. per hour. The cost of power per hour is also figured in the cost of the work where these types of machines are used.

Signal for Special Locations

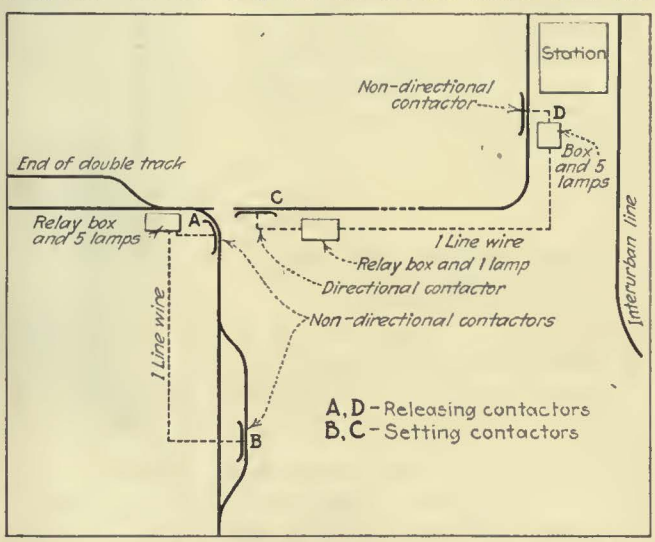
BY H. J. CHARTERS
Portland Railway, Light & Power Company, Portland, Ore.

THIS company has developed a simple signal which is used for a number of purposes, such as the following: To indicate to the crew of an interurban train that a connecting city car is approaching; as a one-way block; as a terminal signal for use on the single track which extends beyond the end of a double track or beyond the last passing track on city lines. The device consists of a pick-up relay in series with five 36-watt Mazda lamps, of which one is mounted directly behind a 6⅜-in. ruby lens. This gives an indication which is visible even when on a bright day the sun is shining directly against the front of the box.

Signal and Relay Box Open for Inspection

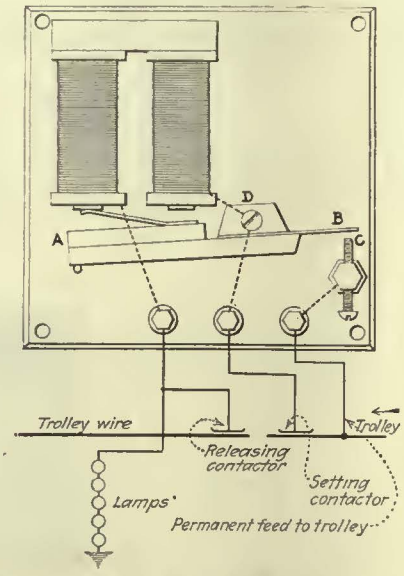
The general principle of the relay is given in the smaller diagram showing the circuits. When a car passes under a setting contactor, a momentary current is sent through the relay winding, bringing the holding circuit into operation by closing the contact between *B* and *C*. Current continues to flow until a car passing under a releasing contactor shunts out of circuit the relay winding, which has 50 ohms resistance, releasing the armature and opening the holding circuit. A spring between the armature and the magnet core assists the former in dropping promptly.

Applications of this signal are given in the larger diagram. In this diagram the normal limits of a one-



Track and Signal Layout Showing Two Special Applications of Portland Railway's Signal

way block are indicated by the setting contactor *B* and the releasing contactor *A*. Contactor *B* is placed to provide an overlap, as indicated. A car setting the signal from *B* will travel the length of the siding before passing onto the single track. Thus, if two cars enter the block from opposite directions at the same time, the one entering from *A* will have time to come into sight of the other car around the curve before the latter car has left the siding. The car on the siding can then wait until the other one passes, avoiding possible delay by one car having to back into the clear. Another application of the signal, shown in the same diagram, is to notify interurban crews that a city car is within a distance that will justify waiting for possible passengers. A relay and signal box containing one lamp is located at *C*, this lamp being connected in series with five in the signal box at *D*, the distance between the two signals being about ½ mile. A directional contactor at *C* causes the relay to close, lighting both signals. When the car passes *D*, a releasing contactor contact is made, opening the circuit. In this case the last connecting city car at night carries signs stating that it is such, and interurban crews have instructions to call the dispatcher in case the connecting car has not appeared up to their leaving time. In connection with this signal, nondirectional brush type contactors are used in most cases, but when necessary, United States Signal Company No. 5 switches are used to give directional selection. These simple lamp circuit signals cause little trouble. Their purpose is to prevent delays incidental to cars having to back into the clear. Under these conditions the burning out of lamps does not involve dangerous operation, the speeds of the cars not being high.



Circuits of Pick-Up Relay Used in Portland, Ore.

Pins Indicate Accident Locations

LOCATIONS of accidents on the Worcester Consolidated Street Railway are plotted for the general manager by means of colored pins stuck at the proper points on a large map showing the track layout of the entire system. Five different colored pins denote different kinds of accidents, such as automobile collisions, boarding and alighting accidents, car collisions, etc. When an accumulation of pins occurs at some point the attention of the management is drawn to the number of accidents occurring there and investigations are made with a view to remedying the situation.

Rolling Door Worked by Electricity

A ROLLING door recently installed at the entrance to the Main Street carhouse of the Worcester Consolidated Railway, Worcester, Mass., has proved very satisfactory. The track layout of this carhouse is such that all cars enter and leave through a comparatively narrow doorway, and it is therefore possible to close it off entirely by this rolling door. The door, which was made by the Kinnear Manufacturing Company, is electrically operated. It will open or shut in fifteen seconds. Push-buttons located in the dispatcher's office alongside the doorway control the operation. The control will either open the door, shut it or stop it instantly in any position. This is important to avoid accidents.

In order to prevent cars running into the closed door, bright red electric lights have been placed on both sides of it. These go on automatically when the door is closed and warn motormen to stop. When the door begins to descend, a hinged section of the overhead contact wire drops down to allow a space for the door. When the door is rolled up to open the passageway for the cars, this hinged section snaps back in place through the action of a trip on the door.

This building is used not only as an operating carhouse but also as a repair shop. It is said that many tons of coal have been saved in the carhouse since the installation of this door last fall. The shop men working around the cars have now discarded the sheepskin coats formerly worn and the quality of the work performed has improved.

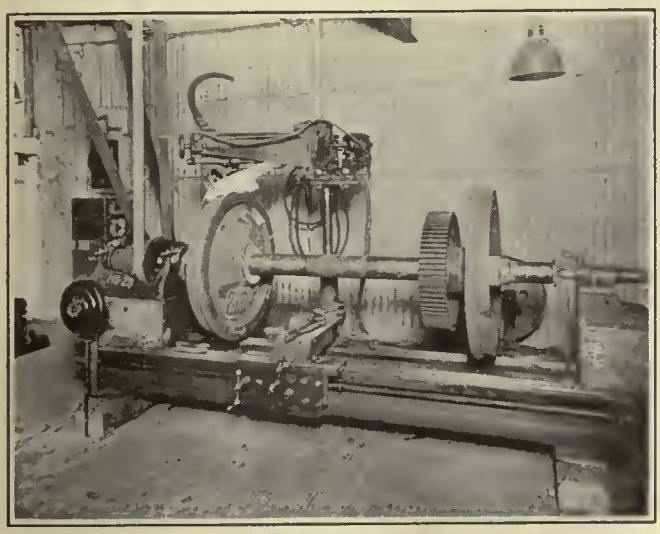
Through the Installation of This Rolling Door at the Carhouse Entrance a Considerable Saving of Coal Has Been Effected

Comprehensive Shop Welding Program Makes Big Savings

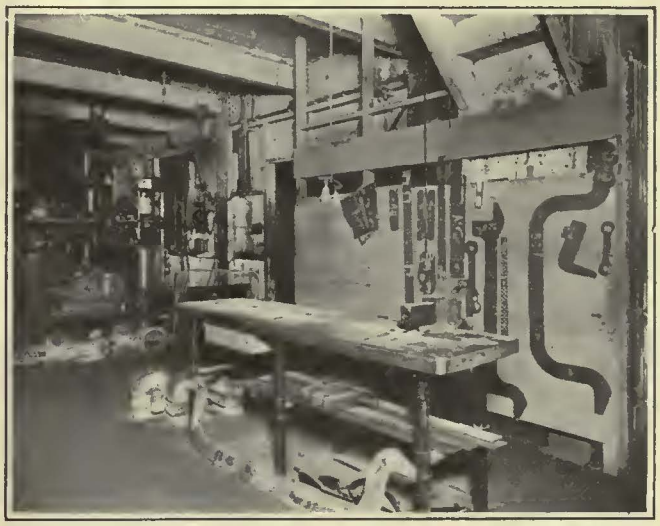
Reclamation of Trucks, Motor Cases and Worn Steel Wheels and Axles in Shops of Springfield Street Railway and Worcester Consolidated Railway Has Materially Reduced the Waste Coincident with the Scrap Pile

BY THE installation of complete modern electric welding equipment the Springfield Street Railway and the Worcester Consolidated Railway, which are under the same management, have reduced to a small amount the quantity of material being sent to the scrap pile and have effected large financial savings. The efficiency of this reclamation program is increased by the use of American high-speed drill presses and a Lucas horizontal boring machine. The welding facilities at the Worcester shops are more elaborate than those at Springfield and much of the work is therefore done at the former place.

Rehabilitation of old trucks is accomplished in an interesting manner. The truck is entirely knocked down, wheels and axles are removed and reclaimed according to a process that is described in another paragraph of this article, motors are removed, and the armatures and fields taken out and sent to the armature room. Worn motor cases are built up by welding. The procedure in the case of an individual broken part that has to be taken out of service is similar to that employed when the entire truck is overhauled.



Flanges Are Built Up on Worn Steel Wheels at Worcester by Means of an Automatic Welder Placed on the Carriage of an Old Lathe



Templates Are Used in Marking Holes to Be Drilled in Welded Truck Parts and the Work Is Done on a High-Speed Drill

The method of reclaiming the equalizer bars of the truck is typical. These are first sent to the welding room, where all the bolt holes are completely filled in and worn parts built up by the electric welder. This process requires about two hours. They are then sent to the grinding table, where a man with a portable electric grinder smoothes them down. Fifteen minutes is required for that part of the job.

Next these pieces are taken to the marking table. Here there are steel templates for every important part of the truck frame. The templates are made with ½-in. holes in the exact position of the holes required in the truck member. Around each hole in the template is a 2-in. square of ¼-in. steel. The template is laid on the welded piece and a hand punch inserted in one of the holes. With a tap of a hammer the layout man then punches the precise center of the hole to be drilled in the piece. After the location of all holes to be drilled has been thus punched, the template is removed and the size of the hole is marked in chalk. The arrangement of templates hanging on a wall beside the layout table is shown in an accompanying illustration.

After being welded, ground down and punched the pieces are taken to the drill press. For drilling, an American high-speed drill is used. With this machine all the necessary holes in the equalizer bar of a truck frame can be drilled in ten minutes. One man operating this high-speed drill is able to do more work in less time than was formerly done by two men operating old-fashioned drill presses.

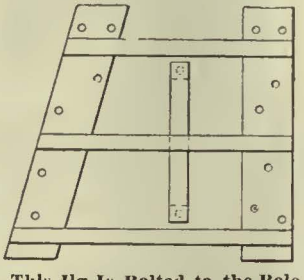
Having the various machines used in this process located in the proper relation to one another is an important factor in the efficiency of the operation. At the Worcester shops the welding room, the grinding and layout tables and the drill press are so placed that little time is lost transporting pieces from one to the other. The machines are all near together and the path of the piece under repair is continuous from one to the next.

At Worcester the practice is to build up the flanges on steel wheels as fast as they wear down, until the tread of the wheel has been worn to the predetermined limit marked by a shallow cut on the wheel surface.

A Horizontal Boring Mill Used to Drill Holes In Welded Motor Cases

All worn steel wheels are repaired by means of an automatic welding machine. An accompanying illustration shows this machine at work. A pair of wheels mounted on the axle are set up in the bed of an old lathe. The axis of the lathe has been raised by the insertion of cast-iron blocks so that wheels of the largest size can be accommodated. The welding head is mounted on the lathe carriage, which has been equipped with ball bearings to permit easier movement. Height adjustment of the welding head to suit wheels of different sizes is easily made. By the adjustment of this head worn axles can also be built up in this machine.

The lathe is operated at a speed of one revolution in fourteen minutes by an electric motor running at 1,500 r.p.m. Gears from an old air compressor are used to accomplish this reduction in speed. It requires about eight hours to build up the flanges on a pair of steel wheels and two hours more to turn them down to the proper contour.



This Jig Is Bolted to the Pole Pieces of a Motor Case When the Case Is Being Redrilled

It is estimated by the company that this process adds 50,000 miles to the life of the wheel and has reduced by 30 per cent the expenditure for steel wheels. An annual saving of nearly $6,000 has been accomplished. Wheels are scrapped only after a personal inspection has been made by the master mechanic. It is now planned to reclaim many old wheels which were taken off and stored for scrapping prior to the installation of the automatic welding apparatus.

Welding is done at these shops in individual rooms specially built for the purpose. There are at present two automatic welding rooms and three for ordinary arc welding. One man, however, operates both of the automatic machines and has spare time besides. The doors of the welding rooms are heavily curtained and the insides are painted with G.E. No. 881 ultra-violet ray protective paint. An overhead trolley system with traveling chain hoists is used to transport heavy material to and from the welding rooms. It is felt that safety from eye injuries to other workmen and better quality of work by the welders result from having individual welding rooms.

Another important phase of the reclamation program being carried on by the railway is that of modernizing motor cases. In particular it was desired to convert the old type No. 101 motor cases to the more up-to-date 101-B2 type. The holes in the old cases were filled in by welding and rebored with 1¼-in. diameter instead of 1-in. as before. The old 1¼-in. hole for the armature housing was filled in and two new ones built up by bending a piece of ¼-in. iron to circular shape and filling with welding metal.

All bearing fits and housing fits were filled in and then rebored. Gear case supports were built up by welding. New fields and rewound armatures were installed where needed. This reconstruction included the elimination of the old mica brush-holder insulators and made possible the use of a more modern type of brush-holder.

Many motor cases have been reclaimed also by the Springfield Street Railway in its own shops. After the holes in the old cases had been filled with welding metal and all worn parts built up the contact surface of each half of the motor shell is carefully planed down. No equipment is available for doing this in the railway shop at Springfield, and such work is therefore sent out to a near-by machine shop.

A novel jig is used in the process of reboring these motor cases. This consists of two pieces of ¾-in. sheet steel held together by other steel cross members, as shown in the accompanying sketch. The various pieces are riveted together. Holes have been made in the heavy steel to correspond with the holes to be drilled in the case. On account of the thickness of the material used in this jig no reinforcing plate is required around these holes.

The method of procedure for this work differs materially from that employed in reclaiming truck parts at Worcester, as already described. By means of the center strip the jig is bolted firmly to the pole pieces of the motor case. The case is placed in a Lucas Precision horizontal boring machine, as shown in the illustration on this page, and the holes bored. About three cases, or one and a half motors, can be drilled in a day on this machine. More than 400 motors have already been overhauled in this way and put in good, serviceable condition.

Ciment Fondu Proves Unsuccessful for Grout

A RECENT inspection made by the Boston Elevated Railway of paving laid on Main Street, Charlestown, Mass., and grouted with Ciment Fondu indicates that the grouting in between the blocks has disintegrated. When this paving was laid in September, 1923, the railway did not have on hand a sufficient quantity of Ciment Fondu to use it for the concrete paving base. It was, therefore, used only to cover the granite block surface.

When the grout was mixed it was bluish black in color and oily or greasy in appearance. It flowed and worked liked ordinary cement. Equal parts of cement and sand were used in the mixture. The work was completed at 3 p.m. and by 8 o'clock the following morning the pavement had the appearance of having set for three or four days. It was then firm enough to receive vehicular traffic.

An inspection was made of this paving on March 29, 1924, after it had been in service for 187 days. It was

found that the grout had entirely disappeared from the face of the paving blocks and from the joints between the paving blocks to a depth varying from ½ in. to ¾ in. After the dirt which filled these joints had been removed it was found that the grout was chalky white in appearance and was easily scored with a pointed tool. It did not seem to possess the degree of hardness of ordinary portland cement grout. From the tests it would appear that this French cement is not adaptable for grout paving.

In another instance, however, the railway reports that it proved more satisfactory. A small amount was used during the construction of a sewer, where on account of the tides and the inability of the contractor to keep the ground water below the level of the manhole inverts it was impossible to use ordinary cement because every tide washed it out from the joints. A small amount of Ciment Fondu was successfully used on three of the manhole inverts because this cement sets so quickly that a fairly firm set was secured between tides.

Compromise Joint Plates Made by Welding Shims to Angle Bars

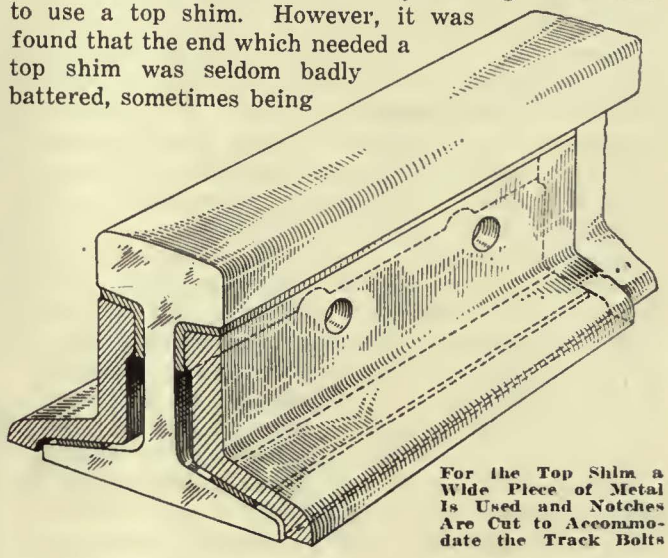
The Great Variety of Rails Which Were Used on a Small Railway Made a Difficult Repair Problem

BECAUSE of battered joints it became necessary a short time ago to repair 3 miles of track on a small Southern railway. A miscellaneous assortment of material, including many kinds of rail, had been used in the original construction of this line, which had been sponsored by real estate men more interested in the development of a tract of land than in the construction of an electric railway. The great variety of rail sections made joint repairs a difficult problem and the method finally decided upon was the use of compromise joint plates made by welding shims to angle bars.

Although approximately four out of five of the joints were composed of rails of different sizes, and a great improvement could have been effected by taking up, sorting out and relaying the rails, it was felt that such a method would be too expensive. So many kinds of compromise joints had to be made that it was out of the question to buy angle bars to fit. Moreover, it was found virtually impossible to weld such bars satisfactorily to the rail. In many cases on low T-rail, and in all cases where the bar was too small for the rail, the top edge of the angle bar was hidden beneath the ball of the rail. The plan of turning the angle bars bottom side up and welding them in that position was thought to be unsatisfactory, because the fit was likely to be very poor with such a great variety of rails in use. To take up the rails and cut off the worn ends would have been very expensive. Moreover, with so many different sized rails in use, satisfactory joints could not have been made after the rail ends were cut off. But by using the rail in the same length as it was originally made and bringing the joints even by the use of shims a smooth running surface was attained at moderate cost.

In order to make the joints tight in repairing these 3 miles of bad track, shims of various sizes were used on top of or underneath the angle bars, or sometimes at both the top and also the bottom. The material used varies in thickness from ⅛ to 5/16 in., and in width from 1¼ to 1½ in. The top shim was welded to the angle bar after the joints had been made up, except in cases where the shim was wide enough to reach down on the inside and be held in place by the track bolts. In that case openings were cut in the edge of the shim the same distance apart as the bolt holes, as shown in the accompanying illustration, and after the bolts were in place no movement of the shims was possible. The lower shim usually was welded either to the underside of the angle bar or to the base of the rail. Long shims used on the bottom were sometimes not welded but were cut about 4 in. longer than the angle bar and the ends bent over after the joint had been made up. In this way they were prevented from working out endways when the track bolts loosened.

At first thought it might be considered better practice to build up the head of the rail by welding rather than to use a top shim. However, it was found that the end which needed a top shim was seldom badly battered, sometimes being entirely uninjured. There was often a difference of 5/16 in. in the thickness of the balls of adjacent rails. It was therefore decided to bring the rails into line by the use of shims rather than by extensive welding. In some instances the use of a top shim was avoided by cutting down a large angle bar to exact size with a blow torch.



For the Top Shim a Wide Piece of Metal Is Used and Notches Are Cut to Accommodate the Track Bolts

On open joints the welding was usually done during the heat of the day, the angle bars being left loose until the joint closed up. A week or so later the joints were tightened again. Special attention was given to hammering the weld during the application of the metal, thus hardening it and giving a better running surface.

Where the angle bars were worn only on the top in the center, welding metal was added to correct this defect before the bar was used, so that the finished joint would have no tendency to sag.

Joints repaired by this method five years ago have remained in good condition on open track with the bolts being tightened only three times. It was expected when this work was originally undertaken that it would be at best only a makeshift job. Accordingly, only the worst battered joints were built up with the electric welder, because the company had no grinder, but as the work progressed, the results were much more satisfactory than could have been anticipated. The car wheels make but slight noise in passing over these joints, and the cars ride very smoothly. The use of this method has been extended, and the cost of fixing joints is less than it would be for labor alone to take up and re-lay the rail.

Commercial and Research Department Feature Pittsburgh Organization

A Distinct Sales Organization with Executive Powers Has Been Formed to Cover Fares, Service and Relations with the Patrons—Research Department Will Be Source of Data for All Other Departments

ON FEB. 1, 1924, the receivers of the Pittsburgh Railways were discharged, the property was returned to the Philadelphia Company and the railway reorganized along lines that would make it correspond more closely to a truly commercial organization of modern type. The two features of immediate import are the new commercial and research departments, the first to sell the goods ordered from the transportation department and the second to serve as the data reservoir of the company at large. The commercial department will be broader in scope than the pioneer American one of the Chicago Rapid Transit Company, while the research department is practically new in American electric railway organization.

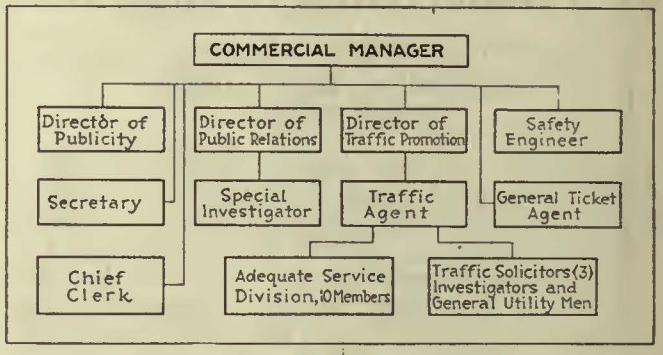
These changes are in accord with the ideas of Thomas Fitzgerald, general manager, who has long been on record as a believer in the doctrine that the words "public service" as applied to a railway mean the serving of the public to the utmost degree consistent with financial stability. This doctrine he put into specific form some four years ago (see ELECTRIC RAILWAY JOURNAL, May 15, 1920) when he suggested that the correct basis for rewarding a mass transportation concern is to pay it a profit in proportion to its popularity as a common carrier. The commercial department is the tool for making this modern conception of service effective.

W. H. Boyce Commercial Manager

No understanding of the commercial department would be complete without some sketch of the experience of the personnel. W. H. Boyce, commercial manager, is no stranger to the industry. For many years he was general manager of the Beaver Valley Traction Company, also a subsidiary of the Philadelphia Company. His work in the Beaver Valley in public relations, in safety pioneering and in fares is nationally known. Few managers have so largely enjoyed the confidence of regulatory bodies. One marvels at the celerity with which changes in rates have been granted to the Beaver Valley Traction Company, no matter how novel the kind of fare was at the time. Short-haul fares, weekly passes, emergency ticket rates, off-peak reductions on special days have been granted practically over night because of the commission's experience that the applicant had at heart both the public and the investor's interest. This background is already proving invaluable in the larger sphere of the Greater Pittsburgh district.

As detailed on the "Personal Items" page of the April 5 issue, the commercial manager is assisted by a staff of men who are already familiar in detail with the Pittsburgh system. F. R. Cogswell comes by the place of director of traffic promotion through his intimate knowledge of Pittsburgh routes and travel habits. J. B. Donley, director of public relations, knows the press and the various city departments, whose cooperation is so desirable, as only a native can. C. C. Gillette as traffic agent supplements Mr. Cogswell in this wise:

Cogswell says that there is business to be obtained at such and such a time over such and such a route provided the transportation department has the men and cars available. Whereupon it is Gillette's part to determine whether suitable facilities can be provided by the transportation department, whether sufficient



Organization Chart of the Pittsburgh Railways Commercial Department

power is available, whether freight will not interfere, etc. From this it will be seen that the commercial department acts precisely like the sales organization of a private concern, sales and manufacturing functions being entirely distinct.

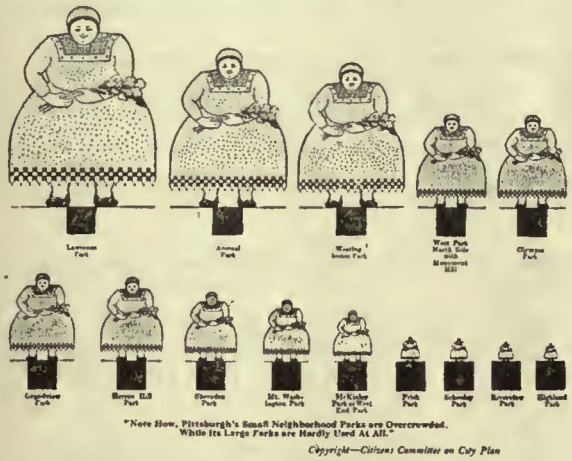
Other commercial department duties disclosed in the organization chart reproduced herewith are those relative to adequate service, traffic solicitation and investigation. J. E. Davis, as chief of complaint adjustment work with the title of special investigator, has put this work on a much higher plane than hitherto, as may be guessed from reading the details of his formal and professional education.

In addition to the general ticket agent, W. G. Stern, the commercial department will soon be expanded in certain other directions, close to public relations work, as will be revealed in due time.

Constructive Work Done from the Start

For several years preceding the reorganization, Arthur W. Thompson, president, had spoken before numberless civic bodies on the now effective traction agreement that would make the Greater Pittsburgh municipalities a real partner and co-manager in the enterprise of mass transportation. Through this work the general public attained a high degree of understanding and interest in the traction problem. It follows that when the new management took hold the

public expected to see some tangible proofs of the company's sincerity. New cars were ordered and other improvements begun as had been promised, but naturally enough there was a keen desire for immediate action in regard to fares and service conditions.



"Note How, Pittsburgh's Small Neighborhood Parks are Overcrowded. While its Large Parks are Hardly Used At All."

Copyright—Citizens Committee on City Plan

We Can't Take the Parks to the People

But We Can Take The People To the Parks

THE Chart above, from the splendid "Parks" report of the Citizens Committee on City Plan, shows how few Pittsburgh people are getting enjoyment from their largest and finest Parks.

This Committee has found that only two-fifths of the people live within a 15 minute walk to the parks.

