MAINTENANCE ISSUE

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ELECTRIC RAILWAY JOURNAL

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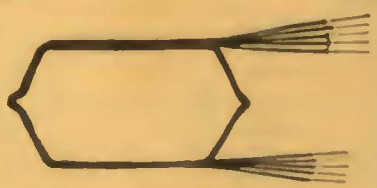

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ELECTRIC RAILWAY JOURNAL

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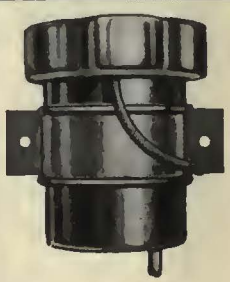

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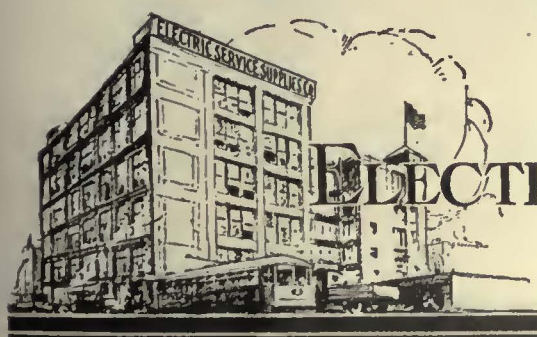

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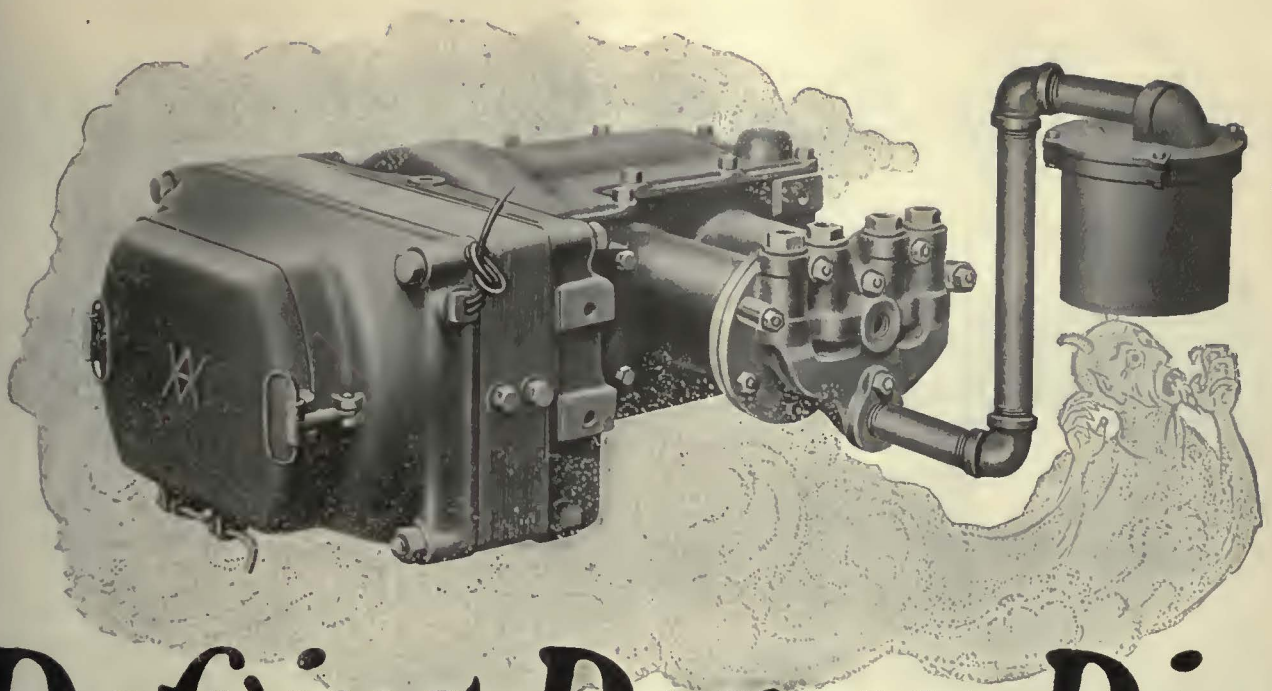

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Around every compressor there is a demon lurking in the air —DIRT. It will stealthily, though surely, work havoc if permitted to gnaw at the vitals of the compressor.

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New York, Saturday, November 15, 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 64
Number 20

Machine Tools Will Be Developed Only if Electric Railways Buy

ONE of the most common deficiencies of electric railways is the glaring inadequacy of their shop equipment. Some 40 per cent of their machine tools are more than 20 years old. Many improvements in machine tools have been made, the benefits of which are not being shared to any extent in our field. These improvements should be given careful consideration as a part of their modernization program.

Some of the machines of late design which are particularly suitable for electric railway shop conditions include lathes, drill presses and planers, with provision for increased speed and capacity of the drive and feed mechanism to give greater production. Another marked improvement in machine tool equipment is in the new methods used for lubricating bearing parts. Many recent machines have forced-feed lubrication of all bearings and an oil bath for gearing. Rapid developments have been made in grinding machines, and many electric railways are obtaining definite economies from substitution of grinding operations for the machining methods previously used.

There has also been considerable activity in the design of smaller tools and general utility machines. These are very useful for small electric railway properties where the amount of work of one particular class is insufficient to warrant the investment in a special machine for a particular type of work.

Machine tool manufacturers have developed a number of new designs of machine tools particularly adapted to electric railway work. But these tools have not actually been constructed pending the receipt of orders. The manufacture and future development of machines especially designed for the electric railway thus depends to a large extent on whether electric railway men show signs of desiring such improvement by actual purchases.

An Amateur Watch Repairer Is a Poor Man to Imitate

THE story of the amateur watch repairer who after taking a clock apart and tinkering with it put it together again and had a number of wheels left over is familiar to all of us. It is a classic example of what happens when an unskilled workman undertakes a difficult job.

But what of the railway trackman who tears up the pavement to repair a joint and has a quantity of paving material left over after he has completed the work? Such things occur with greater frequency, perhaps, than some managements realize. The reason that there is a surplus of paving material, of course, is that the pavement has not been put back properly. It is a great deal more difficult to restore the surface as it should be than simply to fill up the hole with dirt and stones and to dispose of the excess material. Slipshod track maintenance methods of this kind, however, are as great a reproach to the railway which permits them as are the tinkering methods of the watchmaker who has extra parts left over.

Since the automobile has come into as widespread use as it has at the present time, the quality of the street paving is a matter of interest to a far larger number of people than it used to be. Coincident with this the electric railways have undertaken on a large scale to cultivate public good will in the communities they serve. But it is of little avail to talk of "friendlyizing" the public while continuing to do things that are a source of irritation to large numbers of people. It is certainly a mistake to economize on track maintenance to the extent that the pavement in the railway area contrasts unfavorably with the pavement elsewhere in the street. The money saved in making cheap pavement repairs is a poor economy if the finished surface is rough and unsightly, and a source of annoyance to the general public.

Using Railway Labor More Efficiently

THE problem of stabilizing the work done by the maintenance forces of an electric railway is rendered more important now that higher wages are being paid. Nearly all railway companies are using all the rolling stock they have available during the rush-hour period. Consequently it is necessary to make repairs during the off-peak interval. Usually, cars cannot be placed in the shops until 9 or 9:30 in the morning, and they must be released by 4 o'clock in the afternoon. The real problem of stabilizing labor is to provide something for the men to do before the cars are placed in the morning and after they are released at night.

There is much work which can be done during these times, but unless a careful program is laid out in advance, there is a tendency for the men to loaf or work inefficiently. One large railway with a number of inspection shops uses the men in the mornings, before the cars are placed, for making up and repairing stock of the particular class that the men are familiar with. Thus the controller inspectors make contact tips,

This is the issue in November that is devoted essentially to maintenance subjects

put new springs on controller fingers, remove carbonization from arc deflectors which are suitable for use to replace defective parts, etc. The motor inspectors look over carbon brushes that can be cut to smaller dimensions for reuse, and they repair brush-holder parts and the like. Oilers sort waste, look after its soaking with oil and get the day's supply ready. Other inspectors do similar work.

Still another part of the problem of stabilizing labor is to provide for uniform employment of forces at different periods of the year. The practice of releasing men at certain seasons and hiring new ones at the period of greatest need does not work out efficiently, since the railways lose the benefit of retaining men of experience. Among shop forces, a schedule of painting and general overhauling can be so laid out as to fill out the period when men will not be required on other work, and so they will work more efficiently and at the same time a uniform force will be kept through the year.

The track and way departments of steam roads have found that new rails can be laid almost as efficiently during the winter as during the summer season, and so many steam roads are placing their orders for rails during the latter part of the year with the idea of using their forces on this work during the winter season when they could not work on other track maintenance repairs. As an example of this, it is reported that three-quarters of a million tons of rail already have been ordered since Sept. 1. This tonnage is much larger than has been ordered in the same period for many years past. Interurban electric railways might follow this practice to advantage.

Hiring men when work is heavy and laying them off when it is light has been found to produce serious losses to the companies as well as being unsatisfactory to the employees. The methods suggested here would be a step in the direction of overcoming the loss which necessarily accompanies a frequent turnover of labor.

Better Maintenance at Lower Cost

THAT no maintenance situation is so bad that it is without hope was brought out forcefully in a paper by W. C. Bolt at the recent meeting of the New England Street Railway Club, which was abstracted in ELECTRIC RAILWAY JOURNAL for Nov. 8. Four years ago the situation on his road, the Eastern Massachusetts Street Railway, was deplorable. In July, 1920, a midsummer month, there were 1,489 equipment failures requiring removal of the car from service, or one pull-in for every 1,400 car-miles. The leading cause of trouble was hot bearings, with 339 failures, while air-brake troubles followed with 222 failures. Armature failures were altogether occurring at the rate of 500 per month.

Certainly such a record must have seemed almost hopeless. It represented a situation that had continued for years and had come to be considered in the same light as was the yellow fever by the inhabitants of the Canal Zone before American engineers got on the job—something that couldn't be cured and had to be endured.

While it must have been a huge task to overcome precedent and prejudice, the attempt was made, with the result that in September of this year there were only 104 maintenance pull-ins from all causes, or one for 14,500 car-miles—a record ten times as good as that in 1920. One large division even bettered this good record by running 75,000 car-miles per pull-in.

The skeptic can argue that any one can make such a record by spending enough in maintenance to keep the cars in first-class condition. The most surprising part of the story is that this good record has been obtained with a reduction in cost of maintenance per car-mile from 6.2 cents in 1920 to 3.54 cents this year—a total saving of more than half a million dollars.

Part of the saving has been due to the purchase of new cars with modern equipment, but a great deal has come from a better understanding of the work and the use of improved practices. Inspection is now made by meter inspection dials instead of in a haphazard manner, modern methods of armature and field coil repairs are used, and better oiling practices have been adopted. Welding is used for many important jobs. Painting is done frequently, but paint spraying has cut down the cost. The shop forces have been greatly reduced, the number of shop men dropping from 447 to 188 in the four years.

The record of this road is exceptional, but it is something that can be matched by any other road that is suffering from the same troubles. The use of modern practices, which is continuously being advocated by this paper, will give a like result wherever applied. It may even be bettered, for Mr. Bolt says that there is still room for improvement on his own property.

California and Washington Reject Government Ownership of Utilities

WHILE the defeat of Senator LaFollette in the national contest was decisive, it is reassuring to know that his schemes of public ownership were not the only ones rejected by the voters last week. Government ownership was an issue at several of the state elections, notably in California and Washington.

The referendum in California was on a measure to bond the state for $500,000,000 to permit it to acquire, construct and operate hydro-electric generating and transmission systems. But the electorate spoke in no uncertain voice, turning down the measure by a vote of considerably more than 2 to 1. This is the second time within the last two years that such a plan has been voted down by the people in California—a good indication of common sense in that commonwealth.

In Washington, which was another state to declare itself in favor of private initiative for utility operation, the measure under consideration was known as the Bone bill, and its purpose was to permit the cities and towns in the state to buy and sell electric current both within and without their corporate limits and to acquire and construct electric generating and distribution systems. Naturally, those who realize the danger of such a policy pointed out its defects, and the vote was decisive against it. Even in the city of its birth, Seattle, the measure was lost. The voters in that city have already had a taste of what municipal ownership of utilities means and wanted to preserve the state at large from a similar experience.

Altogether, considered not only from the national point of view but also from the local point of view, there is not much in the results of the last election that should give encouragement to the advocates of government ownership.

Careful Planning Made Possible the Completion of This Job in a Short Time. The Steam Shovel, Steam Roller, Track Layers, Joint Welders, Grinders, and the Paving Gang Followed One Another in Close Order

Rapid Track Reconstruction with Butt-Welded Joints

Third Avenue Railway Tries New Butt-Weld Method of Making Joints on Large Replacement Job on Upper Broadway—Designed by Manufacturer to Facilitate the Work—This and Careful Organization Made Speedy Progress Possible—Easily Moved Crossovers Aided in Avoiding Interruption to Service

ON A RECENT reconstruction job, the Third Avenue Railway, New York City, has been using the new electric butt-weld type of joint developed by the Lorain Steel Company. Prior to this installation by the Third Avenue Railway, butt-welded joints made under pressure were tried in Boston and in Philadelphia. About 500 joints were made in each place. In Philadelphia, the welding was done at the side of the street and long lengths of welded rail were then moved over into place in the track structure. In Boston, the procedure followed was substantially the same as that of the recent job in New York City, described here.

The reconstruction of 1½ miles of double track on Broadway from 242d Street to the Yonkers city line was undertaken when the city decided some time ago to repave the streets. The street here is part of the famous Albany Post Road and carries extremely heavy vehicular traffic. It was therefore desired that the period during which the street was torn up and closed to traffic be as short as possible. Railway traffic along this route also is heavy and the company wished to carry out the work with a minimum number of interruptions to service.

The old track structure consisted of 9-in. grooved girder rail L. S. Co. No. 323 on untreated wood ties with bolted joints. The new construction is with standard A.E.R.E.A. 7-in. 122-lb. grooved girder rail on new creosoted ties spaced 2 ft. on centers. It is estimated that the total cost of the work will be approximately $180,000.

On this section of upper Broadway the old track had been in service for many years and for some time the company had been considering its replacement. Actual work was not undertaken, however, until the city decided to repave the streets. The reconstruction was very carefully organized in order that it might proceed with the least possible delay. Work was carried on simultaneously from two points on the job, in the following manner:

The first step in the reconstruction was to cut the old rail by an oxyacetylene torch every 20 ft. throughout its length. This cut was made down to within a short distance of the base of the rail. After this had been done, cars continued to operate over the cut rail until the time came for it to be taken up.