We cannot bring the Parks to your door; but we can take You and Your Family to the gates of the Parks, if you will take advantage of the following

Lower Trial Fares

Available on Sundays

From APRIL 13th *to* JUNE 29th *Inclusive*

On Sundays only from April 13th to June 29th inclusive the limits of the present "special" transfer issued on a 10 cent cash fare will be extended to the limits of the first fare zone, so that one 10c fare will take you from any part of the first fare zone across the downtown section to any part of the first fare zone on the other side. On routes which do not reach the downtown district, suitable transfers will be issued to permit this trip.

The regular limits of this "special" transfer issued on a 10c cash day fare, considering Downtown Pittsburgh as a center, are as follows:

North Side District—East Ohio Street and Herr's Island Bridge; Lowrie and Gardner; Spring Garden Ave. and Wickline St.; Rhine and Buente St., East St. and Steps near Suffolk St., Lanark and Fineview; Perrysville and Lafayette; Irwin Avenue Loop; Brighton Road and Island Avenue; California and Sedgwick; Pennsylvania and Beaver; Columbus and Fulton.

West End District—West Carson Street and Corliss; Steuben and Wabash; Main and Wabash.

South Side & South Hills District—Grandview and Oneida; P. R. of W. and Westfield; West Liberty Ave. and Brookside Ave.; P. R. of W. and Reflectorville; Chalfont and Gearing; Beltzhoover and Charles; Warrington and Arlington; South 18th St. and Monastery; East Carson and South 25th St.

East End District—Second Ave. and Bates St., Frazier Street Loop, Forbes St. and Carnegie Library, Fifth and Bellefield Aves., Center Ave. and Bigelow Boulevard; Liberty Ave. and 38th Street, Penn Ave. and 38th Street; Butler and 38th Streets; Wylie and Erin Street.

YOU Don't Have to Walk to the Parks or Stay at Home. Ride the Trolleys to the Beautiful Open Spaces of Our Great City. These Routes Will Take You There Direct or by Transfer.

RIVERVIEW Route..... 8	GRAND VIEW Route.....48
FRICK WOODS Routes... 63, 64, 67	HIGHLAND PARK Routes 71, 73
SCHENLEY PARK Routes 63, 64, 67, 68, 71, 72, 73, 75, 76, 79, 86	NORTH SIDE PARKS Routes 2, 3, 4, 6, 7, 8, 10, 13, 14, 15 18, 19

Your Patronage Will Help to Make These Trial Fares Permanent

PITTSBURGH RAILWAYS COMPANY

Commercial Department

"Live In and Expand Your Business in Greater Pittsburgh"

Announcement of Special Sunday Fares to Take People to the Parks

In appreciation of this feeling, the commercial department has been inaugurating various forms of relief as rapidly as the condition in each case can be analyzed and the necessary material aids (such as the printing of new transfers) arranged. The transfer situation has been especially complicated because of the topography of Greater Pittsburgh, intercompany relations and the necessity of dealing with a very large number of political units ranging from Pittsburgh City, with more than 600,000, to boroughs with only a few hundred inhabitants.

One of the first jobs, therefore, has been to liberalize the transfer situation so that there would be more consistency in the privileges granted both ways and to remove various inequalities that gave residents of one area much less freedom than their neighbors. As it would be a futile task to describe these transfer reliefs in detail, it will suffice to say that several score have already been granted. Each additional privilege has brought many hundreds of persons into a friendlier state of mind toward the company and produced a willingness to be forbearing as regards other changes that will require more time and involve greater revenue.

It may be remarked in passing that some of the transfer reliefs are of the sort on which it is possible to double back. This does not cause the commercial department any deep concern, as both the traffic records and common sense indicate that the preponderant majority of the riders have no interest whatever in doubling back. In other words, the management does not wish to disoblige 100 legitimate users of a transfer because of five illegitimate users; neither does it believe that it pays to set two transfer checking watchmen for every transfer misuser.

At any rate, the revenue returns so far do not show that the finances of the company have been impaired by restoring privileges of pre-war days. Few passengers were paying an extra fare, since most persons had adjusted themselves more or less willingly to the more stressful conditions.

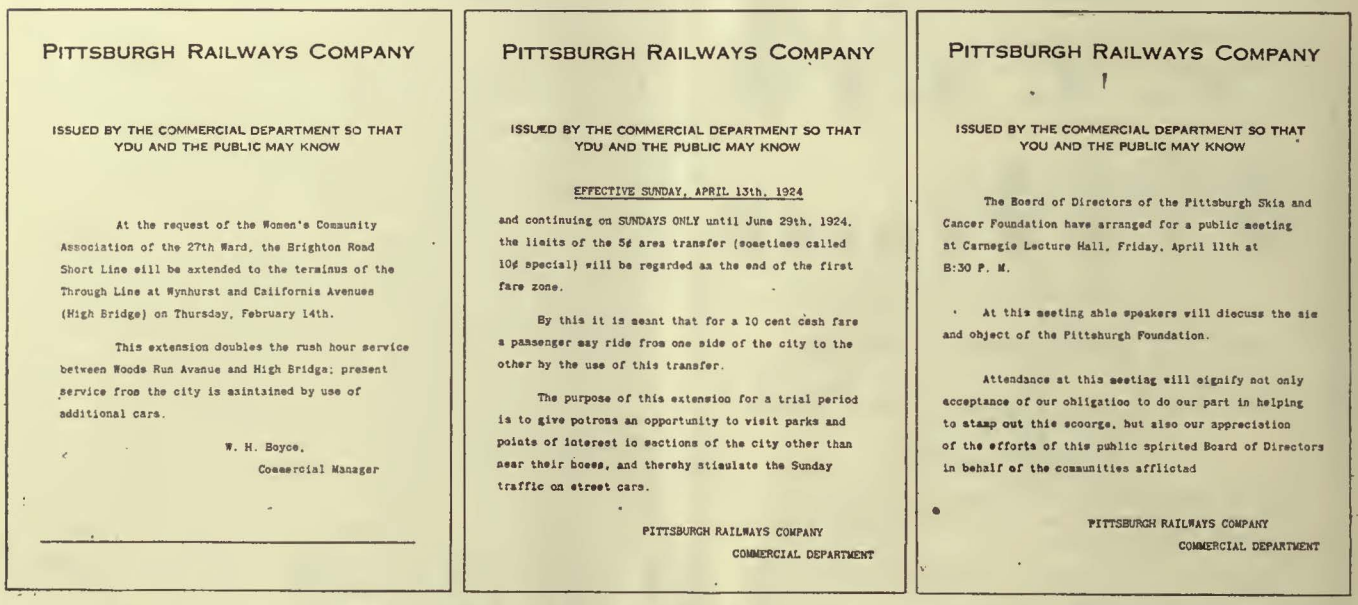
Another step that has been accepted as evidence of good will is the readjustment of certain zone limits. In the case of a Carnegie line, a new transfer privilege has cut down the charge to Pittsburgh by a full one-zone fare. At McKeesport, a zone limit was extended to bring riders directly into the heart of the business and amusement center. The old limit did not force an extra fare from the riders, but did cause them considerable annoyance in bad weather or when laden with shopping bundles. Likewise, other zone boundaries have been shifted so that the limits would come at natural traffic points. In these and other fare studies the department has been aided by Walter Jackson as consultant.

A scanning of the passenger regulations showed some that could be placed on a "dealer and customer" rather than a monopoly footing. The basic token fare of 8⅓ cents is sold three for 25 cents. It may happen, sometimes, that a patron brings two others along and wishes to pay for all three without the extra motions of handing a quarter to the conductor, getting three tokens back and then dropping them into the box with due ceremony. The direct action of dropping the quarter into the box is now permissible, the customer's convenience being held superior to a microscopic accounting error in the relative number of 10-cent cash and 8⅓-cent token riders.

A more common occurrence is the absent-minded passenger who drops too much money in the box. In this instance the management feels that its conductors certainly can be trusted a half dollar's worth anyway; hence the new regulation that conductors may refund at once any excess up to and including 50 cents. The only stipulation is that they turn in the forgetful customer's name and address.

Mr. Boyce had gratifying success with this plan on the Beaver Valley. The daily Pittsburgh records show

As for the probable popularity of the Sunday reduction, one instance is of interest. A woman called up the commercial department to make sure that the 10-cent special really would enable her to reach a favorite church on the other side of town. She was delighted to learn that the 10-cent fare would cover the trip and added that this meant three companions as well. The oddest part of the story is that the limits of the week-day 10-cent special actually were liberal enough to make the same trip any day, but owing to



PITTSBURGH RAILWAYS COMPANY

ISSUED BY THE COMMERCIAL DEPARTMENT SO THAT YOU AND THE PUBLIC MAY KNOW

At the request of the Women's Community Association of the 27th Ward, the Brighton Road Short Line will be extended to the terminus of the Through Line at Wynhurst and California Avenues (High Bridge) on Thursday, February 14th.

This extension doubles the rush hour service between Woods Run Avenue and High Bridge; present service from the city is maintained by use of additional cars.

W. H. Boyce,
Commercial Manager

PITTSBURGH RAILWAYS COMPANY

ISSUED BY THE COMMERCIAL DEPARTMENT SO THAT YOU AND THE PUBLIC MAY KNOW

EFFECTIVE SUNDAY, APRIL 13th, 1924

and continuing on SUNDAYS ONLY until June 29th, 1924, the limits of the 5¢ area transfer (sometimes called 10¢ special) will be regarded as the end of the first fare zone.

By this it is meant that for a 10 cent cash fare a passenger may ride from one side of the city to the other by the use of this transfer.

The purpose of this extension for a trial period is to give patrons an opportunity to visit parks and points of interest in sections of the city other than near their homes, and thereby stimulate the Sunday traffic on street cars.

PITTSBURGH RAILWAYS COMPANY
COMMERCIAL DEPARTMENT

PITTSBURGH RAILWAYS COMPANY

ISSUED BY THE COMMERCIAL DEPARTMENT SO THAT YOU AND THE PUBLIC MAY KNOW

The Board of Directors of the Pittsburgh Skin and Cancer Foundation have arranged for a public meeting at Carnegie Lecture Hall, Friday, April 11th at 8:30 P. M.

At this meeting able speakers will discuss the aim and object of the Pittsburgh Foundation.

Attendance at this meeting will signify not only acceptance of our obligation to do our part in helping to stamp out this scourge, but also our appreciation of the efforts of this public spirited Board of Directors in behalf of the communities afflicted

PITTSBURGH RAILWAYS COMPANY
COMMERCIAL DEPARTMENT

Three Samples of the "Blue Letters" Issued to Employees of the Various Pittsburgh Subsidiaries of the Philadelphia Company

that the new rule is much appreciated by conductors as well as riders. It goes without saying, also, that the passenger is glad to get his money at once without being expected to visit the railway office.

Special Interurban Theater and Pittsburgh Sunday Fares

Two other instances of early constructive work on the part of the commercial department are the reduced fares put on for interurban and city riders during slack periods.

On the two interurban lines round-trip theater-time tickets are being sold at one and one-third times the one-way rate, provided the inbound trip is started at approximately 6:30 p.m. from the farther stations and return is made the same night. So far the desired publicity and personal co-operation with Pittsburgh theater interests has not been worked out to obtain full benefits from these tickets, but in the meantime the patrons of these lines have something pleasant to say about the "commercial department," whose title appears on all announcements of the character described.

Beginning April 13 the company is trying a "Sunday only" liberalization of the 10-cent crosstown fare. Ordinarily, this special transfer is good within a rather restricted distance on each side of Pittsburgh center. The Sunday rate carries the user all the way up to the limit of the one-fare zone if so desired. This rate will be in effect on all Sundays to June 29, inclusive. It is hoped that riding to the parks, to the churches and to family reunions will be especially stimulated. Sunday traffic in Pittsburgh is so far below everyday riding that a trial of this kind is quite logical.

absence of publicity she did not know this to be the case. As regards the Sunday innovation, the people of Pittsburgh have not been left in doubt, for the company ran half pages in the dailies for three days before the new privilege became effective. This particular advertisement stressed Sunday travel to the parks, but in other seasons the emphasis will be on travel to indoor entertainments or other edification.

"So that You and the Public May Know"

Not the least interesting example of the commercial department spirit is the style in which the different regulations are placarded and otherwise made known. Every effort is made to get away from the unconsciously arbitrary wording of so many railway announcements. A feature in harmony with President Thompson's policy on the other subsidiaries of the Philadelphia Company in Pittsburgh is the broadcasting of a "blue letter" from the commercial department to the officers and petty officers of the affiliated companies, aside from the railway circulation of the same letter. The purpose of this outside circulation is to help these hundreds of men to give a satisfying answer to the inquiry of friend, neighbor or stranger on these changes.

An important point about the "blue letters" is that credit is given to the customers for changes in regulations. Some of these blue letters are reproduced herewith, omitting a small picture of a street car which is printed on the blue letter just under the company name. In this simple way it is brought home to the man who reads the letter, whether at home or on the carhouse bulletin board, that the management is not above ac-

cepting suggestions from its customers and its employees and that when such suggestions are found acceptable due acknowledgment will be made.

How Press and Public Show Approval

Up to the present the transfer reliefs seem to have made the strongest impression on the public at large. An editorial approval was one of the first signs, and this has been reinforced by many letters, telephone calls and personal visits from individuals. It is remarkable, also, how large a proportion of the comments that reach the department in these several ways is of a constructive nature. Very few demand an immediate return to a 5-cent fare and the additional ideal of a seat for every passenger every time. The average person is shown to have a pretty clear grasp of the company's financial problems as a whole. If he suggests a transfer here or a lower fare there it is generally with an argument that his personal observation indicates that the company would make more money thereby. He has got over the idea that more money isn't a necessity.

Many of these suggestions are being considered carefully, for it is realized that the person who travels a given territory day after day has a viewpoint that may escape the professional operator. In any event, the collective wisdom of the riders and of the platform men is worth seeking and trying.

It is true that none of the innovations hitherto made affects the majority of the riders. They are but the forerunners of bigger and better events. For such greater changes it is necessary to build up a foundation of public confidence. This is just what is being achieved. Each change or experiment is along the line of the public's desires. The change may not be important enough in itself to show a tangible financial result up or down, but it makes a new group of friends in a new part of the territory.

Nor are these friends being made only through the changes described. The handling of complaints by personal calls from men of culture and refined address and the department's courteous request that telephone complainants give their name and address to permit the immediate mailing of refund tokens are policies bound to have a happy cumulative effect. Many persons are satisfied to turn in a complaint and let it go at that. Laborers and other patrons of limited means are exceptionally pleased when they find an investigator calling in person because adjustment by telephone or letter was not practicable.

Research Department to Be General Data Source

The research department, now being organized, with A. C. Spurr as research manager and A. H. Leschke as research engineer, as yet is not quite so advanced in staff and scope as the commercial department. Hence, a full description of its work is impossible. The general plan is that this department shall serve as a study and statistical organization for the other departments of the company. For example, as motor-bus operation is a live topic, this department is gathering all pertinent data for submission to the motor-bus committee so that the latter can get at the subject without using time in digging for details. Such information is gathered partly from the printed page, partly by correspondence and partly by direct visits. A feature emphasized by Mr. Fitzgerald is that this department will have many opportunities to relieve the different departments of the disturbance of routine that arises when some particular report must be prepared in a hurry. Instead of pulling men away from their daily jobs, the required material can be requested from the specialists who know just where to look for the facts—whether outside or inside the company—and how to put them together to greatest advantage. Such a central bureau in the course of the year will save a great deal of repetition of labor.

The relationship of the research to, say, the commercial department can be illustrated by just one item. The research department and not a clipping bureau reads the local newspapers that come to the office. Therefore, they are read with intelligence and between the lines. In this way the commercial department will be kept apprised of developments in building, in future exhibits, conventions, etc., and all other items that will assist the creation and increase of riding travel at a profit to company and community alike.

Benefits of the Hospital Association Are Extended

PLANS extending the benefits and activities of the Illinois Traction System Hospital Association to all the properties of the Illinois Power & Light Corporation have been completed by trustees of the organization. The name of the Illinois Traction System Hospital Association has been changed to Illinois Power & Light Hospital Association.

The Illinois Traction System Hospital Association was organized in July, 1907, by employees of the Illinois Traction System, now one of the properties of the Illinois Power & Light Corporation. It was formed for the hospital care and treatment of employees of the big interurban system, the workers paying each month a small assessment for dues. Deficits were made up by the company.

In July, 1910, it was decided to extend the scope of the hospital association's activities by adding death benefit and total disability features.

The employees who were members of the hospital association were eligible to join the fund providing they passed the required examination.

The first assessment or dues for employee members amounted to $536, but the Illinois Traction and its subsidiaries added to the fund and made it possible to pay $800 for the first death in July, 1910.

The management then announced that as soon as the dues or assessments amounted to $800 it would make up the difference and make it possible to pay $1,000. The first $1,000 was paid in June, 1913. The death benefit and total disability fund has been paying $1,000 for death or total disability from that time to date as the assessments or dues amount to more than $800 each month.

The assessments and dues for the hospital association as well as the death benefit and total disability fund are based on the monthly wages of each employee. Therefore, each contributes to this fund according to the amount of wages he receives, the higher salaried man, of course, paying the larger amount, but all receiving equal benefits.

To make all of this possible the Illinois Traction and its subsidiaries, since the beginning of the association, have contributed more than $80,000.

Equipment Maintenance Notes

Saving Expense of Night Storekeeper

IN THE shops of the carhouses of the Los Angeles Railway a system is in use which makes it unnecessary for each night mechanic to draw his necessary supplies from the storeroom. This saves the expense of a night storekeeper's salary. Each night mechanic has a separate locker and is assigned to definite work. For example, one man may have charge of a certain amount of brake repair. His locker is then kept supplied with material necessary in his work. A card form is kept in a holder inside the locker door and the mechanic notes on this card the materials he uses. Next morning the day storekeeper makes the rounds of the lockers and replaces the articles which the card shows were used on the previous night. The storekeeper removes the card for his records and places a new blank in the holder.

Lockers Where Night Mechanics Keep Materials for Their Work

Form 606-F

MATERIAL USED AT DIV. NO 4

LOCKER NO. 7 DATE Feb 25/24

ARTICLES	CAR NUMBERS USED ON									NUMBER USED	CHARGE TO ACCT
4 8M BOLTS	481	B	462	B	474	B	819	U			
4 61B BRAKE SPRINGS	651	C	649	C	728	P	716	P			

ABOVE MATERIAL USED BY J. R. Smith

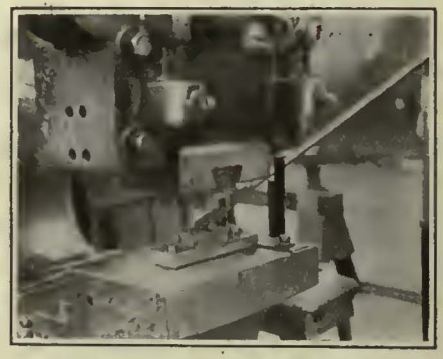
Card Used to Inform Day Storekeeper What Supplies Were Used the Previous Night

Forming Controller Tips on Power Punch

AT THE Harvard shops of the Cleveland Railway use is made of a 200,000-lb. power punch to cut and form the burning tips used on controllers. The dies and fixtures are so arranged that it is possible to cut the tips with the proper bevel at the ends. After a sufficient number are cut, a curved piece is inserted in the die, which forms the individual piece to the proper curvature and at the same time offsets the end which fits under the controller segment.

On the base of the punch is mounted a grooved die into which the cutting and forming die fits. The rear portions of these dies are used for the "cutting off" operation, the copper bar being held in the proper position by two guides mounted on the base of the punch and by an elongated floor rest at some distance from the machine. In this operation it is necessary to turn the material over after each cut in order to give the proper bevel to each end of the tip.

For the curving and offsetting operation a concave die with a shoulder is fitted in the slot in the die holder attached to the base of the punch, while a convex die is fastened to the punch head. The tips are placed on the concave die and are formed and offset by the pressure applied by the punch.

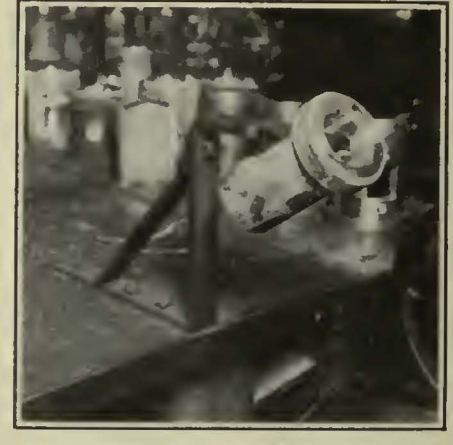


Cutting Controller Burning Tips on 50-Ton Mechanical Punch; 3,000 Are Cut and Formed in 12 Hours

With this adaptation it is possible for one man to finish 3,000 controller tips in 12 hours. Formerly the offsetting operation was accomplished on a milling machine, on which only 75 of the tips were finished in the same time.

Testing Bearings for Loose Babbitt

A COMMON method of determining whether the babbitt lining of bearing shells is adhering properly is to suspend the shell and strike it a sharp blow. When bearings are well babbitted a clear metallic tone will result. The quality and clearness of the tone depend to a considerable extent on the method of suspending the bearing.



Armature Bearing in Position for Testing for Loose Babbitt on Brooklyn-Manhattan Transit System

In order that uniform results may be secured when testing

Dick Prescott Hears Half a Conversation

And a Visitor "Listens In"

"MR. MULLANEY, we're not going to be able to get that car ready for the transportation department today," said Steve White over the telephone in answer to the gruff inquiry from Thomas Mullaney, the general foreman of the Consolidated's shop.

The carpenter foreman's tone was not apologetic. In fact, it was just a little belligerent, and there was evidence of exasperation in the expression on his face. Steve's tone and expression made Dick Prescott feel uncomfortable, but they had been talking when the telephone bell rang and Dick therefore remained standing in the carpenter shop office.

So tense was the situation that neither he nor Steve was aware of the presence of the rather reserved looking gentleman who stopped in the doorway as though to ask a question, and remained waiting for Steve to finish talking. Neither Dick nor the second listener could hear the other end of the conversation, but that emanating from the little office was extremely significant.

"Yes, Mr. Mullaney, I know you said you wanted that car out today, and we did all we could to get it out, but one of the boys made a mistake in getting a piece of work done in the mill." . . .

"That's true, there's been a lot of mistakes made, but part of them have been due to the hit-and-miss way we're trying to do our work." . . .

"You bet I do, Mr. Mullaney, and I'm not the fellow that's trying to pass the buck. I know I'm responsible for what goes on over here, but I've got to have some help in the office or I can't do a bit better than I've done. I'm getting to the place where I'm ready to throw up my hands." . . .

"No, I don't want to do that, Mr. Mullaney, but I can't stay here much longer and keep on taking the responsibility for slips when I know the trouble is not with me." . . .

"I think I do watch things as closely as I possibly can under these conditions, but one man can follow only so much, and some of these things are bound to go wrong unless we get a little more system for handling our work." . . .

"Not at all! I don't want to load the shop up with any more red tape than necessary, but we'd save a lot of worry and mistakes if we planned our work a little ahead." . . .

"That's all true, Mr. Mullaney, but conditions are a lot different than they were 30 years ago, and unless we make some improvements we're going to keep on having trouble. If you'll notice, the transportation department isn't doing things like it did 30 years ago. All this talk about selling transportation, and these new ads they're running in the papers about giving service and calling the car riders customers and all that stuff, are a lot different than 30 years ago. That's one of the things that's giving us trouble. The transportation department is trying to keep all the cars it can in service and we don't have as many in the shop as we used to. That's why we've got to change our methods to keep up with the new conditions, or we're going to keep on having the same troubles we've been having right along." . . .

"Sure I will. I'm glad to hep to it and do all I can. In the meantime, I'll kind of lay out what I think we ought to do in the carpenter shop and mill. I've been thinking a lot about these old machines ever here ever since we got up that depe for the ELECTRIC RAILWAY JOURNAL the other day, and I think we could speed up a lot and save our costs by putting in a few new machines and replacing some of these old types. I'll get my figures together and be ready whenever you want to call a meeting."

Steve White hung up the receiver, heaved a sigh of relief, and then on swinging around in his chair, noticed for the first time the gentleman who stood in the doorway, showing no outward evidence of the effect of the statements he had just heard.

bearings in this manner a special bracket has been arranged on a bench in the babbitting department of the East New York repair shops of the Brooklyn-Manhattan Transit System, on which the bearings are placed. The accompanying illustration shows an armature bearing in position for testing. The end of the bracket is rounded and is covered with several layers of canvas. With this method of suspending the bearing uniform results are obtained.

Vise Handy on Drill Table

MANY small parts are drilled in an electric railway shop, and if each one has to be clamped in position for drilling considerable time is taken. As a result it is quite common practice for the operator to hold the piece on a block with his hand while drilling. This, however, sometimes leads to accidents and is tiring to the operator where a considerable amount of drilling is done.

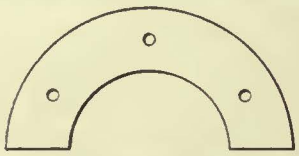
Vise Mounted on Table of Drill Press in Shops of the Philadelphia & West Chester Company

A vise mounted on the table of the drill press is found to be a great time saver in the shops of the Philadelphia & West Chester Traction Company, Upper Darby, Pa. The vise is bolted to the center of the table so that it can be rotated independently and also can be moved as the table is swung about. This enables it to be placed in any position convenient for

drilling and small parts can be clamped in the vise and held firmly in an instant. More accurate drilling also results.

Cast-Iron Axle Collars Replace Fiber

THE Worcester Consolidated Street Railway, Worcester, Mass., has tried the experiment of substituting a cast-iron piece ⅝ in. thick, shaped as shown in the accompanying sketch, as a substitute for the fiber piece of the same shape attached to the axle bearing collar on Standard 050 trucks. This piece is riveted to the axle bearing collar with ⅝-in. rivets. Steel was tried at first, but cast iron was found to give equal service and is cheaper. The increased life of this cast-iron wearing plate as compared with the fiber previously used has resulted in a material saving.



Form of Cast-Iron Axle Collar

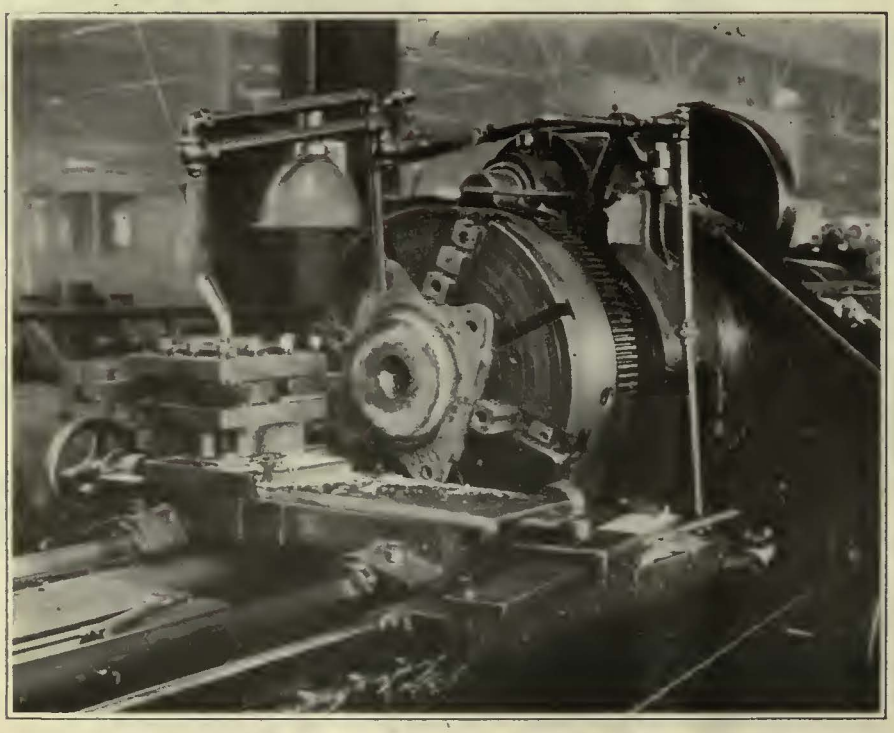
Multiple Tool Post Expedites Turning

A SWIVEL tool post capable of holding four cutting tools is used by the Pittsburgh Railways on a 16-in. lathe when facing center bearings.