Then a sliding crossover was placed at each end of the strip of track to be torn up. Special importance attaches to the use of sliding crossovers, because they permitted the operation of cars past the reconstruction work on a single track on comparatively short headway. The design of these crossovers is such that they can be moved easily from one location to another. This is done by fastening each side of the crossover to the rear of a work car. The cars are then moved simultaneously in the same direction, pulling the crossover behind them. Unless there is some obstruction in the center of the right-of-way between the tracks, the crossover can be moved without being taken apart. This process is much simpler than that of taking apart the usual bolted crossover, loading the pieces onto a car, conveying them to the new location, unloading them from the car, and putting them together again. The process of moving a sliding crossover is so simple

Making Butt Welds on Third Ave. Railway

No. 1. Sliding crossovers of this type are so easily moved that the length of single-track operation was kept at a minimum.

No. 2. General view of welding operation. A second clamp is being adjusted to position, while the first is used in making a weld. Note oil torch attached to rear of car.

No. 3. Hydraulic pressure was used to bring the rail ends together, after molten borax was poured into the molds and the electric current brought the rails to the proper temperature.

No. 4. Appearance of the butt-welded joint before grinding. The bolt holes in the web of the rail play no part in this operation.

No. 5. It was found necessary in order to prevent cracking to heat the welded joint carefully before grinding.

No. 6. This machine was specially designed by the Lorain Steel Company to remove the welding metal from the groove of the rail.

No. 7. Car equipped to grind down the head of the rail after welding.

No. 8. A man with an electric hand grinder finished off the edges of the joint.

that the plan called for moving these every night and thereby made it possible to keep down to a minimum the length of single-track operation.

The old pavement and rail were taken up by steam shovels and loaded on to automobile trucks. Behind the steam shovels a gang of men with picks and hand shovels completed the job of preparing the subgrade, which was then thoroughly compressed by steam rollers. On account of the large number of small stones mixed with the soil in this locality, the ground after rolling has practically the qualities of a ballasted track foundation.

New creosoted ties were placed directly on the rolled earth. The new rail was then laid on the ties and loosely spiked. Because the rails are squeezed together during the welding operation, it was necessary to leave the rails loose enough so that they could be drawn into position for making the weld.

A powerful pressure clamp which is shown in an accompanying illustration was supported on rollers running on the heads of the rails. In making a weld the clamp was placed over the two rail ends and wedged firmly to them. The ends of the rails were kept separated about ⅜ in. and clay molds placed around them. These molds had previously been formed and then baked in an electric furnace located in one of the grinding cars. Into these molds was poured molten borax heated in another furnace in the welding car. Low-voltage electric current sent through the joint keeps the borax boiling and brings the rail ends to the temperature necessary for welding.

When this temperature is reached a pressure of 5,000 lb. per square inch is obtained by hand-operated hydraulic jacks, and the rails are pulled together with sufficient force to upset the ends and give a thorough weld. This process produces an excellent joint with only a small amount of superfluous metal to be removed from the head of the rail. The appearance of such a joint is shown in an accompanying illustration. Although there are bolt holes in the rail, these play no part in the process. The Third Avenue Railway customarily buys rail with such holes already made, and the usual rail was used on this job regardless of the fact that the bolt holes were not needed. All joints were post-heated before grinding. For this purpose an oil torch was used, operated by air pressure from the welding car.

The grinding of the joints was done in three steps. First, a large rotary grinder, that was virtually a planer, was used to make the head of the rail smooth. This was followed by another car specially designed by the Lorain Steel Company to remove the surplus upset metal from the groove of the rail. Finally, a workman with a small electric hand grinder went over the joint and put the finishing touches to it. One welding and two grinding cars were used and they followed one another in close order as the joints were made. Two sets of pressure clamps were used, one on each rail, the first being adjusted to position while the second was used in making a joint. Immediately behind the welding car came the first of the grinding cars to smooth the head of the rail. A short distance behind the second car came the third, equipped to grind the groove of the rail. To this third car was attached the hand electric grinder.

After the joints had been made, the space between the ties was filled in with the same mixture of dirt and rock that was used for the foundation. Tamping and back ramming of this material were all done mechanically by means of Ingersoll-Rand tie tampers.

The railway company's contract with the Lorain Steel Company called for an average of 18 joints per day, but on several days 30 joints were made in less than 9 hours. With 60-ft. rail this means close to 1,000 ft., or four city blocks, of track per day.

Under the laws of New York State, the railway company has the option of itself paving the area for which it is responsible or of allowing the city to do this work. In this case the city is paving the entire street from curb to curb, and the railway company employed the city contractor to excavate and prepare the railway area ready for laying the ties. Some hesitancy was felt by the municipal authorities in allowing the railway and the contractor to close the street altogether to vehicular traffic. It was pointed out, however, that by having the use of the entire area during the period of reconstruction it would be possible to perform the work much more quickly than could otherwise be done, and thereby reduce the total amount of delay to vehicular traffic.

Paving Guards Used in Halifax

AN INTERESTING type of track structure has been used for the past two years by the Nova Scotia Tramways & Power Company, Ltd., Halifax. In streets where there are car tracks the city paving area extends to the end of the ties. At this point Godwin steel paving guards have been installed to separate the city paving from the railway paving, and to prevent the disintegration which in the past has occurred along this line.

The track structure itself consists of a 6-in. concrete base upon which is laid a 2-in. sand cushion. Hemlock ties 6 in. x 7 in. x 7 ft. are used. The rail is 60-lb. T Lorain section 263. Joints are of the continuous bolted type with six special hard carbon steel bolts per joint. Similarly a 6-in. concrete base is used for the paving with a 1-in. sand cushion. The surface is a 3-in. layer of asphalt.

Showing How Godwin Steel Paving Guards Are Installed at Halifax

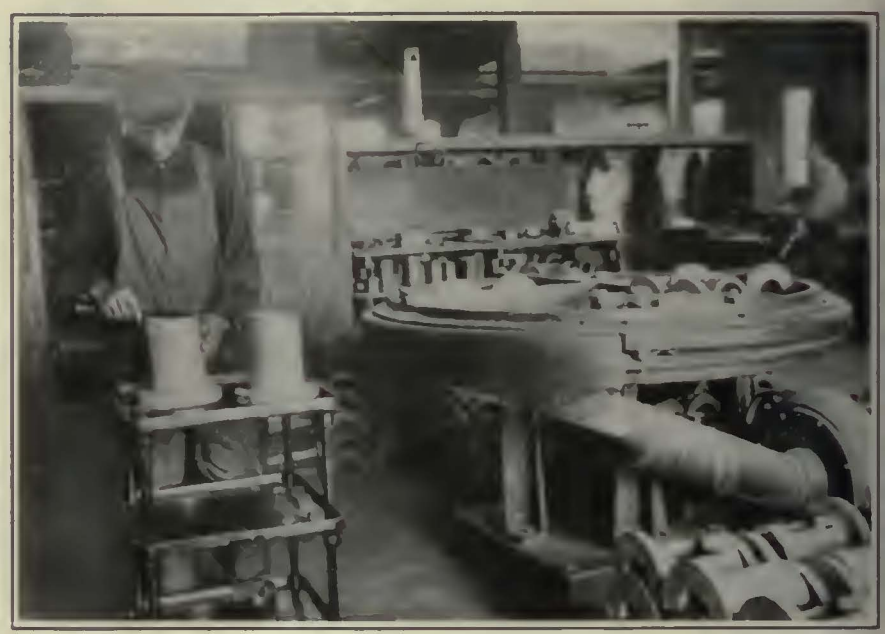
The use of paving guards in Halifax has proved satisfactory and economical. Neither the action of the severe winter weather nor the pounding of heavy traffic has destroyed the edge of paving where these guards have been installed.