In finishing such a casting it is necessary to use more than one cutting tool because of the curvature of the bearing. Rather than change tools in the ordinary tool post, the proper tools are mounted on a swivel post.

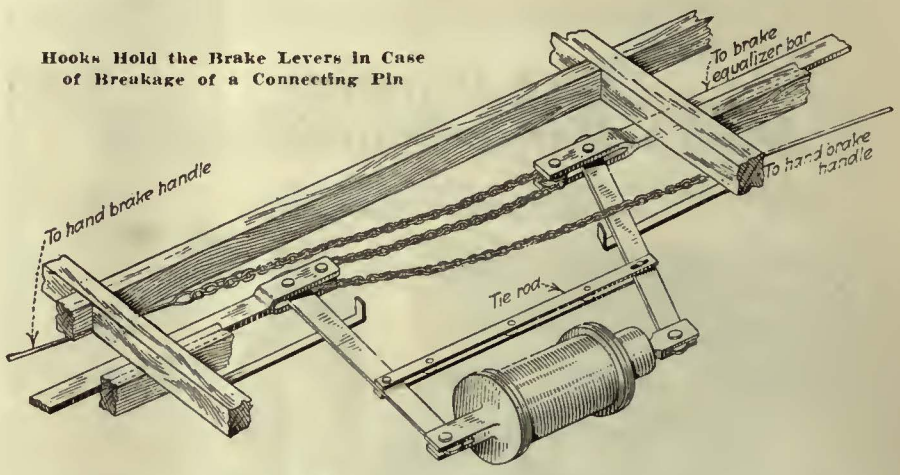
The swivel post is about 6 in. square with a tool groove around the sides. Set screws projecting through the upper edge into the groove hold the ⅝-in. tool steel at each corner. The post is mounted on a swivel which takes the place of the compound. It is locked in place at any desired position.

This device is also used in turning operations as it reduces to a minimum delays caused by necessity to replace dull cutting points. In this use the tool post is simply turned around to the next position and the machining continued with another tool already in place.



Multiple Tool Post on Engine Lathe Used in Facing Center Bearings

Hooks Hold the Brake Levers in Case of Breakage of a Connecting Pin



Safety Hooks on Brake Rigging

TWO metal hooks attached to the underframes on double-truck cars are used by the Union Street Railway, New Bedford, Mass., as a safety precaution in case of the failure of some part of the brake rigging. This device, shown in an accompanying illustration, is somewhat similar to that used by the Holyoke Street Railway, which was described on page 111, ELECTRIC RAILWAY JOURNAL, Jan. 19, 1924. A point of difference is that hooks made of steel strips are used instead of chains. A hook of this kind will hold the brake lever in case of breakage of a connecting pin or rod at one end of the car and prevent the brake rigging at the other end being rendered useless. Another point of difference between the practice at New Bedford and that at Holyoke is that only a single tie rod is used between the brake levers.

Novel Line Truck for Small Road

A LIGHT line truck particularly well adapted to the needs of a small company has recently been built according to plans which were prepared by the Nashua Street Railway, Nashua, N. H. A 1-ton Ford truck was purchased, and the body was built by the railway. As shown in the illustration, the sides have been equipped with hooks to carry extension ladders, poles and long-handled tools on the outside. On the inside of the truck are carried short-handled tools, tackle, etc. The method of operation when making repairs to the overhead lines is to remove the ladder from its supporting hooks, place it against the side of the truck, fasten it firmly into position and

When Making Repairs to the Overhead Lines the Ladder Is Taken Off the Hooks of the Nashua Line Truck and Fastened in a Vertical Position

then extend it upward to a position where the workman can readily reach the overhead line. A convenient feature of this truck is that the sides can be removed altogether and the body used for the transportation of flat material.

Wearing Plate for Motor Suspension

THE accompanying illustration shows a wearing plate welded in position to the face of the casting used on the truck to support the nose of the motor. This method is used in the shops of the Philadelphia &

Wearing Plate Welded to the Truck Motor Suspension Casting

Western Railway. The wearing plate is ⅝ in. x 2 in. x 6 in. and is scarfed all around the edges to provide space for the welding metal. This provides a satisfactory means of bringing the nose suspension to its original height, and by welding the plate in position there is no danger of its working loose.

Oilers Increase Life of Bearings

THE installation of vacuum oilers on motors used by the Worcester Consolidated Street Railway and the Springfield Street Railway was begun in 1921 and has been extended continuously since that time. At Worcester 568 have already been installed and 732 more have been ordered from the Railway Improvement Company. At Springfield 560 have been installed and 476 more have been ordered. The chief advantage of these oilers has been their ability to lubricate the older types of motors which previously had an unsatisfactory oiling system.

At the present time the railway is oiling cars equipped with Ransom oilers on a 3,000-mile basis, whereas formerly it was necessary to lubricate them on a 1,000-mile basis and at times even on a 500-mile basis. Aside from the efficiency of the oiler for lubricating, this apparatus has also the advantage of keeping dirt and grit out of the bearings. Both of the foregoing tend to increase the life of the bearing, although no data are available to show just how much this increase amounts to.

New Equipment Available

Babbitt Pots with Automatic Temperature Control

AN ELECTRIC melting pot for melting and maintaining at working temperature soft metals and alloys such as solder, babbitt, lead and zinc is one of the recent developments of the Westinghouse Electric & Manufacturing Company. This melting pot, which is made in two sizes, of 150-lb. and 750-lb. capacity, has thermostatic control that is claimed automatically to keep the temperature of the molten metal at any desired point between 450 deg. and 950 deg. Fahrenheit. A small electric motor controlled by a thermostat throws the snap switch on or off as the temperature of the metal reaches the high or low limit set by the operator, and an even working temperature is assured without further attention.

The heating element and all its conections are mounted on the melting crucible, which can be easily lifted out of its outside casing to make the element accessible. The outside casing surrounding the crucible is lined with an adequate layer of heat insulating material to reduce radiation losses and insure cool shop conditions. The control panel, which may be mounted in any convenient position, consists of magnetic contactors and suitable relays for opening and closing the line circuit. An instrument panel, which is set up adjacent to the pot, contains the thermostat with temperature regulating pointer, the push button switch for turning the current on or off, and a red signal lamp which serves as a warning in case the heat is left on accidentally.

One of the advantages of the electric melting pot is in connection with

New Automatically Controlled Electric Melting Pot

the use of lead base babbitt. This metal is greatly affected by either overheating or pouring too cold and therefore can only be used where it can be poured at a constant, accurate temperature. With the temperature control possible through the use of electricity for heating, the pouring temperature can be so closely regulated that the use of lead base babbitt is made possible.

Portable Machine Cuts, Threads and Reams Pipe

A NEW portable pipe threading, cutting-off and reaming machine has been brought out by the Williams Tool Corporation, Erie, Pa. It has a handy self-contained grinder and is arranged for either motor, belt or hand drive. The motor-driven machine has a standard 1-hp. motor mounted on a hinged table in

Portable Pipe and Bolt Threader

the base, the power being transmitted by belt to the driving pulley of the machine. A distinctive feature is the method of raising the motor to release the belt and stop the machine by use of a demountable hand crank. Automatic belt adjustment is provided. The machine can be converted to belt drive by removing the motor belt and driving directly from either a line or a countershaft.

The capacity of the machine is such that it will cut either right or left-hand threads on pipe ¼ in. to 2 in., and on bolts from ⅜ in. to 1½ in. inclusive. The machine will ream the inside and chamfer the outside of pipe from ¼ in. to 2 in. The longest thread that can be run at one chucking is 10½ in.

The spindle has two speeds. These are obtained by means of a set of sliding gears. A neutral position is provided so that the spindle may be started and stopped without shutting off the current. All gears are made of steel, machine cut, heat treated and run in oil. The shafts are equipped with long babbitted bearings provided with a self-oiling system.

The front gripping or driving chuck is of the three-jaw, universal, self-centering type. The carriage ways are of extra heavy seamless steel tubing, ground to size and polished. The way nearest to the operator has gear teeth milled on its surface, which engage a pinion shaft for operating the carriage. The die head and carriage are cast in one piece, which prevents the head getting out of alignment. The carriage has six babbitt-lined bearings on the ways.

The cut-off attachment is mounted on the rear of the die head and is operated by a screw and hand wheel. A V-block equipped with hardened tool-steel facings steadies the pipe when it is being cut off. On the cut-off attachment is pivoted the reamer holder, which is operated by a lever. The tool bit used for reaming and chamfering is ⅛ in. square.

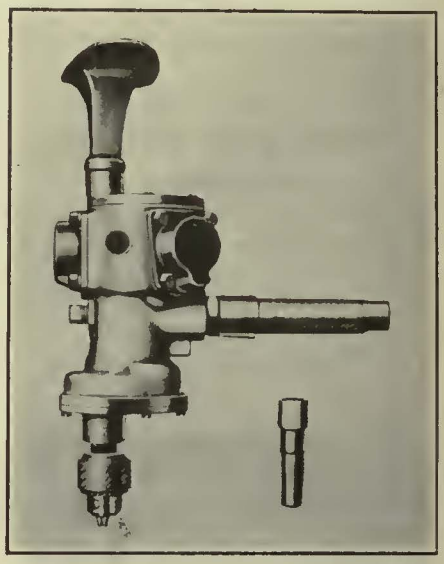
A geared rotary oil pump, located on the rear side of the machine, is driven from the intermediate shaft. The oil is pumped from a reservoir in the base of the machine through a strainer to the pump, being forced from there through a flexible hose to the die head where a three-way valve enables the operator to regulate the flow of oil. After flushing the dies and cut-off tool the oil drains back into the oil or chip pan under the die head, where it is strained before it flows back into the reservoir for reuse.

A feature of this portable machine is a high-speed emery wheel running at about 1,100 r.p.m., mounted on the pulley shaft at the rear of the machine. The wheel, which is 6 in. diameter with ¾ in. face, is driven direct from the motor. The design is such that when the operator uses the emery wheel no other part of the machine is running, giving full power to the motor for grinding.

The weight of the machine complete with motor and all standard parts is 520 lb. A special die cabinet cast in the top of the pedestal provides a safe and convenient place for storing dies and for holding any other small tools which are used on the machine.

Pneumatic Drill Has Renewable Cylinders

A NEW size, light-weight non-reversible pneumatic drill has recently been placed on the market by the Ingersoll-Rand Company of New York. It is known as size D and is suitable for drilling holes up to ⅜-in. diameter and reaming up to ⅝-in. diameter. The drill may be fitted with either breast plate, feed screw or grip handle, making it adaptable for a wide variety of work. The salient features of this device are the light-weight aluminum case with steel bushings cast in all the bearing holes and in the throttle hole, cast iron cylinders which are renewable and interchangeable, and a special three-cylinder motor. The renewable cylinders are a valuable feature, as any cylinder can be re-



A New Light-Weight Pneumatic Drill Made by the Ingersoll-Rand Company

placed easily and the motor made as good as new at slight cost.

The total weight of the new device, including breast plate and chuck, is 14 lb. Its over-all length is 15 in. At 90 lb. air pressure it operates at 700 r.p.m. The three-cylinder motor has the rotating parts all accurately balanced, reducing vibration and wear and tear on the machine. The drill is said to be very economical in regard to the air consumption and cost of maintenance.

The construction of this machine is very similar to that of the No. 6 and No. 600 drills which the same company brought out some years ago and which were suitable for drilling up to ⅜-in. diameter. Every part is readily accessible for inspection and their success led to the new size with larger bore and stroke.

Association News & Discussions

Accidents Analyzed and Elimination Discussed

Mr .Storrs and Commissioner Higgins Contribute Papers at Conference on Motor Vehicle Traffic at New Haven—Analysis of Connecticut Company Automobile Accidents Throws Light on Relation of Traffic to Accidents

AT A Conference on Motor Vehicle Traffic, called by Yale University and held at the Sheffield Scientific School, New Haven, Conn., on April 9, 10 and 11, two papers were read that dealt particularly with problems of transportation by public service vehicles on streets and highways.

In the first, L. S. Storrs, president of the Connecticut Company, discussed the effect of congestion in downtown districts, due to automobiles, on the movement of passengers by street cars, and gave an analysis of accident statistics involving a car and an automobile. In the second paper Chairman R. T. Higgins of the Public Utilities Commission of Connecticut spoke on automotive public service vehicles, with reference to state regulation.

Mr. Storrs pointed out that automobiles owned in Massachusetts, Rhode Island and Connecticut equal one-third of the total number registered in the world, outside of the United States. Increasing congestion works a hardship on operatives by limiting the range of their movement between home and shop; it limits the supply of labor to industry, and it discourages shopping in the business centers of our cities.

Street cars are now carrying more people than at any time in the past, and there is a demand for constantly increasing facilities. The substitution of cars of larger capacity is only a palliative. The real need is for more cars, but their addition, with the increasing number of automobiles, will make the congestion on our streets still more acute.

In New Haven, 86 per cent of the passengers entering and leaving the central area are carried on street cars comprising 27 per cent of the total vehicles. The other 14 per cent use private automobiles, comprising 73 per cent of the vehicles. The accident hazard due to this congestion has received close study. While the monetary loss is of small importance as compared with loss of life or personal injury, it means an average expense to the electric railways of the United States of 4.6 per cent of the passenger revenue, or $44,000,000 a year. In Connecticut it is below the average, being but 3 per cent, or $400,000 annually.

The total number of accidents on about one-third the mileage of the country decreased from 1920 to 1922, while those involving automobiles and street cars increased 13 per cent. In Connecticut those not involving automobiles decreased from 4,889 in 1918 to 4,279 in 1923; the automobile cases increased from 3,505 to 5,258 for the same years.

Analysis of Accidents

Efforts to reduce accidents have taken the form of education of employees and, with the co-operation of the authorities, of school children, track relocation, cutting banks and brush at obscure road crossings, and introducing light-weight cars capable of stopping in a short distance.

By requiring reports on all cases, even the most trivial, the company has records of eight times as many accidents involving cars and automobiles as were listed by the Motor Vehicle Department, to which only those involving personal injury or material damage must be reported.

The following is an analysis of the 5,258 reported in 1923:

Accident	Number	Per Cent of Total
Automobile turning out from curb, hit by trolley	693	13.3
Automobile coming out of intersecting street at motorman's right	281	5.5
Automobile coming out of intersecting street at motorman's left	298	5.5
Automobile hit in rear, trying to pass moving car, same direction	522	10.0
Automobile colliding head-on with car	340	6.5
Automobile hitting standing car, excluding head-on	698	13.2
Automobile sidewiping car, same direction	624	11.8
Automobile sidewiping car, opposite direction	506	9.7
Automobile struck backing out of driveways or buildings	92	1.7
Automobile struck in rear by trolley, due to sudden stopping	375	7.1
Automobile ran into moving trolley car, same direction	224	4.2
Automobile parked, hit by car	588	11.2
Automobile hit at grade crossings	17	0.3
Total	5,258	100.0

The preponderance of accidents due to carelessness on the part of the automobilist is noteworthy. The largest number are those occurring when automobiles were pulling out from the curb, probably due to the frequent neglect to give a signal. On wide streets this type of accident practically vanishes.

Vehicular congestion in the central portion of our cities leads to numerous minor accidents, mostly to pedestrians; it affects all residents who have occasion to visit the business districts, and warrants most careful consideration by expert examiners.

A survey in St. Louis showed 9,842 vehicles entering the business district daily, while parking area is available for only 2,500. In Chicago 51.3 per cent of vehicles entering the Loop district are autos carrying 18.9 per cent of the passengers. Two per cent are street cars carrying 74 per cent of the passengers. Figures for New Haven have been given, from which it appears that 86 per cent of passengers are being inconvenienced for the other 14 per cent who average not over 1.75 per automobile.

Commissioner Advocates Bus and Truck Regulation as Means of Reducing Accidents

Mr. Higgins pointed out that the automobile has established its permanency in the transportation field, in recognition whereof the Connecticut Legislature in 1921 declared motor vehicles operated in such manner as to afford transportation similar to that afforded by street railways to be common carriers and subject to public regulation.

Under this act bus routes have been established totaling 672 miles, mostly in suburban and interurban territory. Operation has been authorized of 239 cars, touring and bus types, in addition to 53 buses operated by street railway companies.

It would be unwise seriously to impair the usefulness of railroads and railways, which have demonstrated their necessity in the activities of our country, by allowing destructive competition. But the public service motor vehicle will become a still more important agency in intrastate, and somewhat in interstate, transportation of freight and passengers, because of improvement in mechanism and flexibility of service.

They should then be under public regulation and control. At present only the jitney is under such control, while the numerous freight trucks are without any public regulation.

Under its broad jurisdictional powers the commission has prescribed rules, the violation of which may be followed by revocation of certificate. This circumstance has been a strong incentive to careful operation. Since the law went into effect, July, 1921, there has been but one fatal accident, and that one not due to the jitney operator.

Motor vehicle transportation should come under state control, and even where interstate traffic is involved the control should be by co-operation of the regulatory bodies of the two or more states interested.

American Association News

Introducing Traction Tom

By LABERT ST. CLAIR
Director of Advertising, Committee of One Hundred, A.E.R.A.

TRACTION TOM, a new figure in the electric railway field, is being introduced to the industry by the advertising section of the American Electric Railway Association.

Tom has been given a permanent assignment as the representative of all the electric railway employees in the United States to tell the public something about the traction business in the language of the worker behind the guns. He is to appear on posters, in newspaper ads and other channels.

Samples of posters and newspaper cuts already have been sent to all electric railway companies in the country and manufacturer members of the association. They are ready for distribution. A series of newspaper advertisements is being prepared and will be ready within another week.

Tom is the outgrowth of the poster series called "The Men Behind the Electric Railways," recently distributed by the Committee on Co-operation of Manufacturers. That series proved a popular one, some 200 electric railway companies using it, and reports from them indicate that the public read the posters with interest.

In creating Traction Tom an effort has been made to reflect in his face the spirit of courtesy and enthusiasm which is manifest in progressive electric railway employees throughout the country. It is the conviction of the manufacturers' and the publicity committees that Tom's friendly countenance will carry the real message of the electric railways to the riding public and arouse a keener appreciation of the work that the employees are doing in providing safe, comfortable rides for customers.

Tom's introductory remarks, through *Truth*, a clip-sheet issued by the association, epitomize fairly well his purpose. This is what he says:

"I am Traction Tom. I speak for the 500,000 workers in the United States who draw pay, directly or indirectly, from the electric railways.

"We are a very important part of a great industry that is on the come-back road after some hard knocks.

"We are out to boost the electric railways because they are necessary and because without them our jobs just wouldn't be."

It is hoped that in addition to using the standard material which is prepared by the association's advertising section companies will localize Tom to the fullest possible extent. The best good can be obtained from using him by tying him up locally with current events through his comments on them. Tom really should be made a sort of browsing salesman for local electric railways, and the closer he gets to home with his comments the more valuable he will be.

Here's a sample of one of the newspaper ads now being offered by the advertising section, which shows the chatty sort of text that Tom's face seems to fit:

"I Liked That City—The Cars Wait for You"

"I was down in Memphis, recently, and an old friend of mine told me how her mother always swore by a certain big city in the eastern part of the United States.

"For a long time the old lady never mentioned any specific reason for liking the town, and, finally, after she had bragged and bragged about the place, my friend asked why she liked it.

"'Well,' she explained, 'the street cars always wait for you there.'

"Probably the old lady, like many persons, thought many electric car men run away from customers purposely.

"They don't. In fact, if they did and the boss found it out, their jobs wouldn't be worth much. Sometimes my buddies overlook folks and pull away from them. But none of them ever does it purposely.

"If you ever think they do, write the boss. He and the rest of us will appreciate it.

"But please make all the haste you can. We men have to keep a certain schedule with our cars just like steam railroad engineers, you know. TRACTION TOM."

Full details regarding Traction Tom and how to use him will be supplied by the association if you will just drop it a line.

Heavy Traction

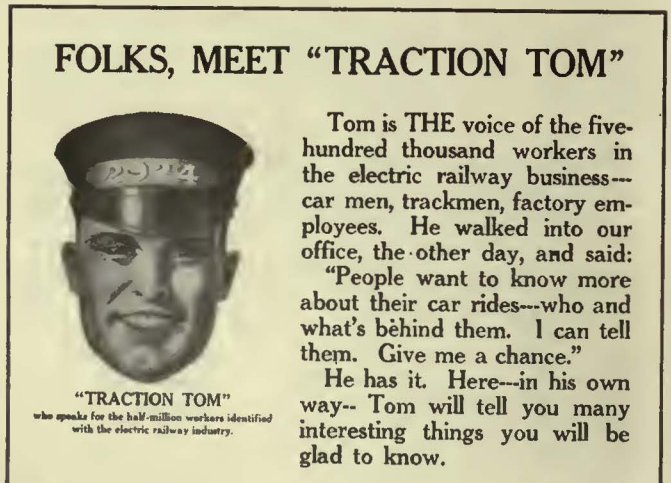
A MEETING of the heavy traction committee of the Engineering Association was held at New York on April 15. The sub-committee on revision of the bibliography on heavy electric traction, H. F. Brown, chairman, reported that it had been decided that the bibliography should be held to a selected list of publications. Professor Warner, who is in charge of the revision, has done some considerable preliminary work. A proposed classification of the index was presented for consideration of the committee, and a number of changes were suggested. The entire matter was referred back to the sub-committee with instructions to proceed along the line of its report.

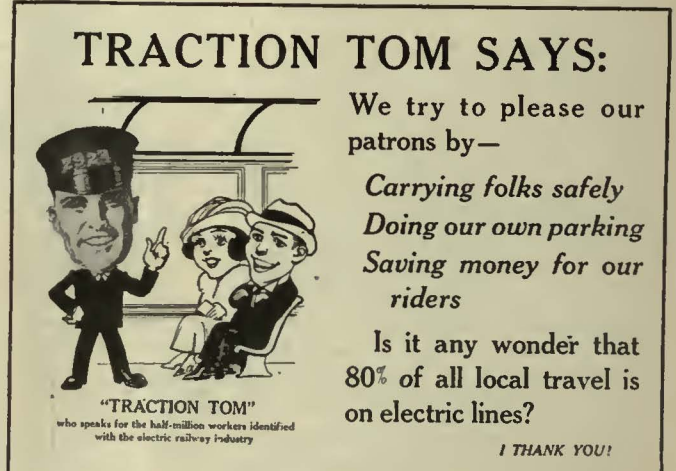
Mr. Armstrong was appointed chairman of a sub-committee on branch-line electrification, to obtain data on self-propelled cars, Diesel-electric, gas-electric, and battery locomotives.

A report of the sub-committee appointed to study train operation, with particular reference to articulated trains, was presented by its chairman, Mr. Sinclair. A drawing has been prepared showing the various articulated trains built or proposed.

Mr. Daus, chairman of the sub-committee to study methods of connection between cars, has prepared a questionnaire on methods of coupling, including air and electric circuits. It is the intention to send out this questionnaire to all railways operating trains.

Members present were J. C. Davidson, chairman; A. H. Armstrong, H. F. Brown, Morris Buck, A. H. Candee representing H. W. Cope, A. H. Daus, J. H. Davis, J. V. B. Duer, Norman Litchfield, J. O. Madison, J. J. Sinclair, L. S. Wells, C. R. Harte, sponsor, and G. C. Hecker of association headquarters.





Two Samples of the "Traction Tom" Series of Posters Put Out by the Advertising Section of the A.E.R.A.

The News of the Industry

Engineers Report at Detroit

Underground Lines Suggested for Use Downtown with Super-Highway System of Suburban Feeders

Daniel L. Turner, consulting engineer, and John P. Hallihan, engineer in charge for the Rapid Transit Commission of Detroit, recommend underground lines in downtown Detroit and surface lines on private right-of-way in suburban districts. This plan is suggested as the backbone of the future transit system. Based on the engineers' report the commission has also recommended a system of 217 miles of super-highways with a width of 204 ft. The report of the engineers containing these recommendations has just been made public. It follows a report on financing rapid transit, which was published in this paper Dec. 8, 1923.

The present report submitted by the engineers relates to the district outside the built-up portion, referred to as that part between the 6-mile and 15-mile circles. The subway system for the city of Detroit will be covered in a report to be issued later. The suggestion for the proposed super-highway system has been discussed and considered with the officials of the communities that it would affect directly.

The engineers point out that Detroit is now being strangled because of lack of streets. It is believed by the engineers that by 1950 Detroit will probably extend out 11 miles from the present center. The proposed super-highway system is designed to serve an area more than three times that of the present city and that area is almost entirely outside of the Detroit of today. The super-highway district is definitely outlined. In the 204 ft. super-highways there will be a central space of 84 ft. for the exclusive use of rapid transit lines on rails. Tunnels underneath the rapid transit tracks and the express motor lane will give access to either side of the street for pedestrians as well as motor vehicles. The rapid transit and express motor services will not be subjected to any crossing interferences.

At a rapid transit station, the rapid transit and motor express lanes would be elevated to permit tunnels for intersecting traffic. The upgrade would aid in retarding rapid transit cars as they approached a station, while the down grade on the other side would aid in accelerating the cars. Passengers alighting from rapid transit cars would descend a stairway at the station, pass to the tunnels underneath and reach the side of the highway. Rapid transit lines would dip under or cross over the intersecting line. As such lines approached the built-up sections of the city they would dip underground and thus reach the heart of the city.

A plan is being drawn up by P. J. M. Hally, counsel for the commission, and a bill is to be submitted to the Legislature which would create a transportation district and permit the levying of an annual tax of one half mill, which would provide from $1,250,000 to $1,500,000 annually for the purpose of acquiring the right-of-way for the super-highways.

The super-highway, it is claimed, will also supply rapid transit on rails in the future at the cheapest cost to the community, even including the cost of the right-of-way necessary. The cost of constructing the permanent way of a four-track rapid transit line on the super-highway, but exclusive of real estate and equipment, it is estimated, will be about $1,100,000 a mile, whereas a subway would cost about $5,500,000 a mile. At the start, the report states, only two-track lines will be required. They will suffice until the city has spread out beyond the 10-mile limit.

The report further states that inside the city, where existing streets control, only underground or elevated lines can be considered, with the underground line preferable.

Fifty Buses for Cleveland

A fleet of not less than fifty buses is to be operated by the Cleveland Railway to supplement electric railway service in Cleveland. Announcement to this effect was made by John J. Stanley, president, on April 16, when the company formally asked the Ohio State Public Utilities Commission for a certificate of convenience and necessity, as required by the Ohio state law.

The application of the railway followed dismissal by the commission of the request of the Cleveland People's Motor Bus Company for similar permission. A hearing on the Cleveland Railway's application has been set for May 29.

The buses will be of the double-deck type. They will be used over five routes, part of which will parallel railway lines. The rate of fare will be at least 10 cents, according to the company, and may be double the present railway fare in Cleveland, which is 6 cents cash, with a 1-cent charge for transfer.

"It is the idea of the company to attract to the motor bus automobile riders and not street car riders," said Joseph H. Alexander, vice-president of the company. "We hope to induce people to ride the buses instead of driving their own automobiles to business. Our bus plans call for quality service."

The routes will run from the suburbs of Lakewood, East Cleveland, and Cleveland Heights, along boulevards and some along streets now covered by street car tracks. They will all end at the Public Square.

Legislature in Review

Some Outstanding Accomplishments of New York Body Reviewed Briefly —Tax Committee Bill Killed

The Legislature of New York State, in annual session adjourned April 10, will be remembered for having passed a 25 per cent income tax reduction law good for 1924 only, for having enacted a home rule enabling act for cities made mandatory upon it by constitutional amendment, for the passing of a compromise transit bill affecting transportation in the city of New York, for having committed the state to a policy of the ultimate expenditure of $300,000,000 for grade crossing elimination and $100,000,000 for the construction of new buildings and improvements by the issue of bonds, if constitutional amendments passed at this session are approved at a subsequent legislative session and receive the favorable vote of the people, and for having consistently refused to adopt a system of public utility regulation and plan of municipal operation of as radical a nature as was ever presented to a legislative body.

The general amendments to the transportation corporations law intended to simplify the procedure of forming utility corporations and functioning under the statute, introduced during the closing days of the session by Senator Fearon, failed to be reported for consideration, but it was anticipated that this subject would go over for another year and the bill was introduced to show progress of the committee and get something tangible before the public so that the interests affected would have opportunity to study the proposed law.

HOME RULE ACT PASSED

The home rule enabling act was finally passed as a new consolidated law instead of being made a special act. It will give to municipalities a certain degree of regulation over public utilities, and the fear that the courts might interpret this power so as to give New York City power to intervene in transit matters is responsible in no small degree for the final compromise reached in relation to this subject.

Among the bills in the Governor's hands as thirty-day bills may be mentioned:

The Garnjost bill (Assembly Print No. 1650), amending Section 53-a Public Service Commission law by providing for the electrification of railroads in the cities of Yonkers and Mount Vernon.

The McGinnies bill (Assembly Print No. 1863), making an addition appropriation of $3,500,000 toward the construction of the New York-New Jersey vehicular tunnel.

The Davison bill (Assembly Print No. 2241), adding new Section 26-b general corporation law, by providing preference in payment of judgments recovered in actions for torts against public service corporations shall be given in liquidation of affairs of the corporation.

The Russell bill (Senate Print No. 546), extending for one year from date of passage of bill the operation of the street railway line of the Nassau Electric Railroad known as the Park Avenue line without exchanging transfers.

The Fearon bill (Senate Print No. 1280), amending the railroad law and stock corporation law, authorizing a domestic railroad corporation to increase or reduce its capital or capital stock pursuant to Section 37 stock corporation law.

The Davison bill (Assembly Print No. 2304), amending the tax law, in relation to the payment and distribution of corporation franchise taxes.

The Legislature amended the workmen's compensation law reducing the non-compensated period after accident from seventeen to seven days, increasing the death benefits for accidental death and increasing the number of payments during the healing period after injury.

Noticeable among the recommendations of the Governor which was killed was the proposition to create a disinterested commission of experts to study the entire tax system of the state, to devise ways and means of relieving public utility corporations from unequal assessments and to suggest a plan which would provide a staple source of revenue for the support of the schools. As a substitute for this, the Davenport-Sheridan tax committee was continued, with an additional appropriation of $25,000.

I.R.T. Will Reduce Wages Five per Cent

Announcement was made by Frank Hedley, president of the Interborough Rapid Transit Company, New York, N. Y., that because of increased expenses in operation and loss of passenger revenue a 5 per cent reduction in wages is proposed for July 1. This reduction would bring the wage scale back to that in operation two years ago. At that time the men accepted a decrease of 10 per cent. Last June the wages were increased 5 per cent. According to Mr. Hedley this increase of last June amounted to an increase in operating expenses of about $1,250,000 for the year. Notification of the wage reduction was made in a circular to the men which said that the company could not buy its supplies cheaper, could not get further reduction in rental and could not borrow more money while its business was in the present condition. No statement has been made through the brotherhood of the Interborough employees.

Final Hearing on Fares in Connecticut on June 2

Another snag in the fare settlement in Connecticut was struck at the resumption of the hearing before the State Public Utilities Commission in Hartford on April 14. At the conclusion of the hearing officials of the Connecticut Company were ordered to report the details of operation expenses to the commission not later than May 12. A final hearing will be held at Hartford on June 2 after an allowance of three weeks for those opposing the fare increase to study the data.

Meanwhile fares will remain as at present, with tokens at the rate of three for 25 cents for all lines in the State except those in Bridgeport. There the rate of two rides for 15 cents will be continued under commission order until the entire question of fares for the State has been decided. Attorney Watrous for the Connecticut Company wanted the fare in Bridgeport to be raised at once to three rides for 25 cents.

Edward G. Buckland, vice-president of the New York, New Haven & Hartford Railroad, which owns $40,000,000 of stock of the Connecticut Company, asked that the Connecticut Company be permitted to earn a fair return upon the value of its property devoted to the service of the public. The earnings of the Connecticut Company are given elsewhere in this issue.

Capital Traction Employees Receive a Two-Cent Increase

The board of arbitration, by a vote of two to one, has granted the employees of the Capital Traction Company, Washington, D. C., an increase of 2 cents an hour. William Knowles Cooper, chairman of the board, and Stanton C. Peelle, the company's representative, voted for the increase, while Representative Tague of Massachusetts, for the men, dissented on the ground that the advance was not sufficient. The men had petitioned for a flat increase to 70 cents an hour. The agreement fixes the following schedule for the Capital Traction: First three months, 52 cents an hour; next nine months, 56; thereafter, 58 cents. At the present time both the employees of the Washington Railway & Electric Company and the Capital Traction Company are receiving 50, 52, 54 and 56 cents. It was roughly estimated that the increase would add between $65,000 and $70,000 a year to the company's payroll expenses. No action has been taken yet on the scale of the Washington Railway & Electric Company's employees.

Two Bus Ordinances Offered in New Orleans

Commissioner Paul H. Maloney of the Department of Public Utilities of the city of New Orleans, La., has offered two ordinances to the Commission Council calling upon the New Orleans Public Service, Inc., to operate a bus service on the streets not now served by railway lines in the upper and lower sections of the city. This is in keeping with the recommendations contained in the Beeler report, which has not as yet been adopted by the Commission Council. The delays incident have occasioned the residents of that area, a thinly-settled portion of the city, great discomfort and inconvenience to reach the street cars.

The officials of the company are reported to have expressed themselves as ready and willing to meet the requirements of the city, in so far as single-deck buses are concerned, but allege that the spreading branches of the big oak trees, in the outlying districts, may make it impractical and hazardous to use double-deck buses on the routes. They assert that the buses will be in readiness for operation within sixty or ninety days.

Ninety-Cent Rate Asked

This Is Maximum Rate Requested in New Cleveland Contract Dating from May 1

Motormen and conductors of the Cleveland Railway, all of whom are affiliated with the Amalgamated Association, have filed a formal demand for an increased wage.

The men are now getting 55 cents an hour for the first three months' service, 57 cents an hour for the next nine months, and 60 cents an hour after the first year. They are asking 85, 87 and 90 cents an hour. The highest previous wage scale paid by the company in 1921 was 70, 72 and 75 cents an hour.

In addition to the wage increase the men also make the following demands:

Workday in the week as near as possible straight eight hours.

Pay on regular runs based on eight hours, minimum.

Time and a half over nine hours.

Sixty per cent of runs laid out inside nine hours.

Thirty per cent inside twelve and a half.

Ten per cent inside fourteen.

Fifteen minutes' extra pay for twelve-and-a-half-hour completion.

Thirty minutes' extra pay for thirteen hour completion.

Forty-five minutes' extra pay for thirteen-and-a-half-hour completion.

Hour extra pay for fourteen-hour completion. (Many runs are now divided between morning and evening rush travel.)

Union to have voice in altering schedules to shorten runs and hours.

Eight-hour runs and time and a half on all Sundays and holidays.

Eight-hour runs at ten-hour pay at night.

Regular crews to get time and a half for extra runs.

Six-hour minimum pay for "trippers."

Breaks or layoffs in regular runs to be paid for as platform time up to one hour.

Allowances for reporting, whether or not assigned to duty.

Thirty minutes' extra pay for making out each accident report.

One day off in eight with pay.

Two weeks' vacation each year with pay.

Five cents an hour extra for instructing new crews.

Company to furnish change for conductors.

Passengers who report trainmen to be compelled to make deposit to reimburse him for time lost in investigation if charges against him are not sustained.

Heating of all cars from Oct. 15 to April 15, instead of from Nov. 1 to April 1, as at present.

Ten minutes' layover at end of every trip and comfort stations at end of every line.

Trainmen under suspension to be relieved of punishment if asked to report during time of suspension.

Pay for the ten minutes time for reporting required of all crews before starting day's work.

John J. Stanley, president of the company, said to grant the demands would increase the payroll $5,000,000 a year and necessitate a 10-cent fare.

The present agreement between the company and the union calls for arbitration of the men's demands. Apparently because the men did not get all they asked for a year ago, they are also asking to have the board of arbitration changed from a three-men body to one composed of five men, two to be named by the company, two by the union and the fifth to be appointed by the Governor of the State in case the four cannot agree. Under the present plan the umpire is appointed by the local federal judge.

The present agreement expires May 1. A prolonged dispute appears likely over the question of changing the composition of the board of arbitrators from three to five members.

No Opposition to Buses in Rensselaer

An informal hearing was held at the City Hall in the city of Rensselaer April 15 at which General Manager Murphy of the United Traction Company appeared and explained the route on which the United Traction proposed to substitute bus transportation for trolley service. The company proposes to abandon railway service on the Broadway-Akin Avenue line in that city. This hearing was called by the Common Council to get an idea of sentiment before the introduction of any ordinance.

No opposition developed at the hearing to buses being substituted for trolley service.

The Capitol District Transportation Company, Inc., Albany, N. Y., was recently formed to operate stage or omnibus routes in Albany, Rensselaer and Saratoga counties. It has a capital of $100,000. The directors and subscribers are Leonor F. Loree, New York City; William H. Williams, Lyon Mountain, N. Y., and Harry B. Weatherwax, Albany, N. Y. The attorney is John E. MacLean, 598 Broadway, Albany, N. Y.

This is a subsidiary of the United Traction Company formed to make application for the operation of buses and trackless trolleys in Rensselaer and Cohoes. The attorney is attorney for the United Traction Company and the Delaware & Hudson Railroad.

Detroit Will Try Trackless Trolley

The Department of Street Railways, Detroit, Mich., will carry on experiments with one of the latest models of trackless trolleys which is expected to arrive in the city shortly.

The type of trackless trolley which is to be tried out is of large capacity, carrying approximately as many passengers as one of the one-man cars now in use on certain lines in Detroit. It has been announced that several of these cars will be purchased if the trials prove such equipment to be adaptable to Detroit's needs and conditions. They will be for use in the outlying districts.

Subsidiary Bus Company Formed

A certificate of public convenience was granted recently to the Valley Motor Transportation Company of East Liverpool and Steubenville by the State Utilities Commission at Columbus, Ohio. The Valley Motor Transportation Company is a subsidiary of the Steubenville, East Liverpool & Beaver Valley Traction Company. The commission extends to the company the right to establish and operate bus lines in East Liverpool and Steubenville.

The company at the present time is maintaining bus service on the old River Road line between the Diamond and the Mulberry Street junction and also along the Lincoln Highway between Pleasant Heights and Stop 55. A bus is also operating on the La Belle View line in Steubenville. The company began the operation of buses on the Pleasant Heights and River Road lines immediately upon settlement of the car strike about a year ago, when it took over cars which had been purchased by the Ceramic City Motor Car Company.

Washington Fare Measure to Be Included in Appropriation Bill

Although hearings have not been concluded by the Senate District of Columbia committee on the bill seeking to force a 5-cent fare in Washington, Senator McKellar, author of the measure, has practically abandoned his effort to secure action on a separate measure and has served notice that he will make an attempt to have the proposal attached to the District of Columbia appropriation bill as a rider. The appropriation bill is expected to reach the Senate about May 1.

The McKellar 5-cent fare bill is opposed by the Capital Traction Company, the Washington Railway & Electric Company and the Public Utilities Commission of the District.

In testifying before the Senate committee, Senator McKellar took the position that the franchise contracts of the two corporations provide for a 5-cent fare. He says that the return allowed by the Public Utilities Commission is based on excessive value.

Officials of the two companies have shown that the income of both railways had decreased steadily since the war ended. While the Capital Traction Company last year earned 7 per cent, plus, on its fair value as fixed by the Public Utilities Commission, the Washington Railway & Electric Company fell far below this figure. The two corporations combined earned less than 6 per cent on their combined fair values.

The present fare in Washington is 8 cents cash, or six tokens for 40 cents.

Operators Tell About One-Man Cars to Help Dayton

City Attorney J. B. Harshman of Dayton, Ohio, has returned to Dayton from New York City, where he went to inquire into the use of one-man cars. Upon the application of Attorney J. Sprigg McMahon, of the law firm of McMahon, Corwin & Landis, representing the railways in Dayton, the depositions of a number of the electric railway operators in the East were taken. Among those who were examined were C. W. Kellogg of Stone & Webster; C. E. Morgan, Brooklyn; E. M. Walker, Schenectady; John E. Duffy, Syracuse. E. J. Murphy, chief statistician of the American Electric Railway Association, corroborated the testimony of the railway officials. An ordinance intended to prohibit the use of one-man cars in Dayton was passed some time ago, but enforcement of its provisions has been delayed. It is said now that the situation will probably be solved by an arrangement being put into effect under which both one-man and two-man cars will be permitted to operate under a definite arrangement which will fix the hours of use of each class of vehicle.

Jitneys Cease Operation in Houston

In accordance with the terms of an ordinance jitneys ceased operation in Houston on March 31. Prior to that date a petition had been filed by several jitney drivers seeking to enjoin the city from enforcing the ordinance, but the city attorney answered by filing a general demurrer which was sustained by the district judge. The attorneys for the jitney drivers gave notice of an appeal to a higher court, but as yet no date has been set for the hearing.

The Houston Electric Company began its increased service on March 28, and on the morning of April 1 was fully prepared to handle the additional traffic. The company is now operating three 29-passenger Yellow Coach buses in all-day service and six during the rush hours over the route of the former Austin jitney line.

The only changes necessary in the operation of the railway system to care for the jitney riders, and to prevent congestion in the downtown district, was the addition of extra cars, rerouting of three lines in the business section, and the use of street collectors.

Eastern Massachusetts Carries Dash Signs to Attract Business

The Eastern Massachusetts Street Railway, Boston, Mass., has been carrying dash signs on its cars for the purpose of attracting more business to the railway. The posters are 21 in. x 13 in. in blue, red, maroon and green type, carrying such messages as "Park your worries at home," "Travel by trolley," "Snow ahead—store auto and use trolley," "The street car stops near all the shops," "Shop by trolley and keep out of the auto jam," and "Travel by trolley for convenience and economy." The publicity campaign was started just before Christmas. Each of the signs was carried about two weeks, with two signs on each car.

The effect on riding is not known as yet; however, a large number of favorable comments from people in the territory have been received by the company, a fair indication that the dash signs have done some good.

Conferences on Wage Matter Scheduled in East St. Louis

Officials of the East St. Louis & Suburban Railway and its East St. Louis Amalgamated employees will confer regarding a new wage scale to take effect when the present contract expires on May 1. A decision to ask for an increase in wages was reached at a meeting on April 10.

The present wage scale in East St. Louis provides a maximum of 56 cents an hour for suburban men, 54 cents for city men and 58 cents for operators of one-man cars. Men employed three months or less get 45 cents; for the next six months, 48 cents, and at the end of nine months 53 cents. After a year they receive the maximum pay for regulars. Conductors and motormen in St. Louis are paid a maximum of 67 cents an hour.

News Notes

Providence Council Opposed to Fare Increase. — The Common Council of Providence, R. I., recently concurred in a resolution directing the city solicitor to appear before the Public Utilities Commission to oppose any increase in fare for the United Electric Railway until the fare zones are extended to the city line. In the annual report of the company it was intimated that the railway would soon petition for increased fares.

Offices Moved.—The Chicago Surface Lines, Chicago, Ill., is moving some of its offices from the eleventh floor of the Illinois Merchants Bank Building to the fourteenth floor of the newly completed section of the building. After April 14 the executive offices will all be on the fourteenth floor and the address will be 231 South La Salle Street.

Fares Lowered.—The new management of the Hornell Traction Company, Hornell, N. Y., has reduced the fare from 8 cents to 7 cents. Some time ago it was announced that the line would probably discontinue service because of financial difficulties. Later it developed that the bondholders voted to have the interest of the company turned over to Raymond Page and W. C. Whitaker. One of the first things the new management did was to reduce fares in the hope of regaining patronage.

Committee Appointed to Formulate Plan.—Another step in the solution of the Spartanburg traction muddle was taken on April 9 with the appointment by the Chamber of Commerce of a committee of prominent unbiased citizens to study the situation and advance a plan that would be acceptable both to the city and the South Carolina Gas & Electric Company. The Chamber of Commerce officials believe that the present inadequate transportation facilities are a distinct disadvantage to the growth of the city.

Bus Line to Replace Railway.—Announcement has been made that the Public Service Railway, Newark, N. J., plans to tear up its tracks in Scotland Road, south of Central Avenue, Orange, and operate a bus line between Morris Avenue and the carhouse at Washington and Dodd Streets, that city. It is expected track removal work will start as soon as definite assurance is received from the county that the freeholders are going to pave and take over the road between Morris Street and Central Avenue. The bus line is to be started within the next month.

Debut of Surface Service Magazine.—Because the company feels that there has been developed a widespread and genuine interest in the activities of the Chicago Surface Lines it has started the publishing of a company pamphlet called "Surface Service Magazine," which will aim each month to discuss public questions and will disseminate news and comment of special local interest. The publication will broadcast the work of all departmental units in the belief that it will help toward making the Chicago Surface Lines a model for the transportation world. The première contained some twenty pages, including stories on "Measuring Power Consumption," "Strong for Accident Prevention," and "Caring for the Eyes." In addition the readers were given a few laughs in the selection of some real jokes.

Fares Increased in Texas Towns.—The City Commission of Denison, Tex., has granted the application of the Texas Electric Railway, which operates local service in Denison, for authority to increase the fare charged in Denison from 5 cents to 7 cents. The application set forth that the company found it impossible to maintain efficient service with a 5-cent fare. The company will sell four fare tokens for 25 cents and will grant one-half fare for all students where books of tickets are purchased. A similar increase was granted by the City Commission at Sherman, which is also served by the Texas Electric Railway.

Six-Cent Fare Extended.—The City Council of Richmond, Va., has again extended the 6-cent fare privilege to the Virginia Railway & Power Company for its Richmond lines. Ordway Puller, chairman of the Council committee on streets, promised action on the franchise of the Virginia Railway & Power Company within the next sixty days. The franchise requested by the company would combine all of its various contracts with the city, expiring at various times during the next ten years, under one agreement. Mr. Puller said he would at a later date issue a detailed statement explaining why there has been delay.

Baseball and Transit Guide in One.—Dates for New York City baseball games are included in a pamphlet recently issued by the Interborough Rapid Transit Company, New York. The pamphlet, called "Ride on the Open Air Elevated," contains a map which is designed primarily as a guide for patrons on elevated lines. Some valuable pointers on both local and express service are included as special features of the "L" service. When the reader wearies of traveling from Brooklyn to the Yankee Stadium or the Polo Grounds he can look over the schedule of the Yankees and Giants "at home."

Co-operation Brings Better Traffic Results.—Co-operating with the police department and practicing double-berthing instead of single-berthing at the corners, the Grand Rapids Railway, Grand Rapids, Mich., has succeeded in cutting the rush-hour time through the business section of the city from thirteen to eight minutes, according to L. J. DeLamarter, vice-president and general manager. Loading platforms at several corners have greatly aided in the time saving, particularly since the platforms have been lengthened to accommodate two cars. The double-berthing enables two cars to move forward at the same time. As a further help police have been permitted to wave on cars against the traffic lights when such move will expedite keeping the street clear. This is practiced especially when cars turn on to the avenue from side streets.

Rate Case Closed.—The rate case of the International Railway, Buffalo, N. Y., before the Public Service Commission on the application of the city authorities of Buffalo for a return to the 5-cent fare, has been closed and the evidence is now being considered by the Public Utilities Commission. At the final hearing before the commission counsel for the International Railway asked dismissal of the city's application and approval of the company's request for an 8-cent city fare. A 7-cent fare with four tokens for 25 cents is now being charged in Buffalo.

Commission to Settle Dispute.—The State Corporation Commission of Virginia has been asked to settle the dispute between the city of Norfolk and the Virginia Railway & Power Company over lines operating in Edgewater, a suburb of Norfolk. The city contends that the line is essential, but the company claims that it cannot be made to pay and should be abandoned. About a year ago the commission was asked to settle the controversy, and recommended that an attempt to reroute the line be made. For the last ten or twelve months both parties have discussed the matter but without reaching any agreement satisfactory to both, and the result is that the commission has been asked to take a hand again.

Wages to Be Arbitrated. — Having failed among themselves to reach an agreement on the wage question, the Trenton & Mercer County Traction Corporation, Trenton, N. J., and its employees have submitted the wage matter to arbitration. Albert S. Richey, Worcester, Mass., has been selected to represent the company, while James H. Vahey will appear for the men. Messrs. Richey and Vahey will choose a third arbitrator. The agreement between the company and men expired on April 1. As a result of conferences issues covering most of the working conditions have been adjusted, but the wage question remains unsettled.

Given a One-Year Permit.—The Atlantic Coast Transportation Company has been offered by the Asbury Park Board of Commissioners a one-year permit to operate buses at that place. To secure the permit the transportation company must agree to a 7-cent fare with transfers, conduct a ten-minute schedule and agree to permit the city to sanction the type of bus, which must be uniform. The Atlantic Coast Transportation Company, which is operated by the Atlantic Coast Transit Company, is capitalized at $100,000.

B.-M. T. Publishes Map for Guidance.—A new map and guide to all Brooklyn-Manhattan Transit lines has been published by the Brooklyn-Manhattan Transit Corporation. It was distributed for the first time at the opening night of the Brooklyn Industrial Exposition on April 5 to visitors at the B.-M. T. booth. The map and guide will be placed conspicuously in all the company's cars. The map is folded so as to be convenient to carry in pockets or handbags. The subway lines are printed in black and the elevated lines in red. On the reverse side of the map is a complete guide with the names of the stations and hours of service.

Financial and Corporate

St. Louis Net Higher

Increase of $296,653 for 1923 Shown Over the Result for 1922—Congestion Becoming a Problem

Net income of the United Railways, St. Louis, Mo., for the year 1923 increased $296,653 over the year 1922. For 1923 the net was $809,745. For 1922 the net was $513,092. Gross operating revenue increased $489,889, from the sum of $19,963,555 in 1922 to $20,453,445 in 1923. It is explained in the printed report of the company for the year that all of the underlying bonds, aggregating $6,100,000, matured Oct. 1, 1923, and that the St. Louis & Suburban Railway general mortgage bonds matured April 1, 1923. It is further explained that the St. Louis Transit Company bonds mature Oct. 1, 1924, and the default in payment of the underlying bonds created a default in the United Railways general mortgage bonds due July 1, 1934. No interest has been paid on any of the bonds since Oct. 1, 1923, but interest has been accrued on the books to Dec. 31, 1923, at the rates provided by the mortgages or extension agreements.

No payments were made during the year on the liability of $2,396,321 for mill tax due the city of St. Louis, this amount being the balance of judgment obtained by the city against the company for mill tax to Dec. 31, 1918. The interest on this judgment, however, has been accrued on the books to Dec. 31, 1923, and the current mill tax has been paid regularly.

Provision for depreciation, renewals, etc., aggregated $1,500,000 for the year 1923, this amount having been fixed by a ruling of the Missouri Public Service Commission. Charges against the depreciation reserve during the year aggregated $788,998 and consisted principally of reconstruction of track and roadway, and retired equipment.

The surplus of the company as of Dec. 31, 1923, stood at $4,275,573, made up of a balance of $3,377,773 and $897,800 of additions during the year. The balance sheet of the company shows among the assets $5,341,150 of United States government bonds and treasury notes.

Rolla Wells, the receiver, points out that the total taxes and street paving costs for the year 1923 amounted to $2,287,048, or 0.781 cents per revenue passenger. In his review of the affiairs of the company the receiver explains quite fully the improvements carried out. Thus during the year 26.82 miles of track was reconstructed or renewed, fifty new cars were built, 113 cars were remodeled, shops and shop equipment were improved and the power supply augmented.

Mr. Wells says that the difficulty of operations in so-called "congested districts" has become more acute. He says that both the efficiency of the service and the expense of the company have been affected by allowing automobiles to be parked indefinitely in those districts, the lack of proper regulation of so-called service cars, the increasing number of passenger automobiles and freight trucks, and especially the permits granted by the Board of Public Service to buses to operate over certain of the heaviest lines of the street car traffic. Thus he says that the number of reveue passengers in 1923 (although seriously falling off in the latter part of the year) was 2.31 per cent greater than in 1922, and the largest in any year in the history of the company. On the other hand, for the purpose of improving the service, the car-miles increased 3.22 per cent, but due to the congestion mentioned the car-hours increased 4.35 per cent and the average miles per hour decreased 1 per cent.

During 1923 the work of equipping passenger cars with Economy watt-hour meters was completed. This work was begun in 1922. Mr Wells says that the results have been very gratifying. The total cost of installation (including equipment for testing and maintenance) was $105,944. The saving in power consumption per car-mile measured at the cars was 8.6 per cent and at the power house primary switchboards 5.8 per cent. On the latter basis the gross saving in cost of power was approximately $112,690. Liberally deducting a depreciating charge of 10 per cent on equipment and 7 per cent interest thereon and all costs for operating meters, maintenance, wages of instructors, inspectors, and clerks, the net saving for the year was approximately $78,293.

With respect to the valuation, Mr. Wells says that on June 4, 1923, after more than four years of work on the valuation of the property in charge of the receiver, the Missouri Public Service Commission handed down its decision and order, fixing as of Jan. 1, 1919, the value of the property of the United Railways (including property of the Florissant Construction, Real Estate & Investment Company) at $52,838,110, and that of the Missouri Electric Railroad at $781,949. Petitions by both the city and the company for a rehearing are still pending before the courts, but developments since Mr. Wells made his report appear to indicate a settlement out of court.