Special Tools Facilitate Machining of Bearings

By the Development and Employment of Many Special Tools the Twin City Rapid Transit Company Has Applied Production Methods to the Various Operations of Finishing Bearing Shells

APPLICATION of modern production methods to the various operations connected with machining of axle and armature bearings offers many opportunities for substantial savings in time and costs. In the mechanical department of the Twin City Rapid Transit Company these various operations are laid out with a view toward the efficient use of special machine and tool equipment.

Both solid bronze and babbitt-lined malleable-iron axle bearings are used on this property. In general, it is the practice to use the babbitt-lined malleable type of axle bearing on those motors where the axle and bearing housing diameters are such that the thickness of the metal in the bearing shell is not less than $\frac{1}{16}$ in. to $\frac{1}{2}$ in. With this type of bearing, the malleable shell is lined with about $\frac{1}{16}$ in. thickness of babbitt, and the outside face of the bearing flange is also babbitted. When the motor and axle design do not permit the use of a bearing shell thickness of at least $\frac{1}{16}$ in., the solid bronze type of shell is used.



The Joining Surfaces of Axle-Bearing Shells Are Finished on a Surface Disk Grinder at the Rate of 180 Half Shells per Hour

Special Tools Play Important Part

In machining both the solid bronze and the malleable shells, the operations are carried out by similar methods, with only such changes as are required by the difference in the materials and the design of the shell. In both cases the various processes are designed to give maximum production with minimum lost motion and handling.

The first operation in machining bronze axle-bearing shells consists in facing off the joining surface on each half of the shell. This is done on a No. 19 Besly surface disk grinder having a disk diameter of 53 in. Across the top of the machine frame two right-angled crossbars allow four groups of shells to be placed on the grinding disk simultaneously. Thus, as two halves are ground against each of the bars, a total of eight halves can be put on the machine at one time. The bearings are simply placed on the face of the grinder and their own weight is sufficient to dress down the flat joining surfaces. The man in attendance keeps the machine filled with bearings and checks the dimensions of those that have been ground so as to make them each as nearly a perfect half as possible. This operation is completed by one man at the rate of 180 half shells per hour, or 90 complete bearings.

After the joining surfaces are finished the next operation is to bore out the interior of the shell. This is done in a horizontal boring mill. A split fitting fastened to the bed of the machine is arranged so that the two bearing halves are securely held together when the cap bolts shown in an accompanying illustration are pulled down. A through boring bar is used and the operation is completed in one cut. The bar is adjustable vertically in the heads of the machine, and by this adjustment the cut is taken exactly in the center of the shell.

Two Halves Stamped to Correspond

Before the bearing is removed from the boring jig, the two halves are stamped with corresponding numbers, so that they will be kept together during subsequent operations. The next of these is the operation of facing the outside of the flange and rounding the edge connecting this face and the inside bore. This is done in a Warner and Swasey 2A turret lathe. The two halves of the bearing are held together on a mandrel by means of an outside clamp ring. The solid ring is slipped over the bearing, and the two halves are held tightly against the mandrel by means of a setscrew. To accommodate bearings of various sizes of internal bore, special sleeves to fit each different size of bearing are provided for the mandrel. The set-up for this operation is shown in an accompanying illustration.

In the next operation the remainder of the outside

of the bearing is finish turned. The two halves are again held on an arbor, but in order to allow the outside circumference to be finished without turning the bearing around to complete the cut, the arbor is arranged so that a clamping nut forces a disk against the end of the bearing and clamps it tightly against a collar on the end of the arbor. Both the disk and collar have knife edges which are forced against the bearing, so that these edges grip the shell and effectually hold the two halves in place. The collar at the flange end is large enough so that its knife edge clears the fillet and bites into the face of the flange. The edges on the disk at the small end of the bearing bite into the metal at the end of the shell. The collar at the large end is a permanent part of the arbor spindle, while the disk at the small end is free to slide on the spindle as the nut on that end is pulled up.

The fifth and last operation in finishing these shells consists of drilling and countersinking the dowel-pin holes. These are located by means of a jig which consists of a large sleeve into which the two bearing halves are placed, so that the split between the two halves corresponds to a scribe mark on the jig. This brings the dowel-pin holes in their proper location.

SIMILAR OPERATIONS ON MALLEABLE SHELLS

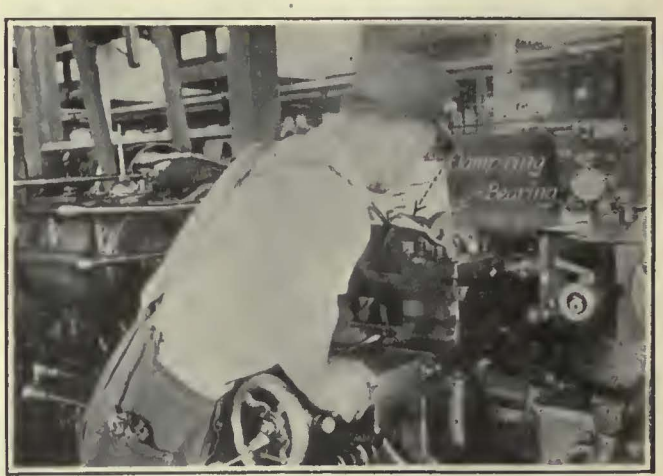
Malleable-iron shells are finished in the same general manner as the split bronze type, except for such variations as are incident to the difference in material and design. The joining surfaces of the two halves of the malleable shells are finished on the surface grinder in the same way as described for the bronze shells. The malleable-iron castings, however, have babbitt retaining grooves cast into the inside surface, and this requires an additional operation of grinding the fins from the edges of these grooves.

drive the casting. This pin is found necessary to keep the shell from slipping on the arbor due to the drag of the heavy cut that must be taken from a rough malleable casting. The pin is not used for finishing the bronze material, as in that case the grip of the outside clamp ring is ample to prevent the bearing from turning on the arbor.

Turning the outside of the bearing to make it fit in the motor housing is the fifth operation on malleable shells. This work, together with that of finishing the inside face of the flange, is performed in the lathe while the bearings are held in place on an arbor by gripping disks on the ends in the same way as was described for bronze bearings. In order to get a firm grip on the harder malleable material, the loose disk is pulled up as tightly as possible with the nut on the arbor and is then rapped with a small hand mallet and the nut again pulled up tight. The next step is to bore out the inside to the proper size after babbitting.