STATEMENT OF EARNINGS OF UNITED RAILWAYS, ST. LOUIS

	1923	1922
Revenue from transportation	$20,220,765	$19,740,118
Revenue from other railway operations	232,679	223,437
Gross operating revenue	$20,453,445	$19,963,555
Current operating expense and depreciation	$15,123,183	$14,895,508
Taxes	1,832,602	1,845,722
Total operating expense, depreciation and taxes	$16,955,785	$16,741,231
Income from operation	$3,497,659	$3,222,324
Non-operating income	225,700	202,830
Gross income	$3,723,359	$3,425,155
Interest and miscellaneous charges	2,913,614	2,912,063
Net income for the year	$809,745	$513,092

TRAFFIC STATISTICS OF UNITED RAILWAYS, ST. LOUIS

	1923	1922
Revenue passengers	292,671,781	286,076,475
Transfer passengers	155,343,193	152,261,868
Total passengers	448,014,974	438,338,343
Percentage of revenue passengers using transfers	53.08	53.22
Average fare per passenger (including transfers)	4.50c	4.49c
Average fare per revenue passenger	6.89c	6.89c
Passenger car-miles	45,652,714	44,229,300
Revenue passengers per car-mile	6.41	6.47
Total passengers per car-mile	9.81	9.91

Tidewater Line at Birmingham Sold Under Foreclosure

Sale of the Tidewater line to the National Power & Light Company for $750,000 and the assumption of bonds and debts amounting to $1,675,000 was made by J. S. Pevear, special master, on April 15. The sale followed the negotiation of an agreement between representatives of the company and the members of the City Commission at Birmingham, Ala., permitting the rerouting of the line with a considerable amount of track abandonment. The purchase is presaged on the agreement being carried into effect by the city by April 19. The property was bid in for the National Power & Light Company by F. B. Odlum, acting for L. B. Hatch, who purchased the properties of the Birmingham Railway, Light & Power Company for the same concern.

Elimination of seventy-two railroad crossings at grade was effected by the track abandonment consented to by the members of the City Commission at the conferences. Changes agreed to by the City Commission, it is stated, will permit the Tidewater line to be made an integral part of the railway system and will enable the company to operate the portions of the line retained under the agreement on a self-sustaining and perhaps a profitable basis.

Operation of the Tidewater line has been in the hands of the Birmingham Railway, Light & Power Company and later in the hands of the receivers for several years. The line, according to officials of the company, has just about broken even on operation expenses, but has lost about $40,000 a year in depreciation of tracks and equipment. Lee C. Bradley and Mr. Pevear, co-receivers, stated to city officials that unless an agreement could be reached that would enable the reorganized company to take over and operate the useful portions of the line on a self-sustaining basis the entire line would have to be junked. The City Commission originally declined to consent to the changes asked, which are in the main the changes which were consented to in the agreement just adopted. Commissioner William L. Harrison wrote a letter offering the line to Henry Ford, but was later advised that Mr. Ford was not interested. The agreement was reached when the company representatives met the city's terms on through service,

additional paving, the $75,000 payment for franchise revisions and track changes, and consented to retain certain trackage on the western end of the line which had originally been included in the plan for abandonment.

Stockholders Seek Dissolution of Northumberland Property

Stockholders of the Sunbury, Lewisburg & Milton Railway, Sunbury, Pa., have voted to petition the court for a decree of dissolution of their corporation. With this action consummated, the property, which consists of a railway between the Sixth Street Junction, in Northumberland, of the Sunbury & Northumberland Street Railway and a point at the western end of the classification yards of the Pennsylvania Railroad, also in Northumberland, will be turned over to a trustee for sale. This line has been operated under the same management as the Sunbury and Selinsgrove lines.

The question of providing transportation for about 4,000 Pennsylvania Railroad employees, between the west end of the yards and the trolley junction, has not yet been solved, although a proposal has been made for establishing bus service between the two points.

U. S. Supreme Court Acts in Clark Case

The United States Supreme Court has declined to review the decision of the Court of Appeals of Franklin County, Ohio, which awarded a verdict to Augusta M. Slaymaker and the Columbus Railway, Power & Light Company against E. W. Clark & Company, and others. Without comment, the Supreme Court on April 14 denied a petition for certiorari which would have brought this case on appeal before it.

Deficit in Honolulu in 1923

The Honolulu Rapid Transit Company had a deficit in 1923 of $33,585. The total revenue from all sources in 1923 was $988,928, compared with $989,521 in 1922. Operating expenses in 1923 were $618,708 as compared with $602,757 in 1922. Passengers carried showed an increase of 5½ per cent over 1921 and an increase of 2 per cent over 1922. The report of the company for the year refers to the bus service started in the Kalihi district on Aug. 16, 1923. From that period up to Dec. 31, 1923, operations resulted in a deficit of $2,038. The improvements and extensions carried out during the past year under the program laid out in 1922 for the expenditure of $500,000 included track work, power installation, construction of six new cars and other miscellaneous improvements and additions.

	1923	1922
Total revenue from transportation	$978,433	$973,129
Total revenue from other railway operations	10,495	16,392
Gross revenue from operations	$988,928	$989,521
Total operating expenses.	618,708	602,757
Net revenue from operations	$370,220	$386,764
Total deductions	403,805	351,216
Surplus	*$33,585	$35,548

*Deficit

President Castle said that the year 1923 had been a disappointing one in many respects. With the acceptance of the new franchise in February, 1922, the company was faced with the need of extensive and immediate improvements to its system. Already more than $550,000 had been expended on improvements to track and equipment, new capital expenditure which has been financed in part by a stock issue of $500,000. All of this work had not brought in corresponding increase in revenue. The present rate of return could not be maintained on a 5-cent fare upon present patronage. The results of operation in 1923 compared with 1922 are shown in the accompanying table.

Net Income of Connecticut Company Smaller in 1923

The net income of the Connecticut Company, New Haven, for the year 1923 was $1,025,247. This is a decrease of $285,168 over 1922. Figures to this effect are contained in the statement of the affairs of the New York, New Haven & Hartford Railroad for the year ended Dec. 31, 1923. That company owns the entire $40,000,000 of capital stock of the Connecticut Company and $1,000,000 of debentures and $4,568,916 of the company's notes. This stock is in the hands of federal trustees, who under decree of the federal court shall exercise their best efforts to complete the sale of shares before April 1, 1925.

In commenting on the affairs of the Connecticut Company E. J. Pearson, president of the New York, New Haven & Hartford Railroad, says that while there has been a constantly increasing patronage of the cars in Connecticut, the percentage of increase in passengers has not been equal to the percentage of the reduction in the rate of fare made effective April 1, 1923. Mr. Pearson explains that it was necessary on June 1 to make effective an increase in rates of pay to all classes of labor, and the increased payrolls together with a decreased gross revenue resulted in a decrease in net for the year, the decrease becoming greater as the winter period approached. It was, therefore, necessary to announce an increase in the rate, effective Feb. 10, 1924, to three tokens for 25 cents, referred to previously in the ELECTRIC RAILWAY JOURNAL. The operating ratio in 1923 was 79.32 per cent, an increase of 2.11 per cent over 1922.

INCOME ACCOUNT OF THE CONNECTICUT COMPANY

	1923	1922
Total operating revenues.	$14,717,233	$14,477,611
Total operating expenses..	11,673,454	11,177,594
Net operating revenue....	$3,043,779	$3,300,017
Tax accruals.....	576,672	558,808
Operating income.....	$2,467,106	$2,741,209
Non-operating income.....	62,618	44,831
Gross income.....	$2,529,724	$2,786,040
Deductions from gross income.....	1,504,477	1,475,625
Net income.....	$1,025,247	$1,310,415

Franchise and Financial Details Paramount in St. Louis

The directors of the United Railways, St. Louis, on April 8 ratified the appointment of an enlarged reorganization committee which will take up immediately the problem of refinancing the local railway, now in the hands of Receiver Rolla Wells. The new body will begin where the old committee of three members left off.

The head of that committee was Frank O. Watts, president of the First National Bank, St. Louis. He will be chairman of the new committee which is to have five members. Others on the new committee are to be J. K. Newman, president Newman, Saunders & Company, New York; A. L. Shapleigh, president of the United Railways Company (both members of the old committee); William P. Gest, president of the Fidelity Trust Company, Philadelphia, and J. Sheppard Smith, vice-president of the Mississippi Valley Trust Company. Mr. Gest was chairman of one of the protective committees for holders of St. Louis Transit Company 5 per cent bonds. In Mr. Smith the Mississippi Valley Trust Company will for the first time be represented on the organization committees. That institution is interested in a fiduciary capacity in the securities of both the United Railways and the St. Louis & Suburban Company.

Mr. Watts has said that no fixed plan can be announced at this time, as the ideas thus far developed by the reorganization committee must be submitted to the United States District Court, to the state commission and to the city administration.

As has been indicated previously it is contemplated that the $30,300,000 outstanding general mortgage 4's due in 1934 will remain outstanding, as the reorganization committee has been advised by counsel that there will be no permanent default in these bonds if certain legal requirements are met. Those requirements seem comparatively easy of performance. The financial plan will, therefore, be confined to the Transit 5's, Suburban general 5's, and to the preferred and common stocks Necessarily, the receiver's certificates, the underlying bonds and other temporary or past due obligations will be provided for.

As Mr. Watts sees it the immediate undertakings of the reorganization committee are:

1. To determine with the Public Service Commission, the proper valuation of the properties for the purposes of reorganization.

2. To arrange for a new franchise which will insure proper service and protection to the car-riding public, and which will establish reasonable conditions of operations and define all matters necessary to be determined before reorganization can be accomplished.

3. To prepare and promulgate a financial plan acceptable to the city, the Public Service Commission, the court and the present security holders of the company.

Mayor Henry W. Kiel has declared in favor of an initiative election on a new blanket franchise for the company,

which he contends must provide for payment of some $3,000,000 in back mill taxes now due the city.

Newman, Saunders & Company will shortly open an office in St. Louis and place experts at work on the reorganization details immediately.

Earnings of Westchester High-Speed Line Improve

The New York, Westchester & Boston Railway, operating 57 miles of high-speed electric railway out of New York City into Westchester County, for the year ended Dec. 31, 1923, had gross revenues of $1,452,943, an increase of $98,934 over 1922, and balance after taxes of $247,172, equal to 25 per cent of annual interest charges on its $21,390,000 of 4½s, upon which interest is guaranteed and paid by the New York, New Haven & Hartford Railroad.

There was a deficit after charges for the year of $1,616,714, due to $886,727 interest on unfunded debt, chiefly on $16,300,000 notes and advances by the New Haven, in addition to rentals, miscellaneous charges and regular bond interest.

The Larchmont extension, which was put into operation early in 1921 at a cost of $418,500, has shown average annual net income since of $117,707 and for 1923 of $148,400.

P. R. T. Seeks Approval of $1,000,000 Loan

The Philadelphia Rapid Transit Company, Philadelphia, Pa., has requested the city to approve a proposed $1,000,000 bond issue to retire $389,000 of the company's real estate mortgage bonds and to provide funds for necessary transit improvements. This request was contained in a letter to the Council from W. C. Dunbar, president of the company, on April 10. Its presentation was followed by the introduction of an ordinance by the chairman of the committee on transportation and public utilities providing for the city's assent. The subject was referred to his committee. Mr. Dunbar explained that the proceeds of this loan will be used to:

Retire mortgages now outstanding on various parcels of the company real estate, $389,000.

Construct track extensions to the new Southern carhouse now being built at Twentieth and Johnson Streets, $300,000.

Construct and equip a substation at Fox Chase, $90,000.

Add rotary converter at Ranstead substation, $40,000.

Provide emergency and utility equipment and house same, $81,000.

Purchase additional signals, shop facilities and equipment for Market Street elevated, $100,000.

Another Step Taken in New Jersey Readjustment

Formal application has been filed with the Board of Public Utilities Commissioners of New Jersey for approval of a merger of the Public Service Electric Company, the United Electric Company and the Public Service Gas Company. At the same time approval was asked of a plan to change the 500,000 shares of the Public Service Railway of $100 par value into no-par value stock, the shares to be exchanged par for par.

The merger is in line with the plans for financial readjustment to which reference has been made before in the ELECTRIC RAILWAY JOURNAL. The new company will be known as the Public Service Electric & Gas Company and will be controlled by the Public Service Corporation. The electric and gas company is expected to be the company to put out future new capital issues.

Assurance is given that the readjustment will not disturb the relationship which the corporation now bears to its subsidiaries or to the public, nor will it affect the holders of underlying gas, electric and railway properties except to improve their position by facilitating the development of the properties.

Indianapolis-Louisville Line Does Well

The gross operating income of the Interstate Public Service Company, Indianapolis, Ind., for the year 1923 was $2,128,679 greater than for 1922, or 49.8 per cent. The net earnings for the last year were $466,698 greater than for 1922, or 48.5 per cent.

The railway department showed an increase in revenue over 1922. Heavy freight and express traffic made necessary the purchase of additional equipment, including three sleeping cars for service between Indianapolis and Louisville, two express motor cars, three express trail cars, ten live stock cars and two convertible ballast cars for use in track maintenance. The interurban tracks were extended into the Bourbon stockyards at Louisville during the year. This materially increased the live stock business. As many as 337 cars of stock have recently been handled in a month. During the year three parlor buffet cars were placed in service on the interurban line between Indianapolis and Louisville. This new service proved popular from the start and two additional cars of the same type are now under order.

As for financial operations, the company retired its first and refunding mortgage, and in lieu thereof executed a new mortgage designed to finance the requirements of the company under existing conditions on more advantageous terms than the older mortgage executed some years ago. Under the new mortgage the company issued $8,192,000 in face amount of first mortgage and refunding gold bonds, Series A, using the proceeds to retire $4,048,000 in face amount of its first and refunding mortgage bonds and $3,044,000 in face amount of divisional underlying bonds of comparatively early maturities and to finance the cost of additions and extensions.

During 1923, the company also issued and sold $358,000, par value, of its preferred stock, and $335,000, par value, of common stock, and issued and delivered $2,000,000, par value, of common stock in connection with the acquisition of various properties in January, 1923. Also during the year $1,100,000, par amount, of prior lien stock was issued and delivered on account of and in connection with the acquisition of various properties in January, 1923; $211,000 par was issued and exchanged for certain outstanding general mortgage bonds of the company amounting to $211,000, and $1,524,700, par amount, of prior lien stock was issued and sold to investors, many of whom are customers of the company, and the proceeds used to pay or reimburse the cost of additions and extensions to the company's property.

The policy of offering the company's prior lien stock to customers, inviting them to become part owners of the company, has resulted in a wider personal interest in its affairs. The company's stockholders increased in number during the year from 1,980 to 4,485.

STATEMENT OF EARNINGS OF INTERSTATE PUBLIC SERVICE COMPANY FOR YEAR ENDED DEC. 31, 1923

Gross earnings, including merchandise sales		$6,405,343
Operating expenses (including taxes)		4,825,177
		$1,580,166
Miscellaneous income		16,251
		$1,596,417
Rental of leased railway property		165,898
Net earnings		$1,430,519
Interest on funded debt		647,189
		$783,330
General interest and amortization of discount		97,674
Available for dividends		$685,656
Dividends paid and accrued:		
Prior lien stock dividend		250,461
		$435,195
Preferred stock dividend		298,108
Balance carried to surplus		$137,087

Scaling Down Planned in Erie Reorganization

Details have been announced of the plan under which it is proposed to reorganize the Buffalo & Lake Erie Traction Company, Erie, Pa. It is proposed that the committee for the holders of the first and refunding mortgage 5 per cent thirty-year gold bonds, through its nominee, shall acquire all the property of the Buffalo & Lake Erie at foreclosure sales. Two new companies will be organized, designated in the plan as the Erie Company and the Interurban Company. The Erie Company will acquire the lines in the city of Erie and the Interurban Company will acquire the purely interurban line.

The Erie company will have a capitalization of $5,000,000 of 6 per cent first and refunding mortgage sinking fund thirty-year gold bonds, of which $1,000,000 are "presently issued"; $1,500,000 of 7 per cent cumulative preferred stock, of which $1,050,750 will be the initial issue, and 60,000 no par value shares of common stock. From the proceeds of $1,000,000 of the sinking fund gold bonds, and other moneys, the syndicate proposes to retire the receiver's certificates now a lien on the property of the Erie Company and to make available the $700,500 cash to be received by the committee. The property will be subject to mortgages and other secured debt.

The Interurban Company's capitalization is to consist of $1,500,000 of first and refunding mortgage 6½ per cent thirty-year sinking fund bonds. $800,000 of which comprise the initial issue; $1,500,000 of 5 per cent noncumulative preferred stock, of which $700,500 will be "presently issued," and

30,000 shares of no par value common stock.

On the basis that all bondholders assent to the plan each holder of a $1,000 bond of the Buffalo & Lake Erie will receive $150 par value of 7 per cent cumulative preferred stock of the Erie Company, amounting to 15 per cent of his holdings; 10 per cent in 5 per cent non-cumulative preferred of the Interurban Company, or a par value of $100; three shares of common stock of the Erie Company, no par value, having an estimated book value of $16.47 a share and aggregating $49.41, and $30 cash on the basis of an estimated available balance for this purpose of $218,900. In other words, each holder of a $1,000 bond will receive new stock of a par value of $299.41 and cash of approximately $30.

The company has been in the hands of a receiver since 1915.

Cleveland Southwestern Wants to Issue Bonds

Application was filed with the Ohio Public Utilities Commission recently by the Cleveland Southwestern Railway & Light Company, Cleveland, Ohio, for authority to issue $4,500,000 in bonds and $4,000,000 in common stock for the purpose of consummating the reorganization of the company formerly known as the Cleveland, Southwestern & Columbus Railway.

Following an order of foreclosure sale by the Federal Court the properties were purchased on March 14 by John Fleek for Hayden, Miller & Company, who acted as reorganizing managers on behalf of all depositing bondholders. The sale was approved by the court, stockholders and directors.

The plan of reorganization calls for the issuance of securities substantially as follows: $800,000 prior lien twenty-five-year 6½ per cent bonds; $175,000 equipment trust certificates; $1,500,000 extended bonds comprising $200,000 Cleveland & Elyria thirty-year 6s, $100,000 Elyria & Oberlin thirty-year 6s, $127,000 Cleveland, Berea, Elyria & Oberlin thirty-year 6s and $1,073,000 Cleveland, Elyria & Western thirty-year 6s; $2,200,000 general and consolidated mortgage thirty-year 5s.

Auction Sales in New York.—At the public auction rooms of A. H. Muller & Sons there were no sales of electric railway securities this week.

Loss for 1923 $65,593.—The Fresno Traction Company, Fresno, Cal., reports to the Railroad Commission for the year 1923 that its operating revenue was $430,441 and operating expenses $344,739, giving a net operating revenue of $85,702. The net corporate loss for the year was $65,593. The deficit at the beginning of the year was $621,466. Miscellaneous additions to surplus for 1923 were $75,064 and miscellaneous deductions were $2,425, leaving an accumulated deficit at the end of the year of $614,419.

Approves Track Removal.—The New York Transit Commission announced on April 11 its approval of the proposed condemnation and removal of the tracks of the Sixth Avenue elevated road, at present running from Fifty-third Street to Fifty-ninth Street, and known as the Fifty-eighth Street spur. This will leave the Board of Estimate and Apportionment free to initiate the condemnation proceedings and start the work of removal as soon as it may desire.

Power and Light Properties Included in Sale. — The Warren-Jamestown Street Railway, Jamestown, N. Y., the Warren Street Railway, Warren, Pa., and the interurban line connecting Warren and Sheffield as well as extensive light and power systems of the Warren Traction Company have been sold to the Penn Public Service Corporation, which took over the electric railway properties as of April 10, 1924.

Name to Be Changed.—Steps have been taken by the Northern States Power Company in La Crosse to change the name of its largest division, the Wisconsin-Minnesota Light & Power Company, which supplies city and interurban railway service throughout a large territory in western Wisconsin, to the Northern States Power Company. Formal notice of the proposed action is contained in an amendment to the articles of incorporation of the company recorded recently.

Seeks Partial Abandonment. — The Stark Electric Railroad petitioned the Ohio Public Utilities Commission on April 8 for authority to abandon a part of its tracks in the city of Alliance. The application has been set for hearing May 12. The tracks proposed to be abandoned begin at the west side of Arch Avenue, running west on Main Street to Union Avenue, thence north to the right-of-way of the Cleveland and Pittsburgh tracks, thence on Vine Street.

Suit to Compel Payment of Dividends Dismissed.—The suit filed by holders of participation certificates of the Chicago Railways asking that dividends be ordered paid on certificates has been dismissed by Judge Cliffe of the United State District Court at Chicago. In his opinion Judge Cliffe held that "since the contractual obligations imposed by the plan of reorganization have not been violated, I must grant the motion to dismiss."

Receiver Discharged at Binghamton. —W. G. Phelps has been discharged as receiver of the Binghamton Railway, Binghamton, N. Y., by order of Federal Judge George W. Ray. Earnings of the company for 1923 are as follows: Gross, $1,073,723; net $325,733; interest and taxes, $217,107; balance, surplus, $108,626.

Short Pennsylvania Line Sold.—The Blue Ridge Traction Company, operating an 8-mile line, which connects Danielsville, Edgemont, Berlinsville, Walnutport and Slatington, Pa., was sold recently to H. Sofranscy Company, Allentown, Pa., junk dealers. It is believed that the new owners will scrap the line.

Mortgage Gold Bonds Offered.— Harris, Forbes & Company and A. C. Allyn & Company, Inc., New York, are offering at 100 and interest, yielding 6 per cent, $2,250,000 of refunding mortgage gold bonds of the Columbus Railway, Power & Light Company, Columbus, Ohio. They are known as the 6 per cent series due 1941. The bonds are dated Dec. 1, 1921, and are due Dec. 1, 1941. The Columbus Railway, Power & Light Company does practically the entire commercial electric light and power business in Columbus and vicinity, and does the entire railway business in Columbus.

Seeks Authority to Abandon in Palo Alto. — The Peninsular Railway has applied to the California Railroad Commission for authority to abandon its street railway system in Palo Alto and adjoining territory lying north of the Southern Pacific Company's tracks and to remove the tracks and equipment. The railway had a loss of $8,538 on these lines during 1923 and $12,523 during 1922. The deficit for its entire system for the year 1923 was $377,737.

Representatives of Bankers on Board. —At the annual meeting of the Public Service Corporation of New Jersey, on April 7, Alfred L. Loomis and Landon K. Thorne of Bonbright & Company, New York, were elected to the board of directors. Bonbright & Company have been identified with the recent financing of the company.

Deficit in New Jersey Slightly Larger.—A deficit of $126,922 was reported by the Public Service Railway, Newark, N. J., for February, compared with a deficit of $112,823 in February, 1923. The company is operating under a temporary schedule which provides within the limits of the larger cities served a 5-cent fare with an additional 5-cent charge in the suburbs, no transfers. In all other parts of the territory the rate of 8 cents, four tokens for 30 cents, 1 cent transfer, continues.

Authorizes Bond Issue. — The Key System Transit Company, Oakland, Cal., has been authorized by the Railroad Commission in a supplemental order to execute a deed of trust to secure the payment of its general and refunding mortgage bonds amounting to $20,000,000, and to issue $8,951,000 of such bonds, $1,365,800 bearing interest at the rate of 6 per cent per annum, and $7,585,200 at the rate of 5 per cent per annum, and to use the proceeds to refund outstanding obligations.

Abandonment of Three-Mile Line Approved.—The Public Service Commission, under an order issued April 9, approved the declaration of abandonment by the Huntington Traction Company, Inc., of that part of its line in Huntington, L. I., south of the Long Island Railroad extending along the highway from Huntington to Siding No. 7, a distance of 3 miles, on the understanding that the railroad is to remove all of its structures and place the highway in good condition. The railroad is to continue between the north side of the Long Island Railroad and Halesite. It was asserted at the hearing that if any abandonment is to be permitted, the railroad should not be allowed to retain that part of its line north of the Long Island Railroad in Huntington. The commission holds that so far as this contention is concerned, the evidence is that public interest requires the continued operation of this part of the road, and further, that the commission has no power to compel a street railroad to abandon a portion of its route without its consent.

Personal Items

Mr. Greenland Goes to St. Louis

Fort Wayne Official Retained to Assist in Extensive Work to Be Done in Connection with Reorganization of the United Railways

SAMUEL W. GREENLAND has resigned as vice-president and general manager of the Indiana Service Corporation, Ft. Wayne, Ind., effective May 15, to go to St. Louis as the representative of Newman, Saunders & Company, Inc., New York, to assist them in their work as agents of the reorganization committee of the United Railways. That firm has recently opened offices in St. Louis. The company with which Mr. Greenland is now connected owns and operates the electric railways in Ft. Wayne, Wabash, Peru and Logansport and the interurban lines connecting Fort Wayne with these cities and with Lafayette and Bluffton, Ind., and does a general power and lighting business. In addition to his connection with the Indiana Service Corporation Mr. Greenland is general manager of the Ft. Wayne & Decatur Traction Company and holds a similar position under the receiver of the Ft. Wayne, Van Wert & Lima Traction Company.

Important Work Ahead

Mr. Greenland's duties at St. Louis have not been specifically defined. There is a vast amount of work to be done in connection with the lifting of the receivership of the United Railways there, and it is to this that Mr. Greenland will at first apply himself. The most important matters to come up immediately are the valuation and franchise questions, with which of course are interwoven the preparation and promulgation of the details of the financial reorganization, in working out which the interests of the city, the public service commission, the court and the present security holders will all have to be reconciled so that the future may best be served.

To the part in this work which Mr. Greenland will take he will bring a combination of exceptional natural talent and a knowledge of utility problems extending over a period of twenty-five years. He is one of the outstanding figures among Middle West railway men, because of his progressiveness in modernizing the operation of the Ft. Wayne properties. A very important piece of work here was his part in the complete recasting of the financial structure of the Ft. Wayne & Northern Indiana Traction Company and the organization of its successor, the Indiana Service Corporation. It seemed like a bitter pill for many of the local security holders to have to accept new substitute securities, with greatly reduced face value, for their former paper. But they had faith in the management and, even though reluctantly, came in on the plan and made possible the initial step toward turning the near-bankrupt property into one able to provide first-class service and make a nice profit on the railway as well as the lighting service.

Since the reorganization, the property has been very nearly wholly re-equipped and rebuilt with the best of rolling stock and increased power facilities, including a changeover to 100

S. W. Greenland

per cent 60-cycle service, doing away with all 25-cycle energy.

In the merchandising of transportation Mr. Greenland has also shown his progressiveness. He was quick to see the virtues of the weekly pass as applied to the conditions confronting him and he has been able to turn that to advantage as a revenue producer and as a means of cementing still closer his friendly relations with the public. And aside from the mechanics of the job, Mr. Greenland has been unusually successful in his relations with his employees, and has in addition made himself a real factor in all the progressive work of the community.

So far as his new work at St. Louis is concerned, it would appear that the future there for him is what he makes it. That being so, Mr. Greenland may be expected to make that future something distinctly worth while to the people of St. Louis and to the investors in that railway.

Mr. Greenland was born at Clarion, Pa., on April 27, 1879. He was educated at the Pennsylvania Military College, Chester, Pa., and at Penn State University, where his work in electrical engineering was concluded in 1900. His first job in the utility field was with the Bell Telephone Company at Pittsburgh in connection with construction work. In 1904 he became connected with Robert W. Watson, consulting engineer, Harrisburg, Pa., where for three years he was engaged principally in making engineering reports for financial interests. In 1907 he became general manager of the Columbus Railway, Light & Power Company, which furnishes the gas, electric light and railway services in Columbus, Miss. At the time the Wabash Valley Traction Company was reorganized to become the Fort Wayne & Northern Indiana Traction Company, in 1911, he went to Fort Wayne as assistant general manager and later in the same year was made general manager. Upon the reorganization of this company into the Indiana Service Corporation in 1920 he was elected vice-president as well as general manager.

Former Sectional Association Head

Mr. Greenland has been active in the Central Electric Railway Association and served as its president during 1922. In 1917 he served as president of the Indiana Electric Light Association. He is a member of the American Institute of Electrical Engineers and the American Society of Mechanical engineers. During the war he was a major in the chemical warfare section of the army and had charge of the erection of a 20,000-kw. steam generating station at the Edgewood (Md.) Arsenal. He also looked after the operation of the utilities at Edgewood.

W. W. Nielson, assistant to A. E. Reynolds, vice-president and general manager of the Springfield Gas & Electric Company and the Sprinfield Traction Company, Springfield, Mo., has been promoted to assistant general manager of the Tucson Gas, Electric Light & Transmission Company, Tucson, Ariz.

Charles A. Blose, assistant line superintendent of the Indiana, Columbus & Eastern Traction Company for several years, has been appointed superintendent of lines, taking the place made vacant by the transfer of C. R. Holland, former superintendent, to a similar position with the Columbus, Newark & Zanesville Electric Railway. Mr. Blose will establish offices at Zanesville.

E. M. Ashworth has been appointed general manager of the Civic Hydro-Electric Commission of Toronto. At the time when the new Toronto Transportation Commission first met in the fall of 1920 Mr. Ashworth, then secretary and assistant general manager of the Hydro commission, was temporarily appointed secretary. At that time P. W. Ellis was unanimously chosen chairman.

Albert C. Spencer, engineer of way of the Toronto Transportation Commission, has become assistant general manager of the commission, which is responsible for the operation of the municipal railway lines in Toronto.

W. C. Lincoln with Electric Service Supplies

Goes to Chicago from National Railway Appliance Company to Become Western Sales Manager

Willis C. Lincoln has been appointed Western sales manager of the Electric Service Supplies Company with headquarters in that company's Chicago office. Mr. Lincoln has resigned from his former connection as manager of sales and engineering for the National Railway Appliance Company, New York.

Willis Lincoln is well known in the electric railway, the steam railroads and the mining fields. He was one of the first engineer salesmen in the railway field. In fact, he applied his early selling instinct to help finance himself through Union College. With money which he earned by two years sales work with the Brewer-Pryor Piano Company, Mr. Lincoln studied electrical engineering at Union University under

W. C. Lincoln

the late Dr. Steinmetz, then head of that department of the university. Theory was all right, but Mr. Lincoln wanted practical experience. To get that he entered upon the regular test course of the General Electric Company just as soon as he finished at the university. Next he went with the consulting engineering department of that company. Later he entered the railway engineering department.

MR. LINCOLN IN SELLING END

Mr. Lincoln's next work for the company was at selling. This was a logical step, equipped as he was to talk in terms of performance and not in terms of appearance. And so he packed his grip as a sales engineer and covered several states for several years backed by an accurate knowledge of the material his company handled.

When the war broke out in the year 1914 Mr. Lincoln resigned his position with the General Electric Company to take charge of the engineering department of the Railway Improvement Company, New York. Later, as manager of sales and engineering of this company, his knowledge of selling was still further broadened, for with that company he had entire charge of marketing the company's products intended for use by steam and electric railways and in mines and other industrial plants.

J. O. Wilson Resigns from Cleveland-Southwestern

A quarter of a century of service with the Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, is the record of J. O. Wilson, who resigned, effective April 15, to accept a position as executive president of the Harvard Savings & Loan Company and the Harvard Mortgage Company. Mr. Wilson started in as a clerk in 1899 with the Cleveland-Southwestern properties, and worked his way up through almost every department to the executive position of secretary and treasurer, which position he held at the time of his resignation.

Alcide E. Beauvais has been elected president of the Montreal Tramways & Power Company, Montreal, Que., succeeding William C. Finley. E. A. D. Morgan and Evariste Champagne have been elected directors. The vice-presidency has not yet been filled and there remain three vacancies on the directorate.

J. E. Heston, formerly superintendent of shops of the Interstate Public Service Company at Scottsburg, Ind., has resigned, effective May 1, to enter other fields of work. Mr. Heston entered the service of the Union Traction Company of Indiana in September, 1900, and with the exception of two and one-half years, when he was in the service of the Winona Interurban Railway, was with that company continuously until May 15, 1923. It was on that date that he entered the service of the Interstate company.

Albert Swartz, formerly a receiver for the Toledo & Western Railroad, Toledo, Ohio, has been retained by the successor company and will have complete charge of operations. He was vice-president of the Community Traction Company at its beginning and previous to that time was in the employ of the Toledo Railways & Light Company and the Toledo & Western Railroad. He served a short time in the New York offices of Henry L. Doherty & Company, New York, after graduation from Toledo schools. His preliminary engineering work was done on railroads near Toledo. Mr. Swartz will continue to reside in Toledo. He will have his offices at Sylvania, at which place the headquarters of the Toledo & Western are located.

L. Sommers, formerly superintendent of way, subway and elevated division of the Philadelphia Rapid Transit Company, Philadelphia, Pa., has recently been appointed assistant operating manager of the subway and elevated division. C. C. Haney has been made operating manager.

Raymond Page has become manager of the Hornell Traction Company, Hornell, N. Y., following the vote of the bondholders to have the interests of the company turned over to Mr. Page and W. C. Whitaker. Robert W. Bull retires as receiver.

John R. Marshall Promoted in New Brighton

John R. Marshall, chief dispatcher of the Beaver Valley Traction Company and the Pittsburgh & Beaver Street Railway, New Brighton, Pa., has been advanced to the position of superintendent of transportation. The appointment of Mr. Marshall followed the change in general managership made effective when W. H. Boyce accepted the position of commercial manager with the Pittsburgh Railways and was succeeded at New Brighton by Clinton D. Smith as general manager.

Mr. Marshall has been with the company since 1902. In his early years of association with the Beaver Valley company he accepted a job as motorman at the request of John Buchanan, then president of the Beaver Valley Traction Company. For three years he operated a car, at the same time learning the duties of a conductor. Later he was advanced to assistant dispatcher. A year after he was made chief dispatcher,

J. R. Marshall

and it is this position which he now vacates to become superintendent of transportation.

Mr. Marshall was born on a farm on April 6, 1869. He has always made Beaver County his home. He attended the country schools, but as the oldest of eight children, he early obtained a job and board on a farm. His next venture was turning a boring wheel for ten hours a day at a wage of 50 cents a day. He spent seven years in a lumber camp and two years as a tool dresser and teamster in the oil fields of Butler County. Mr. Marshall's father died in 1897 and for five years thereafter he conducted the homestead farm. Later he moved to Beaver with his mother.

Obituary

J. S. Simpson

J. S. Simpson, auditor of the Washington Water Power Company and the Spokane United Railways, Spokane, Wash., died very suddenly on April 5, following an attack of apoplexy. He had been connected with the companies since 1918. Before that Mr. Simpson

was chief accounting officer of the Washington Public Service Commission. Mr. Simpson was born at Greenland, N. H., in 1871. His first business connection was with the Thomson-Houston Company at Boston. He remained with that company and its successor, the General Electric Company, until 1901. In that year he went to Tacoma to enter the employ of Stone & Webster. D. L. Huntington, president of the enterprises of which Mr. Simpson was an officer, said that "not only had the companies lost a valuable man, in the death of Mr. Simpson, but that the city and the Inland Empire had lost a real friend."

J. E. Barhite

John E. Barhite, for eleven years special County Judge of Monroe County and a member of the Public Service Commission for the Second District of New York from 1917 to 1921, died in Rochester on April 2. He was appointed Public Service Commissioner by Gov. Charles S. Whitman upon the recommendation of the late George W. Aldridge, Rochester, Republican leader. Mr. Barhite was sixty-seven years old.

Lyman K. Brown, for many years treasurer of the Fonda, Johnstown & Gloversville Railway, Gloversville, N. Y., died recently at the age of seventy-five years.

Frank M. Harris, treasurer of the Des Moines City Railway, Des Moines, Iowa, died recently. He had been connected with the Des Moines City Railway since 1897. At the time of his death he was treasurer and general purchasing agent for the company. Mr. Harris was born in the city of Cleveland, Ohio, in 1865.

William C. Hawkes, seventy-nine years old, of Dorchester, died recently at Newton, Mass. Had it not been for a brief period when he was away from Boston, he would have had a record of the longest unbroken service with the Boston Elevated Railway. His first railway connection was with the old Lynn & Boston. Later he became connected with the Highland Street Railway, Boston.

Andrew L. Campbell, formerly chief of the electrical repair department of the United Electric Railways, Providence, R. I., died recently. He was first employed at the power station and later was placed in charge of substations. He had been with the company twenty-seven years.

John Freeman, formerly in the employ of the Northern Ohio Traction & Light Company, Akron, Ohio, died recently at the age of sixty-three years. He entered the service of the company in 1897 as motorman on the Akron city division. One year later he was appointed inspector. Later Mr. Freeman was transferred to New Philadelphia in charge of the lines in that section. Following this assignment he went to Canton as assistant to D. A. Scanlon, then superintendent of the southern division. In 1917 he was retired from service. He was the father of O. L. Freeman, present Akron city superintendent.

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

Further Reduction in Varieties of Paving Brick

At a meeting of the permanent committee on simplification of varieties and standards of vitrified paving brick of the United States Department of Commerce, held in Washington, D. C., March 28, the recognized types and sizes of vitrified paving brick were reduced from six to five. Since the first conference on paving brick simplification was held Nov. 15, 1921, manufacturers throughout the country have reduced the number of types and sizes of vitrified brick used for highway paving and street track paving from sixty-six to five.

The recognized types and sizes as determined upon by the committee through a process of elimination over three years are: Plain wire cut brick, 3 in. x 4 in. x 8½ in. and 3½ in. x 4 in. x 8½ in.; repressed lug brick, 4 in. x 3½ in. x 8½ in.; wire cut lug brick, 3 in. x 3½ in. x 8½ in. and 4 in. x 3½ in. x 8½ in.

The one type and size eliminated by the committee at its last meeting was the 3½-in. x 3½-in. x 8½-in. wire cut lug (Dunn). This elimination, like all eliminations that have taken place since the work of simplification was taken up by the committee, was determined upon only after a survey of the industry's shipments revealed that certain sizes had steadily declined in favor among engineers of the country to a point where they constituted an exceedingly small percentage of the total shipments of the industry.

For guidance at this and future meetings the committee adopted a resolution to the effect that "any variety of brick which shows less than 2½ per cent of total shipments for three consecutive years be eliminated and that any variety of brick which shows 5 or more per cent of the shipments for three successive years be reinstated in the list of recognized types and sizes unless special technical or other reasons show that such action is undesirable; provided, further, that the recognized types and sizes shall represent not less than 75 per cent of production."

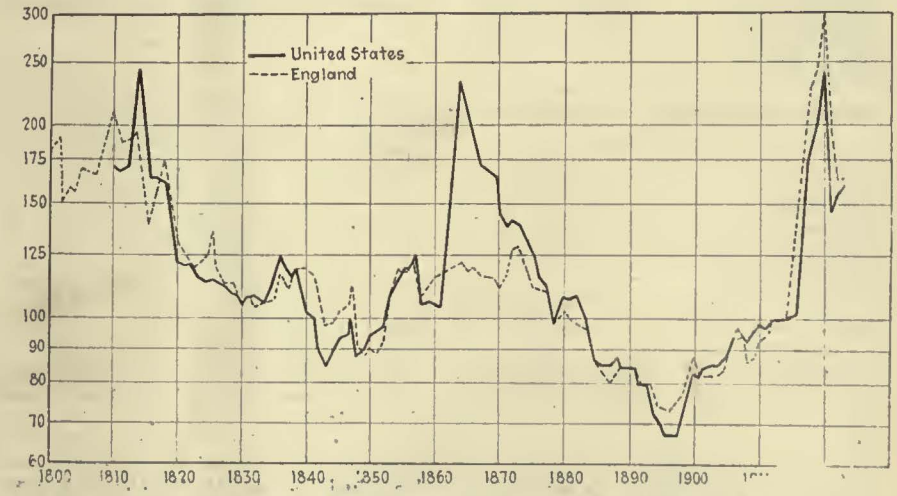
The survey of the paving brick industry made in connection with the simplification conference reveals the fact that the industry has experienced a steady growth since the year of lowest production in 1918. In 1923 shipments reached the high figure of 453,864,183.

G. E. First Quarter Orders Show Decrease

Orders received by the General Electric Company, Schenectady, N. Y., for the three months ended March 31 total $73,487,903, Gerard Swope, president, announced recently. This is a decrease of 8 per cent over the first quarter of 1923, when orders totaled $80,010,045.

Commodity Prices Here and in England Since 1810

In testifying in the International Railway valuation case, referred to in the ELECTRIC RAILWAY JOURNAL, issue of April 12, Dr. Jacob H. Hollander, professor of political economy in Johns Hopkins University, presented the originals of a number of charts in support of his conclusions. Among them were studies showing the trend of prices in the United States from 1913 to 1923, bank credit, gold reserves and federal reserve notes, 1919-1923; prices in the United States, 1913-1923; production in basic industries and volume of business, 1919-1923, and commodity prices in the United States, 1810-1923, and in England, 1800-1923, the last reproduced herewith.



Commodity Prices in the United States, 1810-1923, and England, 1800-1923. Prices in 1924=100

Electric Drills Reduced in Price

An increased rate of production, resulting from the greater demand for electric tools, has enabled the Hisey-Wolf Machine Company, Cincinnati, to reduce its prices. The new price list became effective on March 17. Electric drills of the more popular sizes have been reduced in price from 12½ per cent to 17 per cent. Other reductions range from 5 to 10 per cent.

$22,988 Awarded to 1,752 General Electric Workers for Suggestions

Awards totaling $22,988 were paid to 1,752 employees of the General Electric Company during 1923 for suggestions which increased the efficiency of the company's operations. The suggestions ranged from safety devices for the protection of workers to improved methods of manufacturing electrical apparatus. The highest awards amounted to $500.

During the year 8,078 suggestions were filed, representing about one-tenth the employees of the company. The Philadelphia works leads, with 43 per cent of its workers offering suggestions, and the Edison Lamp Works at Harrision, N. J., tops the list in suggestions accepted, with 48 per cent.

Suggestions are sent to a special committee in each works. This committee investigates the suggestion, passes upon the merit and either makes an award to the man or woman who made the suggestion or explains why the suggestion cannot be effectively adopted. In most cases the award is made within a few weeks after the suggestion is received.

Metal, Coal and Material Prices

Metals—New York	April 15, 1924
Copper, electrolytic, cents per lb.	13.475
Copper wire base, cents per lb.	15.875
Lead, cents per lb.	8.15
Zinc, cents per lb.	6.38
Tin, Straits, cents per lb.	49.25
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.20
Somerset mine run, Boston, net tons	2.35
Pittsburgh mine run, Pittsburgh, net tons.	1.875
Franklin, Ill., screenings, Chicago, net tons	2.175
Central, Ill., screenings, Chicago, net tons.	1.90
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.65
Weatherproof wire base, N.Y., cents per lb.	17.50
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.	$0.99

Rolling Stock

Menominee & Marinette Light & Traction Company, Menominee, Mich., proposes to buy seven new cars at a cost of $50,000.

Grand Rapids Railway, Grand Rapids, Mich., is planning the purchase of twenty new cars.

Department of Street Railways, Detroit, Mich., has just awarded contracts for seventy-five new Peter Witt type cars and will ask for ten new three-car trains similar to the one which has been tried out on the Detroit city lines and is now in operation on Woodward Avenue. Although bids have been asked for 100 new Peter Witt type cars of the large model, contracts were awarded for only seventy-five, street railway officials having decided, after the favorable results obtained from the three-car train, to ask for bids on ten such trains, thus making 105 new cars in all, counting the Peter Witt cars.

Track and Line

Pacific Electric Railway, Los Angeles, Cal., will shortly start extending its track through the heart of Belmont Shore Place and Naples, by way of Second Street. Approximately 7,000 ft. of track will be laid, beginning at Livingston Drive, bridging Alamitos Bay and continuing on through Naples to connect with the Newport-Los Angeles line.

Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich., has doubled its trackage on the docks at Grand Haven.

Toronto Transportation Commission, Toronto, Canada, has already assigned employees to the rearrangement of poles and wires necessary to permit the laying of the curves which will connect the Parliament Street line with the Bloor Street tracks. The rails will be connected with the Bloor Street line and with the loop, which will be built on the plot of land lying east of Parliament and immediately south of the viaduct. It is expected that track laying will start soon and that the loop will be in use within a month.

Seattle Municipal Railway, Seattle, Wash., may build an extension of the Cowen Park line if the petition recently put before the City Council meets with approval. City Engineer J. D. Blackwell estimates the cost of the proposed extension at $125,000, which would pay for the laying of a double track from the present terminus of the line to East Sixty-fifth Street, and for the laying of a single track from East Sixty-fifth Street to Bothell Way, the proposed new terminus. This estimate includes a trestle across the park gulch. For the $125,000 expenditure, 2,100 50-ft. blocks would be included in the assessed district.

Trade Notes

Ohmer Fare Register Company, Dayton, Ohio, in order to complete the acquisition of the American Taximeter Company, New York, and to meet the demands of the company's fast-growing business, has arranged with Spitzer, Rorick & Company, Toledo, for an offering of $600,000 of the 7 per cent serial gold notes. The notes, offered at 101 and interest, are dated April 1, 1924. The American Taximeter Company manufactured a taximeter of the non-recording type which will hereafter be manufactured by the Ohmer Fare Register Company. The plan for the acquisition of this property by the Ohmer Fare Register Company was described in detail in the ELECTRIC RAILWAY JOURNAL, issue of March 15, page 437.

Yale & Towne Manufacturing Company, Stamford, Conn., recently appointed Herbert Charles Rahm advertising manager. In this capacity he succeeds Francis Juraschek, who resigned to enter business for himself. The new advertising manager's first position was as clerk in the advertising department of P. & F. Corbin in New Britain, Conn. In 1915 he received an offer from Sargent & Company to enter its service. Here he took care of all the catalog work. In September, 1922, he went with Yale & Towne as assistant advertising manager. Since August of last year he has been in full charge of the advertising department owing to the continued illness of Mr. Juraschek.

William Lintern, president of the Nichols-Lintern Company, Cleveland, has made a business trip to New England and the Eastern cities. He reports his trip productive of much valuable data relative to the new stop-light which his firm is about to place on the market. He promises a definitive advance, in the shape of a highly simplified system, which will reduce installment and maintenance costs to a minimum.

New Advertising Literature

Century Wood Preserving Company, Pittsburgh, Pa., has issued a bulletin on the "Shipley Treating Unit." The bulletin describes the effectiveness, advantages, construction and capacity as well as uses and availability of the "Shipley Treating Unit."

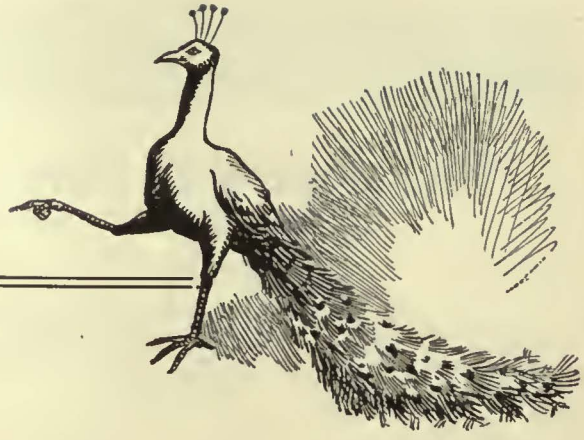
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently published a new booklet, known as Folder 4532-A, dealing with Westinghouse fabrics and papers for insulating purposes. All the forms of treated and untreated fabrics, papers, sleeving, tapes, cord and thread manufactured by the company are fully described in the booklet and their principal applications given. The materials described in this folder are used in the manufacture of Westinghouse electrical apparatus and made available to the general trade.

Crouse-Hinds Company, Syracuse, N. Y., has issued folder No. 12 entitled "Condulets for Concealing in Concrete."

Detroit Electric Furnace Company, Detroit, Mich., has just issued a new publication on brass melting. This booklet tells, first, that the electric furnace is a factor of ever increasing value in brass melting. It next enumerates the economies effected by the electric furnace, and then shows how complete control of analysis, color, texture and homogeneity of the alloy is secured through the electric furnace.

Page & Hill Company, Minneapolis, Minn., has issued a new publication called "Practical Information About Cedar Poles and Butt-Treating." This handbook covers information on the storage of poles, painting of poles, the proper and improper methods of unloading cars, counting and tallying and other practical data for use of engineers, purchasing agents, yard superintendents, foremen and foremen of line crews.

—it's the way it works that counts!



Peacock Staffless Brake

Meets All Requirements

Because it is more powerful, quicker-acting, and of greater chain-winding capacity, the Peacock Staffless Brake is superior for safety cars. That's why it has been chosen over other hand brakes on many roads.

It's not a matter of looks, finish, sentiment or even first cost. It's a question of getting a dependable hand brake, with an established reputation for fulfilling its job in case of emergency. The Peacock Staffless Brake is known to this field as the first satisfactory solution of the safety car hand brake problem.

It meets the other requirements too—occupies minimum platform space, is light in weight and without question is most economical in the long run.

Specify

Peacock Staffless for Safety Cars.

National Brake Co., Inc.

890 Ellicott Sq., Buffalo, N. Y.

Canadian Representative:

Lyman Tube & Supply Company, Limited, Montreal, Canada

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
115 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

The J. G. White Engineering Corporation
Engineers—Constructors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

STONE & WEBSTER
Incorporated
EXAMINATIONS REPORTS APPRAISALS
ON
INDUSTRIAL AND PUBLIC SERVICE PROPERTIES
NEW YORK BOSTON CHICAGO

JOHN A. BEELER
Operating, Traction and Traffic Investigations
Routing Surveys—Valuations—Operation
Management
52 Vanderbilt Ave., NEW YORK

SANDERSON & PORTER
ENGINEERS
REPORTS, DESIGNS, CONSTRUCTION, MANAGEMENT
HYDRO-ELECTRIC DEVELOPMENTS
RAILWAY, LIGHT and POWER PROPERTIES
CHICAGO NEW YORK SAN FRANCISCO

ENGELHARDT W. HOLST
Consulting Engineer
Appraisals, Reports, Rates, Service Investigation, Studies on Financial and Physical Rehabilitation Reorganization, Operation, Management
683 Atlantic Ave., Boston, Mass.

THE ARNOLD COMPANY
ENGINEERS—CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
105 South La Salle Street
CHICAGO

WALTER JACKSON
Consultant on Fares, Buses, Motor Trucks
Originator of unlimited ride, transferable weekly pass. Campaigns handled to make it a success.
143 Crary Ave., Mt. Vernon, N. Y.

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS—APPRAISALS—RATES—OPERATION—SERVICE

DAY & ZIMMERMANN, INC.
ENGINEERS
Design, Construction
Reports, Valuations, Management
NEW YORK PHILADELPHIA CHICAGO

Parsons, Klapp, Brinckerhoff & Douglas
WM. BARCLAY PARSONS H. M. BRINKERHOFF
EUGENE KLAPP W. J. DOUGLAS
Engineers—Constructors—Managers
Hydro-electric Railway Light and Industrial Plants
Appraisals and Reports
CLEVELAND 1570 Hanna Bldg. NEW YORK 84 Pine St.

JAMES E. ALLISON & CO.
Consulting Engineers
Specializing in Utility Rate Cases and Reports to Bankers and Investors
1017 Olive St., St. Louis, Mo.

STEVENS & WOOD, INC.
Design and Construction of Power Stations
Railroad Electrification, Industrial Plants
REPORTS AND APPRAISALS
Management and Financing of Utilities and Industrials
Youngstown New York

HUMAN ENGINEERING
Railway Audit and Inspection Company, Inc.
Fourth and Chestnut Sts., Philadelphia
Boston New York Pittsburgh BRANCHES Baltimore Chicago Atlanta New Orleans St. Louis

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
43 Cedar Street, New York City

Byllesby Engineering & Management Corporation
208 S. La Salle Street, Chicago
New York Tacoma

GREATER COMFORT—GREATER SPEED—GREATER SAFETY—GREATER PROFITS

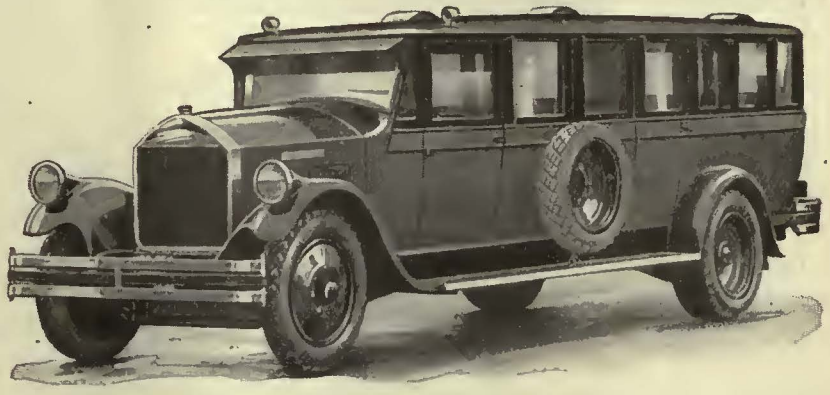
Pierce-Arrow Busses Win *Friends* —and Earn Greater Profits

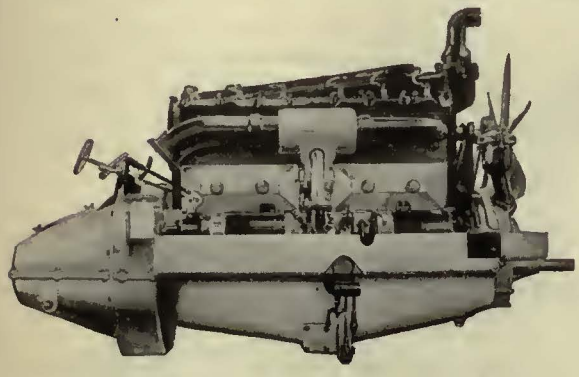
Standard Chassis

$4600

for 196-inch wheelbase, $4750 for 220-inch wheelbase, at Buffalo. Including starter, battery, generator, solid tires and electric lights. Pneumatic tires and disc wheels optional at extra cost.

Terms if desired





The Pierce-Arrow 6-Cylinder Bus Engine

The silent Dual-Valve, Dual-Ignition Pierce-Arrow Bus Engine develops over 100 horsepower at 2500 revolutions per minute. Road speeds of from 45 to 50 miles an hour can be maintained readily, if desired. Six-cylinder flexibility reduces gear-shifting.

It is a demonstrable fact that the Pierce-Arrow Motor Bus is more comfortable and more stable than a Limousine. Sideway is absent. The long wheelbase is one reason for this. The exceptionally wide tread is another. Perfect spring suspension is another. Passengers can ride for hours at high road speeds without fatigue.

We will gladly arrange for a complete demonstration of the Pierce-Arrow Motor Bus at the factory or at principal distributing points.

The name Pierce-Arrow represents the utmost in luxurious motor transportation. It attracts riders—and every Pierce-Arrow rider is a *satisfied* passenger. He rides oftener and praises the luxury and comfort of the service to his friends.