First the surplus babbitt is removed with a coarse file and the mating surfaces are carefully smoothed up so that the bearing will fit into the boring chuck. This is an eccentric clamp chuck and was specially designed for this boring operation. The construction is shown in an accompanying illustration. It will be noted that the body of the chuck consists of a solid steel cylinder. Four heavy pins pass through this cylinder near each end, and are spanned on the outside by two clamping rings, arranged with tapered surfaces in contact with the outside ends of the pins. When the rings are turned through a short distance, the pins are forced in against the bearing and hold it securely in the chuck. The design and arrangement is such that the bearing is accurately centered, thus insuring that the finish bore through the babbitt will be exactly concentric with the shell. The far end of the chuck

While the Two Halves Are Held in a Split Jig, the Interior Bore of Axle Bearings Is Finished in One Cut



A Clamping Ring on the Outside Holds the Two Halves of Axle Bearings on an Arbor While Facing the Flange

The operation of finishing the face of the flange, and rounding the inside edge, is carried out similarly to the corresponding operation on the bronze shells. In addition, however, a dovetail groove is turned in the face of the malleable flange, to help in retaining the babbitt that is put on this face to take end thrust wear.

After this is done, the small end of the bearing is faced off to remove the fin and square up the end surface. The same type of arbor and clamp that was described for facing the flanges on bronze shells is used for this operation, except that a pin on the arbor projects through the bearing window and helps to

in the illustration is threaded to fit the headstock spindle of a turret lathe.

With the bearing thus mounted in the turret lathe, the interior bore and the facing operation on the flange are performed at one setting. The short boring tool is carried in the turret, and the facing tool is mounted in the tool post. This facing tool is carefully squared up with the flange, so that the finish cut is made by simply bringing the tool against the face of the flange with the longitudinal hand feed on the machine. The end of the facing tool is hook-shaped as shown in the accompanying sketch, and by moving

The Outside Is Turned and the Inside Face of the Flange Is Finished in This Set-Up

Above, Arbor for Set-Up Shown at the Left. The Two Halves Are Held by Disks Which Clamp Against the Ends

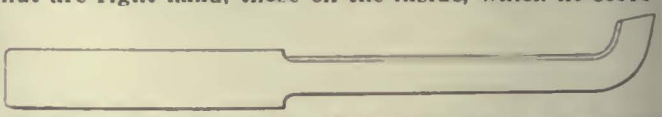
the tool out with the lateral hand feed, the inside edge is quickly finished in practically the same operation as that of facing the flange. The inside bore is finished so that the bearing will just fit a standard plug that is used for checking the size.

On the malleable bearings, as in the case of the bronze shells, the last machining operation consists of drilling the dowel-pin holes. This is done in a jig which is very similar to that described for drilling the bronze shells.

Armature Bearing Operations Simplified

All armature bearings consist of bronze shells cast in one piece, which in some respects lend themselves more readily to efficient machining than is the case with the split shells used for axle bearings. The casting is first chucked by the small end in an independent jawed chuck, which allows the piece to be readily centered in a lathe. With this set-up in a turret lathe, the interior is bored and the outside face of the flange is finished. A ring $\frac{1}{32}$ in. deep and $\frac{1}{16}$ in. wide is cut into the inside bore of the bearing shell about $\frac{1}{4}$ in. from each end, to help hold the babbitt lining in place.

The bearing is next slipped on an expanding mandrel for finishing the outside. This special tool consists of a center spindle having a taper of $1\frac{1}{4}$ in. per foot, and an expanding sleeve that grips the inside of the bearing. Cast-iron sleeves are made up in various sizes to fit the different-sized bearings. A longitudinal slot about $\frac{1}{8}$ in. wide is cut clear through the sleeve on one side, and two slots about $\frac{1}{16}$ in. wide are cut into the outside face to within about $\frac{1}{8}$ in. of the inside bore of the sleeve. The three slots are equally spaced about the circumference, so that the sleeve can expand when it is forced onto the tapered spindle of the mandrel. A large nut on the small end of the spindle is threaded right hand on the inside and also has a long shoulder which is threaded in the same direction on the outside. Although both the inside and outside threads on this nut are right hand, those on the inside, which fit corresponding threads on the end of the mandrel spindle, are pitched 12 to the inch, while those on the outside are pitched six to the inch. These outside threads fit corresponding threads on the inside of one end of the expanding sleeve. Consequently, when the nut is screwed to the left it forces the sleeve up on the tapered spindle at a rate corresponding to the difference in pitch between the inside and the outside threads, and when the nut is screwed to the right it pulls the sleeve off the taper at the same speed.



The Hook on the End of This Facing Tool Finishes the Inside Rounded Edge Immediately After the Babbitt on the Face of the Flange Is Finished

This Special Chuck Centers the Finished Malleable-Iron Bearings So that the Final Bore in the Babbitt Can Be Made. The Outside Rings Force Pins Against the Shell and Hold It Securely

Expanding Mandrels of Two Types Are Used for Holding Armature Bearings While the Outside Is Being Finished. Left, Mandrel Used in Turret Lathe. Right, in Engine Lathe

A short keyway extending for about 3 in. from the shoulder near the small end of the spindle forms a guide for a short pin projecting from the inside face of the sleeve, and serves to keep the latter from rotating as the nut is turned in either direction.

This expanding mandrel has a large head at the opposite end from the adjustment nut just described, and is threaded on the inside to fit the threads on the turret lathe headstock spindle.

Also Designed for Engine Lathe

When the available turret lathes are crowded with work, it is sometimes necessary to finish armature bearings in an ordinary engine lathe. Under these conditions the work must be done between the centers of the lathe, and a somewhat different type of expanding mandrel is used to hold the bearings. In this type of mandrel a nut is provided on each end, one to force the sleeve on the tapered spindle, and the other to force it off. A keyway the entire length of the spindle keeps the sleeve from turning as it is forced on or off. Although the construction of this type of mandrel is somewhat simpler than the one previously described, the turret lathe method is used whenever machines are available, because it is necessary to remove the mandrel from between the centers of the engine lathe each time a bearing is to be put on or taken off. The entire outside surface of the bearing is finished on one or the other type of mandrel in one operation.

Dowel-pin holes or keyways, depending on the method of holding the bearing in the motor head, are next put in.

After the shell has been babbitted, the last operation consists of boring the babbitt lining to size. This is done on an engine lathe equipped with a universal chuck and a special tool post, which enables a boring bar to be used in the lathe.

New Chicago Multiple-Unit Cars Have Automatic Exit Doors

These New Type Cars of the Chicago Surface Lines Are Designed to Give Maximum Flexibility Either as Single Units or in Two-Car Trains — They Are Arranged for Double-End Operation and Are Equipped with Two 65-Hp. Motors per Car Mounted on Maximum Traction Trucks

A GROUP of 100 new cars for the Chicago Surface Lines on which preliminary specifications were announced in the issue of ELECTRIC RAILWAY JOURNAL of April 12, 1924, are rapidly nearing completion. Some of the cars have already been put in service and it is expected that the entire lot will be on the street in regular operation before the Christmas holiday period.

Although the design of this latest addition to the rolling stock equipment of the Surface Lines utilizes many structural features common to other groups of cars built by that property within the past few years, a number of interesting innovations are also incorporated. These include the use of G.E. type M multiple-unit control with two motors per car and maximum traction trucks, and an unusually flexible arrangement of pneumatic door control in which the exit doors are automatically operated by alighting passengers. A similar type of automatic exit door control was installed on a group of 45 double-truck, one-man cars described in the ELECTRIC RAILWAY JOURNAL of Sept. 30, 1922, which have now been in service for a period of more than two years. This latest design, however, represents an extension of the use of the automatic device to cars for service in congested districts either as single units or in multiple-unit trains.