Electric railways who extend or augment their facilities with modern Pierce-Arrow Motor Busses win the good-will of thousands of patrons—and insure greatly increased revenue.

From an operating standpoint, Pierce-Arrow Motor Busses are ideal. They maintain fast headway. The silent, vibrationless 100 horsepower engine is surprisingly economical. They cost less to run and less to maintain. They maneuver easily; the turning radius is unusually short. They are as easy to drive as a big touring car.

Our engineers will be glad to go into detailed facts and figures with railway representatives. And the coupon will bring interesting information about the bus, itself.

The Pierce-Arrow Motor Bus Chassis, produced in two lengths of wheelbase, will accommodate the de luxe, sightseeing or pay-enter types of wood or steel bodies, ranging from 18-passenger capacity upward.

THE PIERCE-ARROW MOTOR CAR COMPANY
Buffalo, N. Y.

Pierce-Arrow

SEND THIS COUPON FOR FULL INFORMATION

THE PIERCE-ARROW MOTOR CAR CO., Buffalo, N. Y.

Gentlemen: Please send me literature and complete information about the Pierce-Arrow Six-Cylinder Motor Bus and various types of bodies.

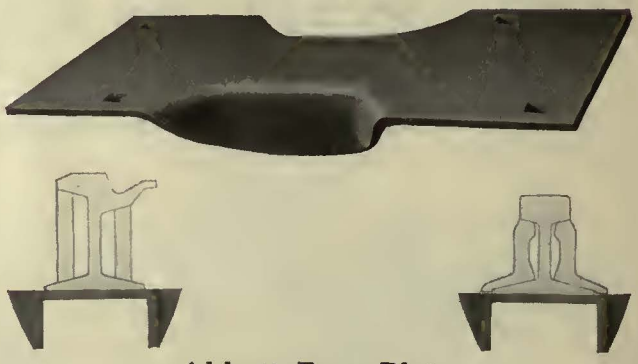
Name.....

Address.....

Support the Rail Joint!

Center Rib Base Plate

The Center Rib Base plate provides reinforcement and support directly under the center of the rail. It supports the joint and prevents "battering," or "cupping" of the rail ends. It is designed for use with either bolted or welded joints — in the latter case the plate is usually welded to the rail, thus imparting additional strength and stiffness to the joint. Particularly adapted for reinforcing old joints.



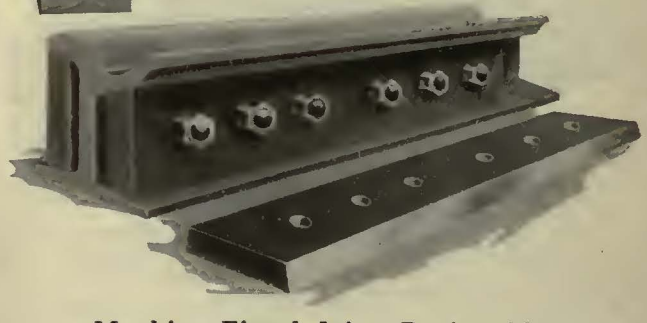
Abbott Base Plate

In the Abbott Base Plate the reinforcement is located on each side of the rail instead of in the center. The joint is thus supported and "battering" and "cupping" of the rail ends is prevented. It may be used with either bolted or welded joints — in the latter case it is usually welded to the rail, thereby imparting additional strength and stiffness to the joint. Particularly adapted for reinforcing old joints.

Machine Fitted Joint, Design 983

Machine Fitted Joints, Design 983 are made from heavy rolled steel bars and are first cut to length and punched. As the last operation, the top and bottom are accurately machined to a true bearing surface free from kinks, wind, burrs, and mill scale. The special top and bottom bevel is provided for electric seam welding. In this design the bottom is reinforced at the center of the joint. A special steel is used so as to secure maximum strength in the weld. Joints can be made in any length, thickness or drilling.

Joints made for any rail section: new, obsolete or foreign



Machine Fitted Joint, Design 980

Machine Fitted Joints, Design 980 are made from heavy rolled steel bars and are first cut to length and punched. As the last operation the top and bottom are accurately machined, producing a true bearing surface, free from kinks, wind, burrs, and mill scale. The joints are made in any length, thickness or drilling to fit any rail section: foreign, domestic, obsolete, new or worn. Where rails are old, rusty and corroded the joint can be made oversize. Special designs are made for either electric seam weld or bolted joints.

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

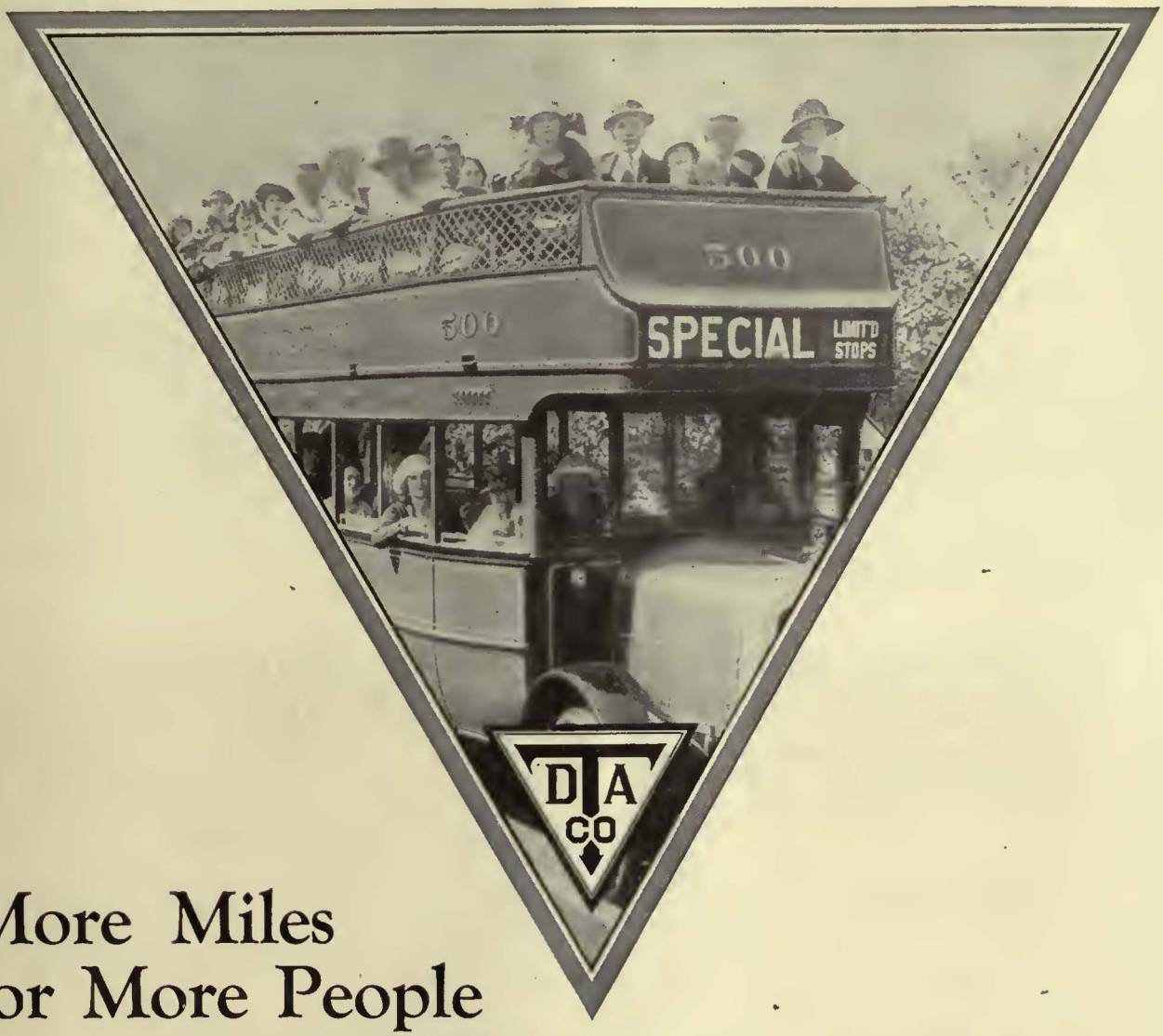
Sales Offices:

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Detroit Cincinnati Chicago St. Louis San Francisco

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM

TIMKEN



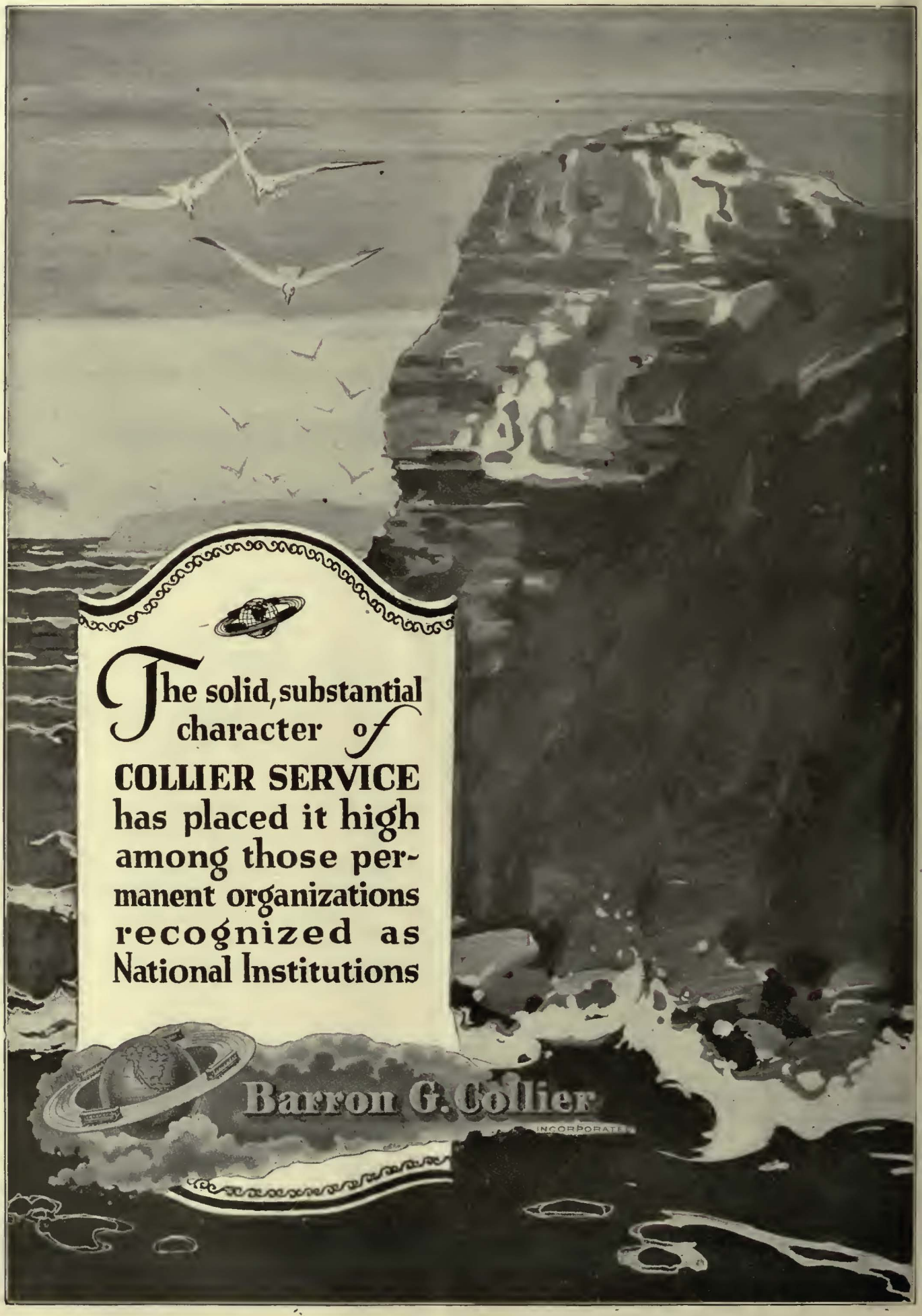
More Miles for More People

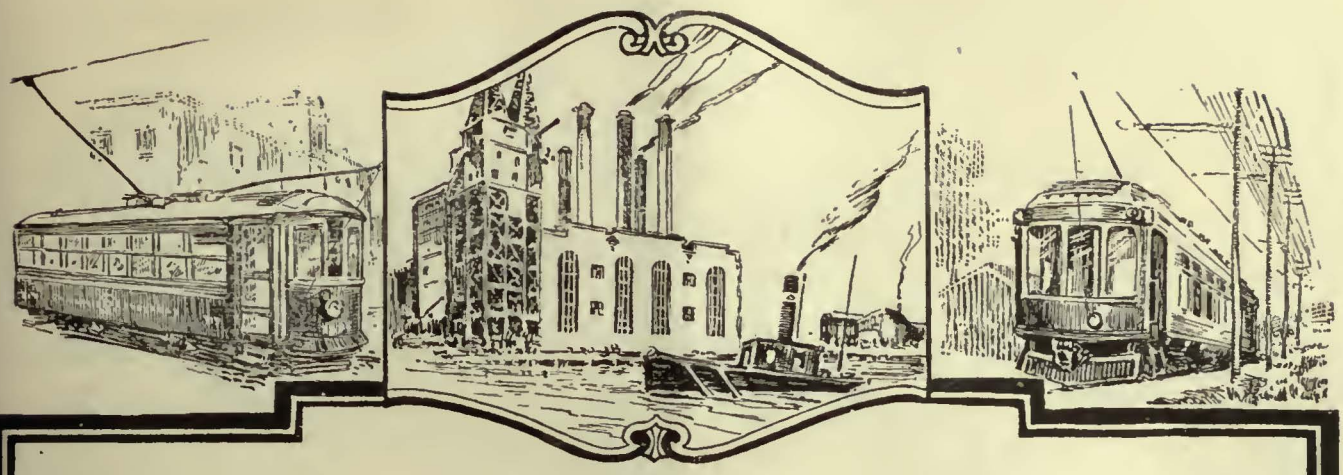
The motor coach adds its quota to our total transportation. Whether double-decker in the city or single on the interurban highway, it creates new business, not only for itself, but for steam and electric lines as well.

The key notes in its progress are comfort, convenience and safety; and in its development, as in that of every other type of automotive vehicle, Timken-Detroit Axles have played an important part.

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT, MICHIGAN

AXLES


The solid, substantial character of
COLLIER SERVICE
has placed it high among those permanent organizations recognized as National Institutions
Barron G. Collier
INCORPORATED



Read the Answer On the Cars

ALL over this broad land thousands of car journals are turning gratefully on a thin but adequate film of Texaco Car Oil. Hundreds of millions of car miles on Texaco—and more as roads renew their contracts and additional roads come to Texaco.

That record is better than anything we can say here.

But better yet is the record of reduced maintenance that follows the introduction of Texaco Car Oils.

Intelligent operating men have come to learn *there* is the place to look for results.

Texaco Lubrication Engineers, with their helpful co-operation, are showing them just how much—or rather how little Texaco Car Oil is needed and they are, from their widespread experience, exchanging ideas as to the best methods of application.

RESULTS—

ECONOMY, HARMONY, CONTINUED USE OF TEXACO CAR OILS.

Texaco Car Oils are made in two grades:

Texaco Car Oil—Summer
Texaco Car Oil—Winter

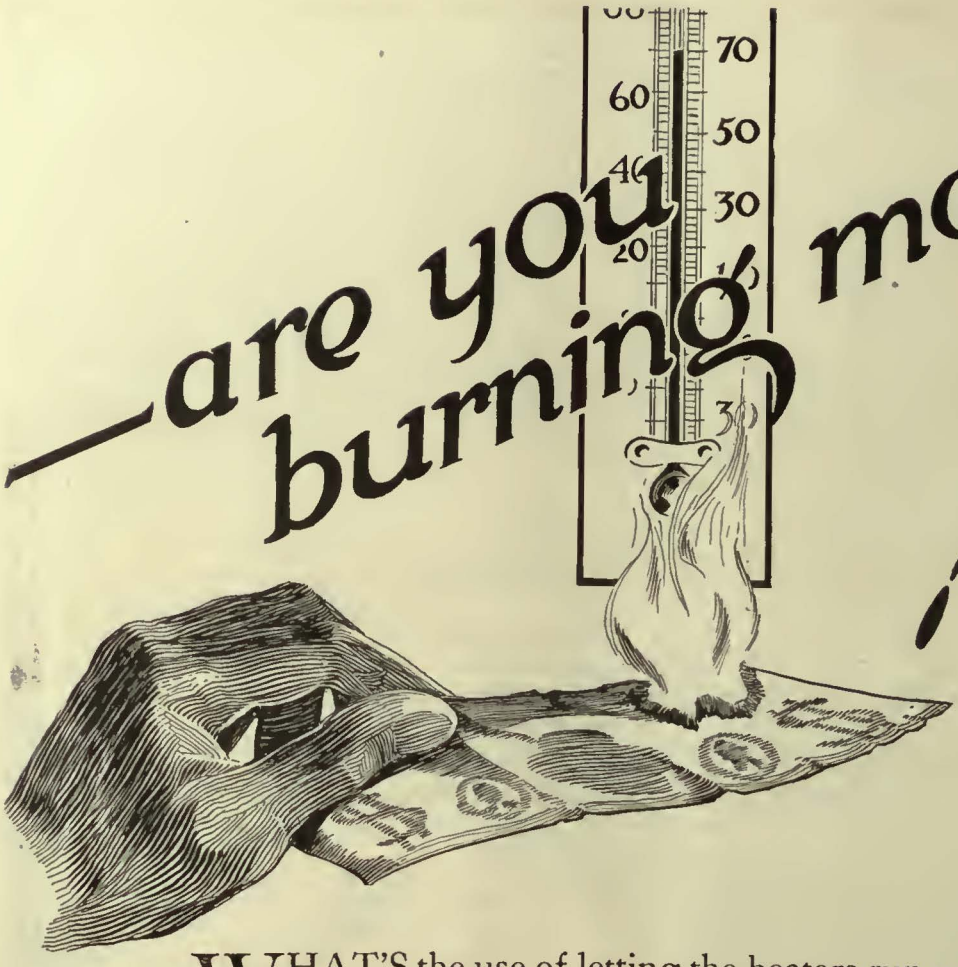
They will take care of all temperature and operating conditions.

On the basis of the excellence of Texaco Car Oils we are securing and holding business; for these oils are important enough to make any road come to Texaco. And, in addition to the savings that are brought about by Texaco Car Oils, roads find additional profits in the use of the rest of the Texaco Line.

There is a Texaco Lubricant for every Street Railway purpose. You will like them all after you use them. And you will like the way Texaco Engineers go about co-operating with your men for improvement of lubricating conditions all along the line.

THE TEXAS COMPANY

DEPT. R-J · 17 BATTERY PLACE · NEW YORK CITY
HOUSTON · CHICAGO · NEW YORK
OFFICES IN PRINCIPAL CITIES



—are you burning money?

WHAT'S the use of letting the heaters run when they are not needed? When somebody merely opens a door or window to cool off, and then there's a call for more heat.

Current means coal and coal means cash.

Control Electric Car Heaters and save cash with CONSOLIDATED New Visible Thermostat

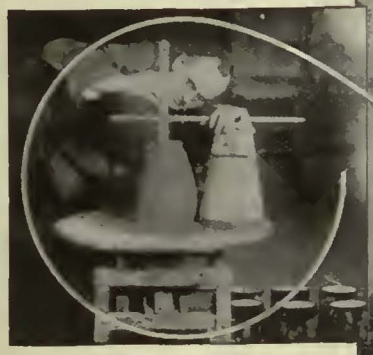
Adequately protected, yet entirely visible. Eliminates failures through malicious injury or tampering with thermostat equipment. Inspection time reduced to a glance.

"Keeps nothing under cover"

Write for information on the visible thermostat and new simplified and compact magnetic switch.

Consolidated Car Heating Co.

Albany New York Chicago



On the job at Newark Bay. By means of this simple slump test, any competent inspector can easily control the quantity of mixing water and, therefore, the strength of the resulting Concrete.

The new, four-track Central Railroad of New Jersey Bridge over Newark Bay will be located 100 feet north of the present structure. The new track level will be 30 feet higher than the old.

New structure is to be 7500 feet long with Concrete Piers weighing 1500 tons each.

Quality Control in the Field

Central Railroad of New Jersey engineers believe in putting the laboratory to work right on the job.

In the Concrete construction, shown above, they are regularly applying approved methods of field control to keep the quality of the Concrete uniform and particularly to maintain desired strength.

Strengths are verified at regular intervals by testing field cylinders.

Proportions of fine and coarse aggregates are accurately determined by fineness modulus.

Slump tests are being made daily to control consistency.

This is only one of many jobs where the most modern field methods of control are directly helping to assure better Concrete with greatest economy.

* * *

The work on the Newark Bay Bridge is being done under the direction of A. E. Owen, Chief Engineer, J. J. Yates, Bridge Engineer, and H. E. Van Ness, Construction Engineer, Central Railroad of New Jersey.

Let us tell you more about the practical advantages of field methods of quality control. Write the nearest office listed below for your free copy of "Concrete Data for Engineers and Architects."

PORTLAND CEMENT ASSOCIATION

A National Organization to Improve and Extend the Uses of Concrete

Atlanta	Denver	Kansas City	New York	Salt Lake City
Birmingham	Des Moines	Los Angeles	Oklahoma City	San Francisco
Boston	Detroit	Memphis	Parkersburg	Seattle
Charlotte, N. C.	Helena	Milwaukee	Philadelphia	St. Louis
Chicago	Indianapolis	Minneapolis	Pittsburgh	Vancouver, B. C.
Dallas	Jacksonville	New Orleans	Portland, Oreg.	Washington, D.C.

ONE HUNDRED YEARS 1824 1924 OF PORTLAND CEMENT

The unique three-car articulated train for the City of Detroit

These cars include many of the latest developments in equipment, including for their *fending equipment* the dependable, rugged and always-safe H.B. LIFE GUARDS.

We manufacture fending equipments up to a standard calling for the component parts to be of the best, strong and rigid to withstand service conditions, quick-acting, efficient and low in maintenance cost.

Our years of experience in building these equipments qualify us to know that to cheapen a guard weakens it.

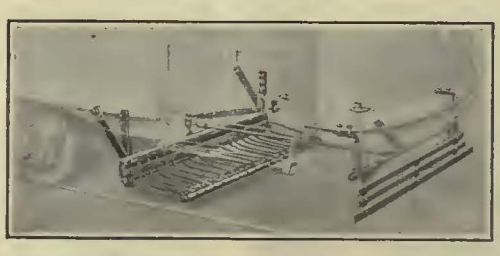
To get what years of experience have taught us under all conditions to be the best —

Specify

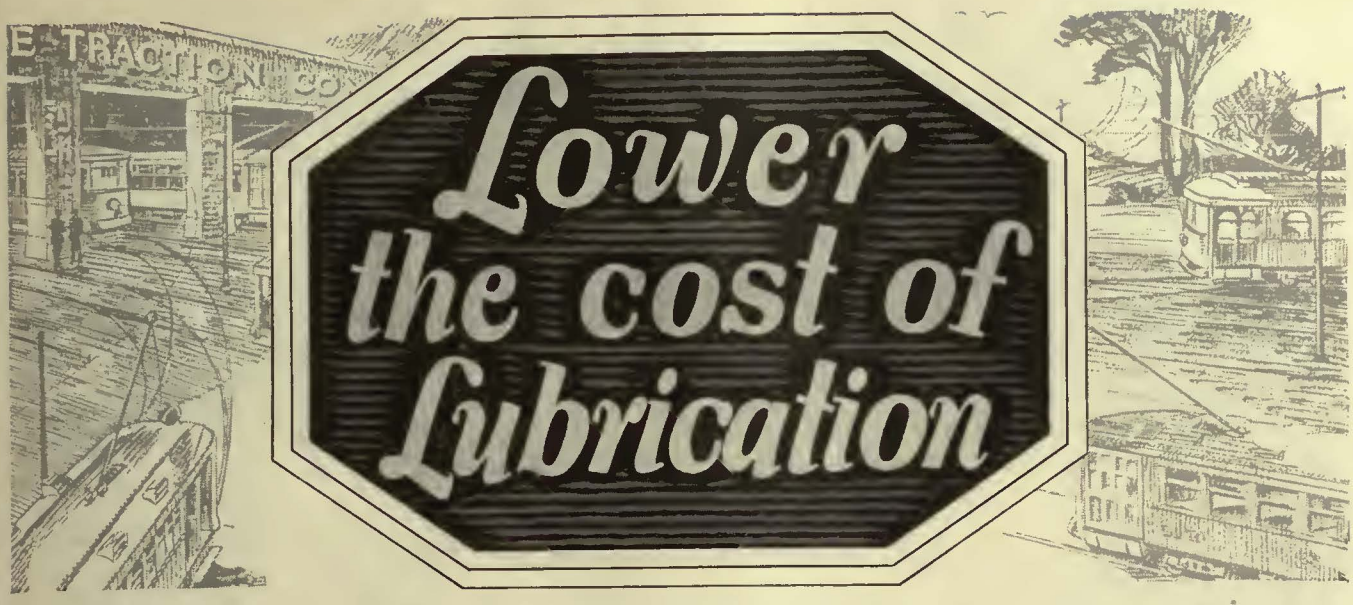
"To Be Manufactured By the Consolidated Car Fender Co."

WENDELL & MacDUFFIE CO., 110 East 42d St., New York

General Sales Agents



H. B. LIFE GUARDS



WHEN you set out to lower your operating costs, consider the reductions you can make by lubricating all of your equipment properly with Standard Oils and Greases.

The proper use of these lubricants will minimize bearing failures, and eliminate pull-ins. It will reduce labor costs by extending time between oiling periods.

The purchase price of these oils and greases represent only 2% or 3% of your total maintenance cost, yet this cost may be substantially reduced by taking advantage of the superior service they render.

Records in our files prove these figures.

An Indiana Traction Company, following the recommendations of our engineering staff, reduced the cost of lubricating their equipment 50%.

Another Company, located in Michigan, after a six months' trial, during which they were guaranteed that their costs would not increase, effected a saving of 30%.

The reductions in lubricating costs which these companies enjoy are typical of the service rendered by Standard Lubrication Engineers and Standard Lubricants. They indicate the possibility of reducing your own maintenance costs.

The first step toward making these reductions practical is to write to our nearest branch requesting the service of a Standard Lubricating Engineer. The report he will make after studying your lubricating requirements will put you under no obligation except to yourself, for it will point out the way for you to lower lubricating costs.