A substantial saving in weight and cost in comparison with four-motor equipment was obtained by the use of two GE-275, 65-hp. motors per car mounted on Brill 39-E maximum traction trucks. The selection of this type of motor equipment instead of four smaller motors per car was also influenced by the desire to obtain rugged, comparatively low-speed machines for the severe service conditions encountered in Chicago. Such equipment gives large-size armature shafts, gears and pinions, and makes the motor parts interchangeable with those used on other groups of cars constructed within the past few years.

Multiple-unit control gives these cars maximum flexibility and permits single units to be operated during non-rush periods and to be readily coupled on the street into trains for rush-hour service without serious delays. Double-end equipment permits them to be operated on lines having stub terminals. Tomlinson automatic car and air couplers facilitate coupling and uncoupling on the street, but the electrical connections between cars are made with flexible jumpers. This application of multiple-unit control marks a further extension of train operation in Chicago, which for a number of years has been carried out with motor cars and center-entrance trailers.

Maximum Speed in Loading and Unloading

National Pneumatic door-control equipment is arranged to give maximum speed of loading and unloading in either street or subway operation. The door and car control are interlocked to prevent starting with the doors open, and full Safety Car Devices apparatus is also used. Single-car units will be operated by two men. In trains of two cars there will be three men, two on the front car and one on the front end of the rear car. In either direction of operation, the doors at the rear end of each car may be con-

The New Chicago Surface Lines Cars Have Multiple-Unit Control and Are Arranged for Operation Singly or in Trains of Two Cars. Streamline Effect in the Body Gives It a Graceful Appearance

trolled by an operator on either platform, or by street collectors. This allows the rear door of the second car in a train to be opened and closed by the conductor stationed on the front platform of that car or by a man on the street supplied with a key to fit the door-control valve located on the outside near the rear door. The automatic exit doors are located on each platform as shown in the accompanying plan drawing, and those at the front end of each car are operative when the train is moving in that direction.

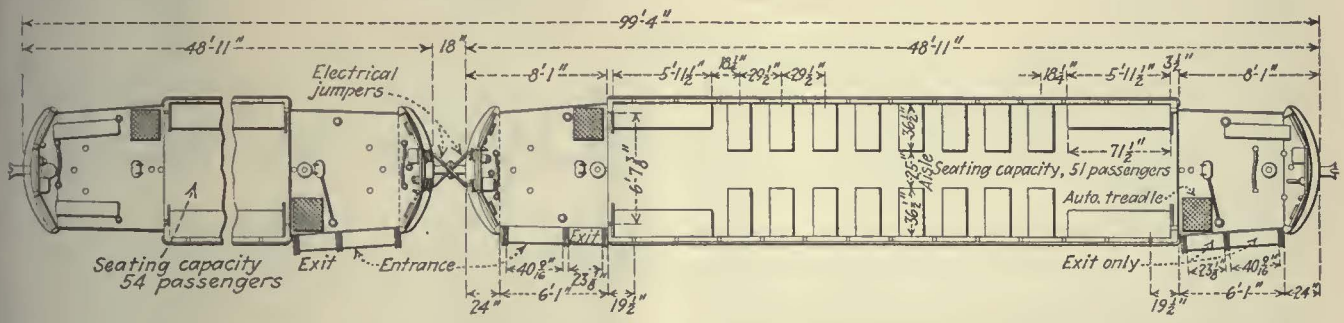
One of the principal features of the arrangement of doors when the cars are operated in trains is the grouping of the entrances at the center of the train. In other words, passengers enter the front car at the rear end and leave this car at either the rear or the front end, while they enter the rear car at the front end and leave at the same end. When street collectors are available, passengers may also be allowed to enter or alight from the rear end of the second car. This arrangement for loading both the front and rear cars at one point in the center of the train is expected to give more uniform distribution of passengers between the two cars than is obtained where the points of boarding the two cars are separated, as in the case of a rear loading motor car and a center loading trailer. In addition, this design is expected to avoid the delay and confusion resulting from passengers trying to board the train at two different locations.

Simple Lines and Smooth Curves with the Dull Finished Cherry Trimming Feature the Interior of This Car. The Wide Aisle Facilitates Passenger Movement.

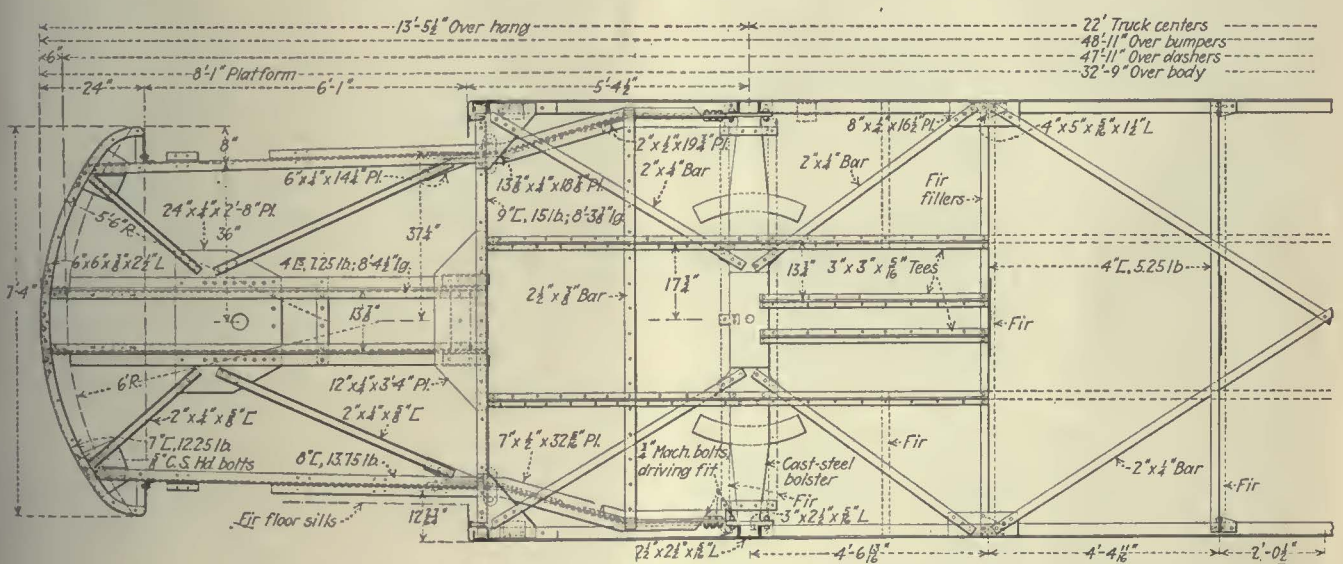
The Automatic Exit Doors Are Controlled by a Treadle in the Platform Floor. Passengers Board Through the Door at the Right and Leave Through the Automatic Exit.

The new cars were designed completely by the engineering division of the shops and equipment department of the Surface Lines under the direction of H. H. Adams, superintendent of shops and equipment. Fifty cars are being constructed in the West Shops of the company and the remaining 50 are being built to Surface Lines specifications and drawings by the Light-Weight Noiseless Electric Street Car Company in St. Paul, Minn. The two groups are identical in construction and all parts of the equipment and structure are being made as nearly interchangeable as possible to facilitate maintenance and repair. The general appearance corresponds with the arch-roof cars now in service on the Surface Lines and, as in former groups of cars, careful attention has been given to the matter of improving the appearance by giving the body a streamline effect.