STANDARD OIL COMPANY
(INDIANA)
910 S. Michigan Avenue CHICAGO, ILLINOIS

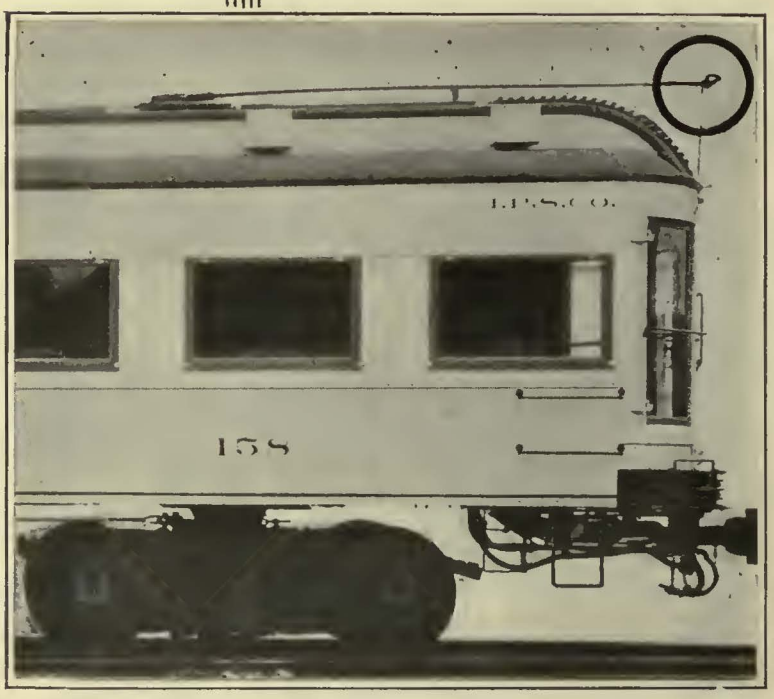
ILLINOIS	INDIANA	IOWA	S. DAKOTA	N. DAKOTA	MINNESOTA	MISSOURI
Chicago	Evansville	Davenport	Huron	Fargo	Duluth	Kansas City
Decatur	Indianapolis	Des Moines	MICHIGAN	Minot	Mankato	St. Joseph
Joliet	South Bend	Mason City	Detroit	WISCONSIN	Minneapolis	St. Louis
Peoria	KANSAS	Sioux City	Grand Rapids	La Crosse		
Quincy	Wichita		Saginaw	Milwaukee		

Of course they are—

MILLER TROLLEY SHOES

(patented)

On the Interstate Public Service Company's Cars



Big cars, fast cars, luxurious cars—they're also quiet-riding cars. That disagreeable hum and vibration so commonly experienced on cars where trolley wheels are used is conspicuously absent. Miller Trolley Shoes because of their smooth sliding contact, afford noiseless operation.

Officials of this prominent interurban agree with many other railway operators in reporting that Miller Trolley Shoes give rise to fewer dewirements and cause no more wear on trolley wire than wheels.

Increased mileage
No lubrication
No bushings

Miller Trolley Shoe Company

295 Columbia Road, Boston-21, Mass.

WHAT size of conduit? What about elbows? Questions instantly and authoritatively settled for any job where rigid conduit is to be installed.

This Chart hangs on the wall as handy as a calendar—and as necessary when wiring must be figured.

It is a quiet reminder of *Sherarduct*—the Rigid Conduit. The Chart is free, and so intensely practical you will regularly use it.

National Metal Molding Company

WORLD'S LARGEST PRODUCERS OF ELECTRICAL CONDUITS AND FITTINGS

1149 Fulton Building, Pittsburgh, Pa.

Represented in All Principal Cities

10

Sherarduct

The Rigid Conduit That Bends

Make certain on every wiring job with this free Chart. Just slip this coupon in the mail now; that's all you need to do.

MAIL TODAY

National Metal Molding Company
Pittsburgh, Pa.

Please send free Chart of Standard Sizes of Conduits.

SIGN—TEAR OFF

Name _____

Firm _____

Address _____

SYMINGTON

SEMI-STEEL JOURNAL BOXES

An Easy Demonstration

HAND file a few strokes on the machined pedestal ways of a Symington Semi-Steel Journal Box.

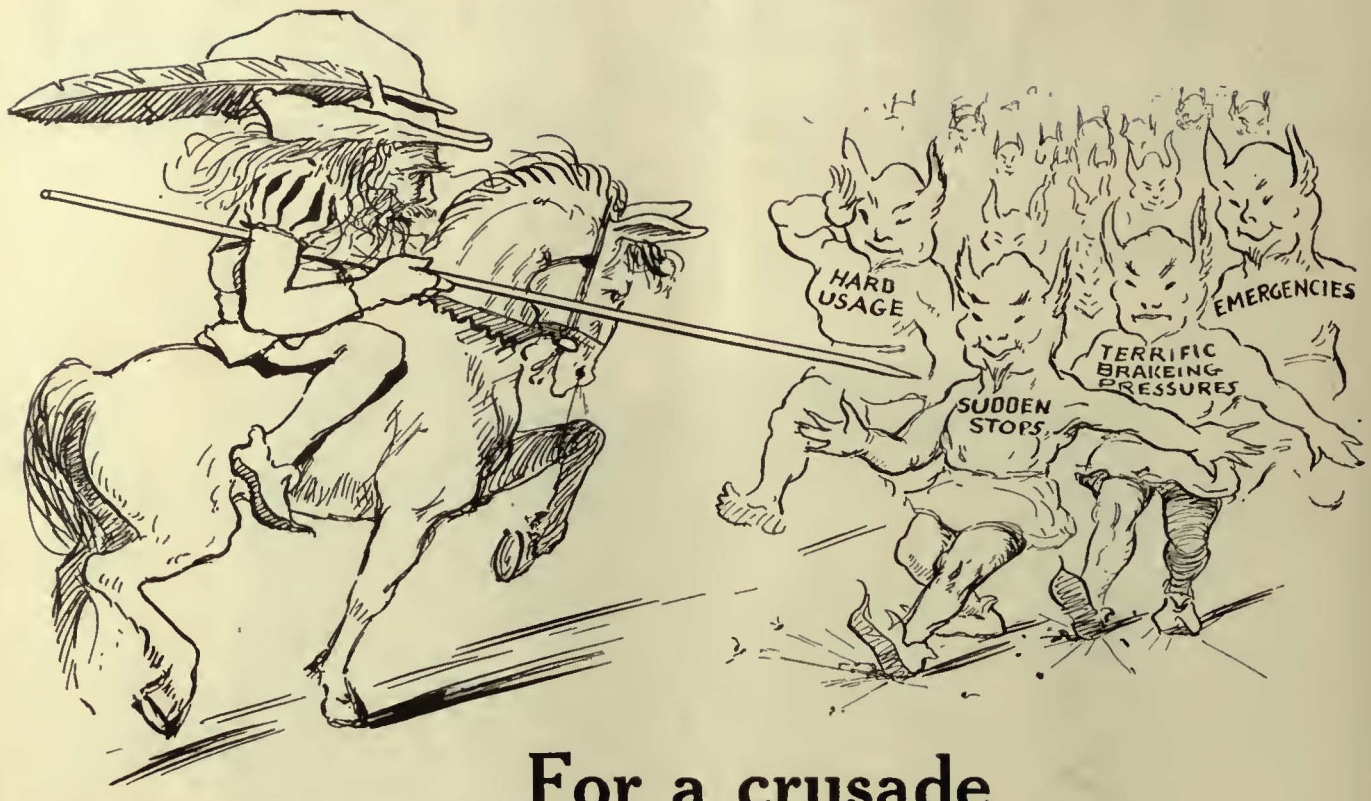
The tough, wear-resisting quality of *semi-steel* instantly demonstrates itself.

This ability gives to Symington Semi-Steel Pedestal Type Journal Boxes their long useful life and economy of maintenance and operation.

THE T. H. SYMINGTON COMPANY

New York Chicago Baltimore Boston Montreal

WORKS: ROCHESTER, N. Y.



For a crusade against high maintenance BOYERIZE!

Even the trusty steel of olden times couldn't stand up to the strains of a brake rigging job on city cars.

Only specially hardened steel can live at all. Only Boyerized steel with its glossy armor plate surface can give full service and protection.

Experience has proved that it actually outwears case-hardened steel three to four times.

Choose from the long wear line

It's Boyerized!

Brake Pins
Brake Hangers
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Pedestal Gibs
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Spring Posts
Bolster and Transom Chafing Plates
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Manganese Brake Heads
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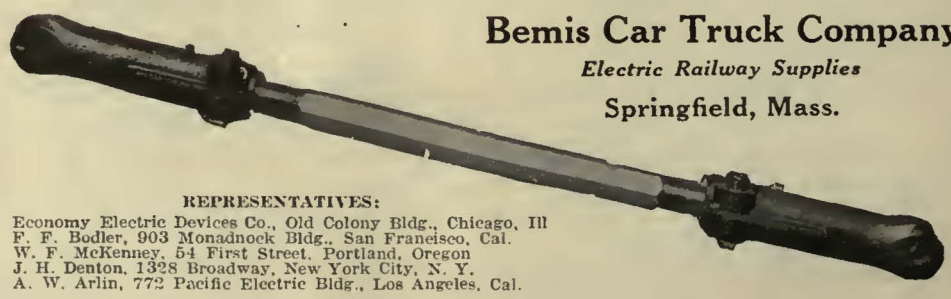
Bushings
Bronze Bearings

The McArthur Turnbuckle

You won't have to refit the rigging with new turnbuckles, if you specify McArthur Turnbuckles in the first place. They will last as long as the truck itself.

More than that—the old-style jam-nut idea has been scrapped, and an efficient spring-equipped, split-clamp principle has been substituted. Now it only takes a pocket-wrench and a moment's time to make an adjustment, and tighten it up to stay.

Full details on request. Let us quote you



Bemis Car Truck Company

Electric Railway Supplies

Springfield, Mass.

REPRESENTATIVES:

Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill
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W. F. McKenney, 54 First Street, Portland, Oregon
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.

POSITIONS VACANT

A GENERAL track foreman wanted to have charge of four or five gangs on construction and general track maintenance work in Connecticut. State qualifications and give references. P-671, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

GENERAL shop foreman wanted for Middle West property, experienced in heavy traction equipment as well as city. In application, state qualifications, references and salary expected. P-678, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

WANTED—A-1 car wire and controller repairman, must understand the old type as well as the new. State wages expected in first letter. Apply Mr. H. T. Royal, Master Mechanic, Coast Cities Railway Co., Asbury Park, New Jersey.

POSITIONS WANTED

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.

AUDITOR, with thorough experience large railway, electric and gas properties, seeks engagement. PW-677, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

GRADUATE engineer desires permanent position in larger field. Fifteen years' successful experience. Five in charge maintenance city and suburban system. Rehabilitation, design, special work, welding. PW-682, Electric Railway Journal, Real Estate Trust Bldg., Phila., Pa.

MASTER mechanic or engineer of equipment, technical education and five years' experience in manufacturing and maintenance of equipment. PW-681, Electric Railway Journal, Old Colony Bldg., Chicago, Ill.

SCHEDULES. Traffic manager and schedule maker, thoroughly experienced in city operation, wants whole or part time employment. PW-685, Elec. Ry. Journal, Real Estate Trust Bldg., Phila., Pa.

SUPERINTENDENT or assistant general manager on city or interurban road. Twelve years' successful experience with first-class record and references. Salary $3,000.00 to start. PW-687, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

SUPERINTENDENT or general superintendent. Twelve years connection with one of the largest and most successful steam railways in America. Five years operator, agent and yardmaster; four years general yardmaster large terminal; three years superintendent in charge all departments electrified subsidiary lines, operating high speed interurban trains and handling heavy carload freight traffic. Desire connection with large electrified property. Have record for establishing new low operating ratios and rendering more effective service. Can secure spontaneous co-operation from employees and meet the public. Reason for leaving present position, electric railway field limited. Prefer situation requiring initiative and executive ability. Age 38. PW-686, Elec. Ry. Journal, Old Colony Bldg., Chcago, Ill.

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 Circuit Breakers
Roller-Smith Co.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Ammeters
Roller-Smith Co.

Amusement Park Equipment
Walker Corp., C. M.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Western Electric 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.
Johnson & Co., J. R.
St. Louis Car Co.

Axles (Front & Rear) Motor Truck and Passenger Car
Timken-Detroit Axle Co.

Axles, Steel
Carnegie Steel Co.

Axles, Trailer and Motor Bus
Timken-Detroit Axle Co.

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

Barges, Steel
American Bridge Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
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.
Western Electric Co.

Bollers
Babcock & Wilcox Co.

Bond Testers
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Roller-Smith Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Electric Railway Impt. Co.
Elec. Service Supplies Co.
Liteweld Company
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co.
Western Electric Co.

Bonds, Rail
Amer. Steel & Wire Co.
Electric Railway Impt. Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Page Steel & Wire Co.
Railway Track-work Co.
Rail Welding & Bonding Co.
Western Electric Co.
Westinghouse E. & M. Co.

Book Publishers
McGraw-Hill Book Co.

Boxes, Junction and Outlet
National Metal Molding Co.

Boxes, Switch
Johns-Pratt Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
American Bridge Co.
Bates Expanded Steel Truss Co.
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.
Western Electric Co.

Brake Adjusters
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

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

Brakes, Brake Systems and Brake Parts
Allis-Chalmers Mfg. Co.
Bemis Car Truck Co.
Brill Co., The J. G.
General Electric Co.
Johns-Manville, Inc.
National Brake Co.
St. Louis Car Co.
Safety Car Devices Co.

Bridges & Buildings
American Bridge Co.

Brooms, Track, Steel or Rattan
Paxson Co., J. W.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Westinghouse E. & M. Co.

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

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

Buses, Motor
Brill Co., The J. G.
Brockway Corporation
Pierce-Arrow Motor Car Co.
St. Louis Car Co.
White Co.

Bus Seats
Hale-Kilburn Co.
Heywood-Wakefield Co.

Bushings
National Metal Molding Co.

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

Cables (See Wires and Cables)

Cambric Tapes, Yellow and Black Varnished
Irvington Varnish & Ins. Co.
Mica Insulator Co.

Carbon Brushes (See Brushes, Carbon)

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

Cars, Dump
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
St. Louis Car Co.

Cars, Self-Propelled
General Electric Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Castings, Brass, Composition or Copper
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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.

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Earll, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.
Western Electric Co.

Ceiling Car
Pantasote Co., Inc.

Cement Products
Portland Cement Co.

Change Carriers
Cleveland Fare Box Co.

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

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

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

Cloth and Stencil Silk Signs
Kress & Co.

Cleats
National Metal Molding 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.

Coils, Armature and Field
Economy Electric Devices Co.
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
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 Slotters
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.
Mica Insulator Co.
Westinghouse E. & M. Co.

Compounds (Insulating & Splicing)

Compressors, Air
General Electric Co.
Ingersoll-Rand Co.
Western Electric Co.
Westinghouse Tr. Br. Co.

Compressors, Air Portable
Ingersoll-Rand Co.

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

Condenser Papers
Irvington Varnish & Ins. Co.

Conduits, Flexible
Alphaduct Co.

Conduits, Interior
National Metal Molding Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Consolidated Car Heat'g Co
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

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

Converters, Rotary
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Conveying and Hoisting Machinery
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Copper Wire
Anaconda Copper Mining Co.
Page Steel & Wire Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
Internat'l Register Co., The
Roebling's Sons Co., J. A.
St. Louis Car Co.
Samson Cordage Works

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
Allis-Chalmers Mfg. Co.
Industrial Works
Universal Crane Co.

Cranes, Gas or Electric
Industrial Works
Universal Crane Co.

Cranes, Locomotive, Motor Truck & Portable
Industrial Works
Universal Crane Co.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co

Crossings
Ramapo Ajax Corp.

Crossing Signals (See Signals, Crossing)

Crossing, Frog & Switch
Ramapo Ajax Corp.

Crossing Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.

Crossings, Track (See Track, Special Work)

Crossings, Trolley
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.

Curtains and Curtain Fixtures
Brill Co., The J. G.
Elec. Service Supplies Co.
Morton Mfg. Co.
Pantasote Co., Inc.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co.
Transit Equip. Co.

Derailing Devices (See also Track Work)
Wharton, Jr., & Co., Wm.

Derailing Switches, Tee Rail
Ramapo Ajax Corp.

Detective Service
Wish-Service, P. Edward

Doors & Door Fixtures
Hale-Kilburn Co.
St. Louis Car Co.

Door Operating Devices
Brill Co., The J. G.
Consolidated Car Heat'g Co.
General Electric Co.
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

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Nat'l Pneumatic Co., Inc.

Drills, Rock
Ingersoll-Rand Co.

Drills, Track
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Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.

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Elec. Service Supplies Co.
Hetherington & Berner

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Ohio Brass Co.

Ebony Asbestos Wood
Johns-Manville, Inc.

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Roebling's Sons & Co., J. A.
Western Electric Co.

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American Bridge Co.

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Railway Track-work Co.
Rail Welding & Bonding Co.
Seymour Rail Grinder Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

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Beckwith-Chandler Co.

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Arnold Co., The
Beeler, John A.
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Byllesby & Co., H. M.
Day & Zimmermann, Inc.
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Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Ong, Joe R.
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Richey, Albert S.
Robinson & Co., D. P.
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Consolidated Car Fender Co.
Elec. Service Supplies Co.
St. Louis Car Co.
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Godwin Co., Inc., W. S.

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Ohio Brass Co.

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Johns-Pratt Co.

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Johns-Pratt Co.

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General Electric Co.
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General Electric Co.

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Railway Track-work Co.
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Page Steel & Wire Co.

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General Electric Co.
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Ingersoll-Rand Pneumatic Paving Breakers and Tie Tampers in use on reconstruction of complicated crossing

Economical Reconstruction

Ingersoll-Rand pneumatic methods speed up track rehabilitation and cut the costs one-third to one-half.

Two men with I-R CC-25 "Paving Breakers" do more work than twelve to fifteen men with hand sledges and picks. Only a fraction of the labor is required with I-R Paving Breakers.

Pneumatic Tie Tampers are not only labor saving tools but tamp the track more uniformly, and are far more effective around frogs, switches and crossovers than hand methods.

Air power for these tools and methods is efficiently supplied from Ingersoll-Rand Portable Air Compressors, especial designed for railway work. Ask for complete information.

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206-TT

Ingersoll-Rand

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Gold Car Heat. & Light. Co.
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Smith Heater Co., Peter
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Irvington Varnish & Ins. Co.
Insulating Varnishes
Irvington Varnish & Ins. Co
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Okonite Co.
Westinghouse E. & M. Co.
Insulation Slot
Irvington Varnish & Ins. Co.
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Ohio Brass Co
Western Electric Co.
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Elec. Service Supplies Co.
Hubbard & Co.
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Lapp Insulator Co., Inc.
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St. Louis Car Co.
Symington Co., T. H.
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Westinghouse E. & M. Co.
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Lanterns, Classification
Nichols-Lintern Co.
Lightning Protection
Elec. Service Sup. Co.
General Electric Co.
Ohio Brass Co.
Shaw, Henry M.
Westinghouse E. & M. Co.
Line Material (See also Brackets, Insulators, Wires, etc.)
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Elec. Service Sup. Co.
Hubbard & Co.
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Galena-Signal Oil Co.
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Ramapo Ajax Corp.
Manganese Steel Switches, Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.
Manganese Steel, Special Track Work
Bethlehem Steel Co.
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Mica Insulator Co.
Molding, Metal
Allis-Chalmers Mfg. Co.
National Metal Molding Co.
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Westinghouse E. & M. Co.
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Omnibuses (See Buses, Motor)
Oxy-Acetylene (See Cutting Apparatus Oxy-Acetylene)
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Paasche Air Brush Co.
Paint, Spraying Devices
DeVilbiss Mfg. Co.
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Mica Insulator Co
Paints & Varnishes (Preservatives)
Beckwith-Chandler Co
Paints and Varnishes for Woodwork
Beckwith-Chandler Co.
National Ry. Appliance Co.
Pavement Breakers
Ingersoll-Rand Co.
Paving Brick Vitrified
National Paving Brick M'f'r's Assn.
Paving Guards, Steel
Godwin Co, Inc., W. S.
Paving Material
Amer. Br. Shoe & Fdy. Co.
Pickups, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.
Pinion Pullers
Elec. Service Supplies Co.
General Electric Co.
Wood Co., Chas. N.
Pinions (See Gears)
Pins, Case Hardened, Wood and Iron
Bemis Car Truck Co.
Elec. Service Sup. Co.
Ohio Brass Co.
Westinghouse Tr. Brake Co.
Pipe Fittings
Westinghouse Tr. Brake Co.
Planers (See Machine Tools)
Plates for Tee Rail Switches
Ramapo Ajax Corp.
Pliers, Rubber Insulated
Elec. Service Sup. Co.
Pings
National Metal Molding Co.
Pneumatic Tools
Ingersoll-Rand Co.
Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.
Poles, Metal Street
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Hubbard & Co.
Western Electric Co.
Pole Reinforcing
Hubbard & Co.
Poles & Ties Treated
Bell Lumber Co.
Poles, Ties, Posts, Piling & Lumber
Bell Lumber Co.
Poles, Trolley
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
Nuttall Co., R. D.
Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Sup. Co.
Porcelain, Special High Voltage
Lapp Insulator Co., Inc.
Potheads
Okonite Co.
Power Saving Devices
Economy Elec. Devices Co.
National Ry. Appliance Co.
Pressure Regulators
General Electric Co.
Westinghouse E. & M. Co.
Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Pumps, Vacuum
Ingersoll-Rand Co.
Punches, Ticket
Bonney-Vehslage 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 Joints—Welded
Lorain Steel Co.
Metal & Thermit Corp.
Rail Welding
Rail Welding & Bonding Co.
Rails, Relaying
Foster Co., L. B.
Rails, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Foster Co., L. B.
Railway Paving Guards, Steel
Godwin Co., Inc., W. S.
Railway Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.
Rail Welding
Metal & Thermit Corp.
Railway Track-work Co.
Rattan
Brill Co., The J. G.
Elec. Service Supplies Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
McGuire-Cummings Mfg. Co
St. Louis Car Co.
Registers and Fittings
Brill Co., The J. G.
Elec. Service Supplies Co.
Intern'l Register Co., The
Rooke Automatic Register 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 Coils)
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.
Mica Insulator Co.
Westinghouse E. & M. Co.
Rollers, Shade
Haviland Shade Roller Co., Inc.
Roofing Car
Pantasote Co., Inc.
Roofing, Asbestos
Johns-Manville, Inc.
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National Metal Molding Co.
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Hetherington & Berner, Inc.
Sand Houses
Hetherington & Berner, Inc.
Sand Storage
Hetherington & Berner, Inc.
Sanders, Track
Brill Co, The J. G.
Elec. Service Supplies 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 Cleaners and Scrapers, Track)
Screw Drivers, Rubber Insulated
Elec. Service Sup. Co.
Seats, Bus
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Seats, Car (See also Rattan)
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
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Heywood-Wakefield Co.
Pantasote Co., Inc.
St. Louis Car Co.
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Electric Equipment Co.
Transit Equip. Co.
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Brill Co., The J. G.
Shovels
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.
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Signals, Car Starting
Consolidated Car Heat. Co.
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.
Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.
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Elec. Service Sup. Co.
Nachod Signal Co., Inc
U. S. Elec. Signal Co.
Wood Co., Chas. N.
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Nachod Signal Co., Inc.
U. S. Elec. Signal Co.
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Elec. Service Supplies Co.
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Nuttall Co., R. D.
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Nichols-Lintern Co.
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Heywood-Wakefield Co.
Snow-Plows, Sweepers and Brooms
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St. Louis Car Co.
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Buda Company
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St. Louis Car Co.
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Brill Co., The J. G.
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Morton Mfg. Co.
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Babcock & Wilcox Co.
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Switches, Safety
Johns-Pratt Co.
Switches, Selector
Nichols-Lintern Co.
Switches, Tee Rail
Ramapo Ajax Corp.
Switches, Track (See Track Special Work)
Switches and Switchboards
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Anderson Mfg. Co., A. & J. M.
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Tee Rail Special Track Work
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Std. Underground Cable Co.
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Johns-Pratt Co.
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Consolidated Car Heat. Co.
Gold Car Heating & Lighting Co.
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Metal Safety R.R. Tie Co.
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Ohio Brass Co.
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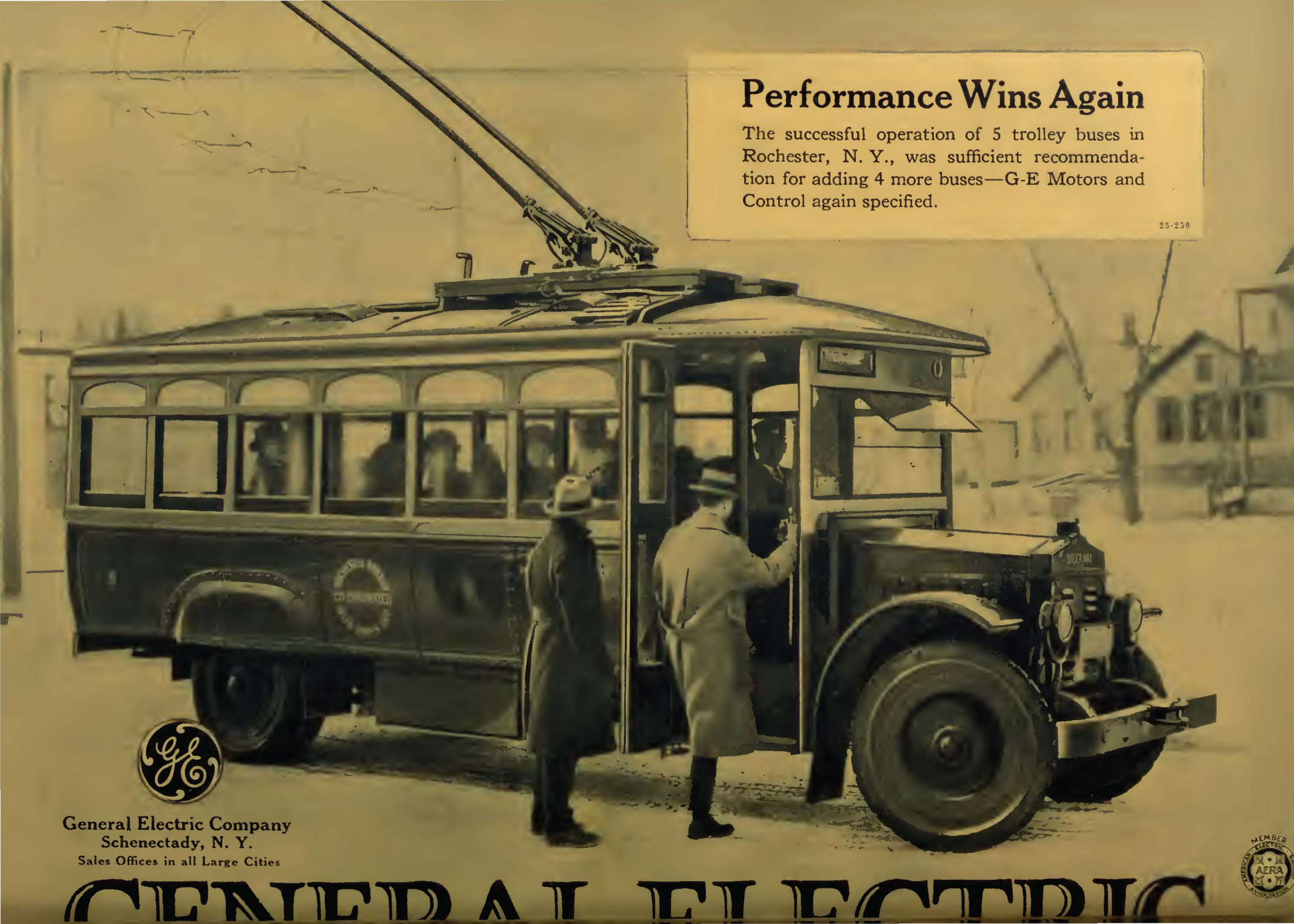

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