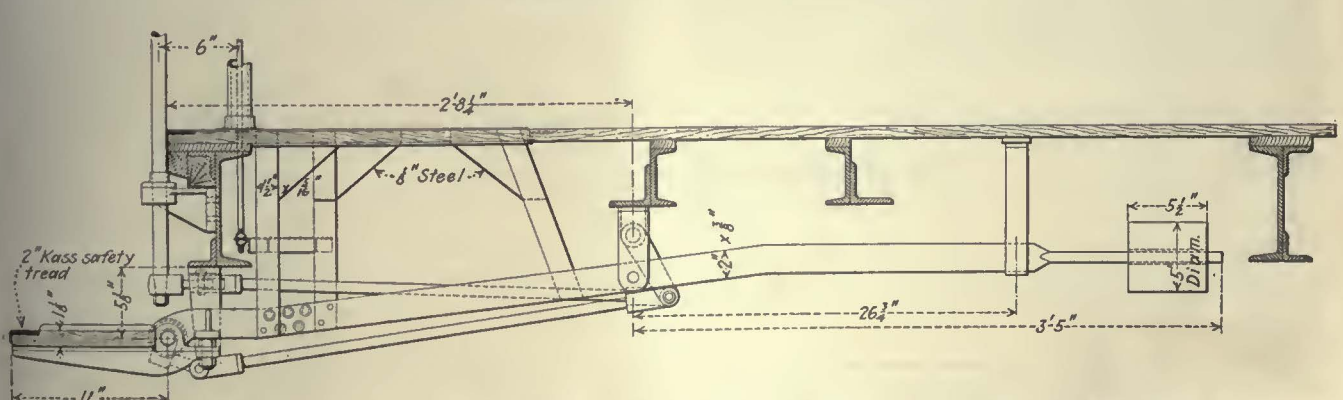
Minimum weight consistent with the severe service conditions encountered was another objective in the design. The complete cars weigh 41,000 lb. each. This weight is distributed between car structure and equipment as follows:



The Front Car of a Two-Car Train Seats 51 Passengers and the Rear Car Seats 54. Automatic Couplers Connect the Air Line, but the Electrical Connections Are Made with Jumpers



The Underframe Is Designed to Withstand the Severe Conditions Encountered in Chicago Service and Also to Meet the Requirements of Train Operation



The Treadle Mechanism for Controlling the Automatic Exit Door Is Connected with the Step so that the Door Remains Open Until the Alighting Passenger Steps Off to the Street

	Pounds
Car body	14,100
Trucks without motors and gears	11,280
Motors and gears	5,000
Electrical equipment	3,100
Air brakes, hand brakes, door equipment, couplers and piping	5,250
Body and vestibule seats	1,350
Sign boxes, register equipment, curtains and miscellaneous accessories	920
	41,000

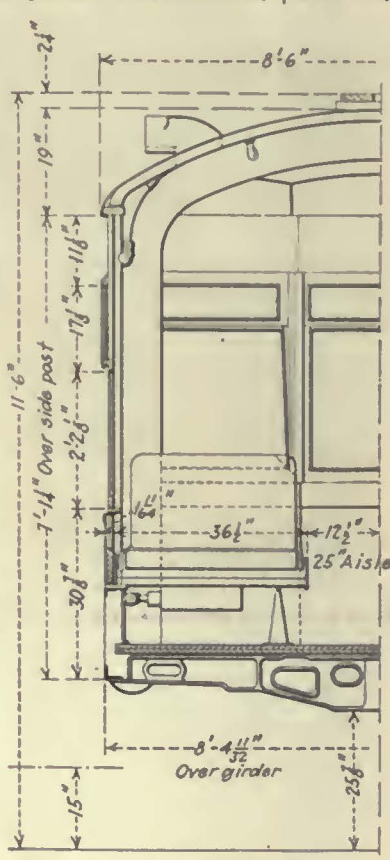
The general dimensions are shown in the tabulation below:

Length over bumpers	48 ft. 11 in.
Length over corner posts	32 ft. 9 in.
Width over all	8 ft. 6 in.
Seating capacity, first car	51
Seating capacity, second car	54
Width of aisle	25 in.
Door opening in clear, rear entrance of front car and front entrance of rear car	40 in.
Door opening in clear, rear exit of front car and front exit of rear car	23½ in.
Door opening in clear, front exit of front car	62 in.
Height, rail to trolley board	11 ft. 6 in.
Height, rail to floor	37½ in.
Height, rail to side sill	31½ in.
Height, rail to step	15 in.
Height, step to platform	12½ in.
Height, platform to body floor	8½ in.
Side-post centers	29½ in.
Truck wheelbase	4 ft. 10 in.
Truck centers	22 ft.

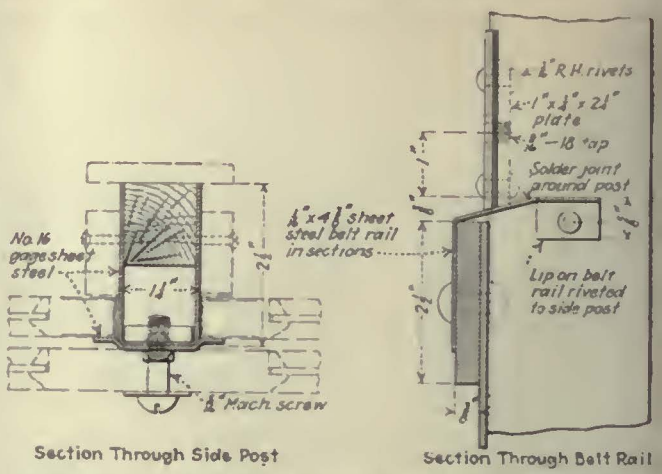
American Electric Railway Engineering Association standard parts and recommended dimensions have been used as far as possible throughout the body structure and equipment.

The side girder plates are made of No. 12 gage steel. Each side is reinforced at the lower edge with 3-in. by 2-in. by ⅜-in. angles and at the top edge by the belt rail, formed of ⅛-in. sheet steel and further reinforced with a 2½-in. by ⅜-in. bar. Seat support angles 1¼ in. by 1¼ in. by ⅛ in. are placed longitudinally half way between the bottom and top edges of the girder and are cut for the side posts. These are formed of ⅛-in. sheet steel and correspond in design to the side posts used in the group of 45 one-man double-truck cars described in detail in this paper, issue of Sept. 30, 1922.

Drop-type platforms are carried on 8-in., 13.75-lb. channel platform knees, reinforced at the point of greatest stress by web plates and angles. Bumpers are 7-in., 12¼-lb. channels with the flanges turned in. The end sills consist of 9-in., 15-lb. channels secured to the side structure with gusset plates. Channels are used for the main body cross-sills and are of 4-in., 5¼-lb. section. The under-



Cross-Seats Are 36½ In. Wide, and for an 8-Ft. 6-In. Over-all Width an Aisle Width of 25 In. Is Obtained by Making the Wall Thickness Below the Belt Rail Only 1 11/64 In.



Pressed-Steel Side Posts Are Used. The Belt Rail of Pressed Steel Is Reinforced with a Flat Bar at the Upper Edge of the Side Girder

frame is rigidly braced with diagonal members, as shown in the accompanying drawing of the construction of this part of the framing.

A combination of flat steel and wood carlines is used to support the roof in a manner similar to that which has been standard construction with the company for several years. The roofing material is ¼-in. Haskelite and the headlining is ⅛-in. Agasote. Other details of the body structure and framing are very similar to a former group of 169 cars described in this paper for Sept. 8, 1923.

Car wiring both for control and auxiliary circuits is carried in "Duratube" except where exposed to abrasion or direct wheel wash, where it is put in aluminum conduit. The main motor cables are inclosed in "Duratube," cleated under the center of the car floor. The floor is carried continuously between trapdoors for a space about 8 in. wide, and this allows the cables to be carried past the trapdoor openings with no special provision for extra protection at this point. Aluminum motor junction boxes are used, and the heater wiring

SPECIFICATIONS FOR THE NEW CHICAGO MULTIPLE-UNIT CARS

Air brakes	G.E. CP-27, 16 cu.ft. capacity
Compressor	G.E. Type
Control	G.E. Type M light-weight
Trucks	Brill 39E-2x, maximum traction
Roof	¼-in Haskelite covered with No. 8 National prepared roofing
Headlining	⅛-in. Agasote
Interior trim	Cherry, stained dark with rubbed finish
Signal bell	Consolidated single stroke bells
Buzzers	Consolidated
Trimmings	Statuary bronze
Center bearings	Surface Lines standard plain type
Side bearings	Stucki
Conduits	Duratube and aluminum
Couplers	Tomlinson automatic car and air
Curtain material	Fabrikoid, double faced
Curtain fixtures	Railway Supply & Curtain Co. No. 30 "Duquad"
Destination signs	Hunter illuminated
Door-operating mechanism	National Pneumatic with interlocking control and automatic exits
Wheelguards	H-B Lifeguards
Hand brakes	Pittsburgh No. 35, drop handle
Hand straps	Rico sanitary No. 7
Heater equipment	Consolidated
Headlights	Trolley Supply—Surface Lines standard
Meters	Economy
Motors	Two G.E.-275, 65 hp.
Paint	Chicago Varnish Company and vitrolite enamel
Rails and stanchions	Aluminum
Registers	International R-7 and R-13 backs
Sand traps	Electric Service Supplies
Sash construction	Wood with brass channel on stiles
Sash fixtures	O. M. Edwards with lock on one side of sash and compression brake on opposite side
Seats	St. Louis
Step treads	Kass
Thermostat	Railway Utility
Trolley catchers	Trolley Supply
Trolley base	US-14
Trolley wheels	Railway standard 5-in.
Ventilators	Railway Utility with compensating intakes
Wheels	28-in. and 21-in., rolled steel
Window wipers	Railway type, hand operated

long the truss plank on the interior of the cars is carried in aluminum conduit.

In one sample car of this group "Romex" cables and wiring were used. In this installation the insulated conductors are inclosed in fabric covering woven directly over the conductors and then coated with flame-proofing and waterproofing compound. This type of wiring was put in to obtain more experience with this material, which is believed to come within the tentative rules for car wiring presented by the 1924 A.E.R.E.A. committee on car and carhouse wiring.

Complete specifications for materials and equipment used on these cars are given in the table on the preceding page.

Thermit Process Gives Good Results in Youngstown

This Method Is Used in the Installation and Repair of Crossings, Switches and Mates, Compromise Joints and Other Special Work—It Has Been the Standard of the Company Since 1916

By D. J. Graham
Engineer of Maintenance of Way Youngstown Municipal Railway, Youngstown, Ohio

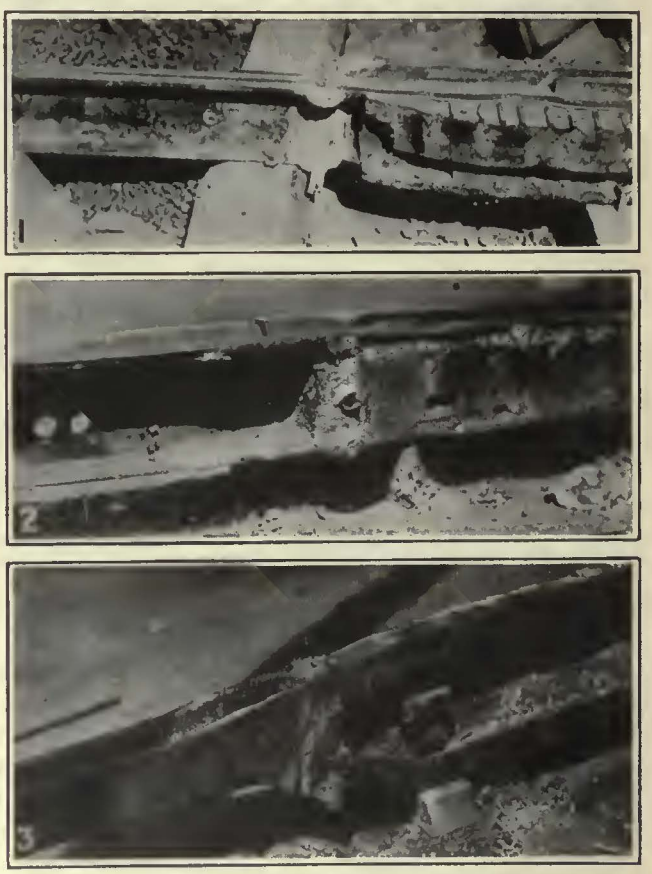
DURING the past eight years, approximately, 8,000 thermit-welded joints have been installed by the Youngstown Municipal Railway and to date only seven joints have failed. From investigation of the failures it was found that in most cases the break was due to faulty pouring, improper preheating of rails, or neglect in setting the mold boxes in the center of weld. In 1916 thermit-welded joints were adopted as standard practice for all types of new track construction. At first this method of welding was used for joints only, but gradually it has been developed to a point where it is used for other purposes, such as repairing switches, crossings, compromise joints, and other special trackwork.

An example of its efficiency in this respect is the repair work recently performed on a mate of solid cast-steel construction. A 12-in. piece of guard rail on the point end of a mate broke out, and as the mate itself was only partly worn, it was decided to make repairs on the job. The mate was cut off back of the break and a new piece of guard rail butted against the remaining end and welded to it by the thermit process. This was done during the night when service was suspended and was completed at a very reasonable cost. An additional life of approximately 5 years resulted. The accompanying itemized tabulation of the cost of the job shows the economy of performing this work in the street.

COST OF REPAIRS

Labor (One foreman, 70 cents per hour; one helper, 66 cents per hour; one truck driver, 50 cents per hour)	$ 7.00
Welding, sand and wax	.45
Thermit metal	13.85
Gasoline for preheating	.30
Power for preheater and grinding	.85
Gas and oxygen for cutting	.35
Brick, sand and cement	1.85
18 in. of second-hand guard rail	.65
Total cost	$25.30

This type of reconstruction work is used in repairing frogs and switches with the same economical results. Fig. 1 shows a switch that was taken out of the scrap pile, repaired with the thermit weld, and placed in a diamond turnout where the old switch went to pieces. This repaired switch is now in service and will probably last for two or three years. Other examples of special applications of thermit welds are shown in Figs. 2 and 3, which illustrate the side and bottom views of a switch which was broken through the casting. These indicate how the weld was placed at the break uniting the two ends and making the switch casting as solid as originally. Ordinarily this piece of special work would have been scrapped, but instead it was repaired in the shop and placed in use at another location.



How Switches Are Repaired

No. 1. Broken switch repaired with thermit weld.
No. 2. Side view of switch casting repaired with thermit.
No. 3. Bottom view of the same switch casting showing filled out break in casting.

In addition to repair work, thermit welds are used on all new crossing work. On a double-track crossing made

Examples of Thermit-Welded Special Work

No. 4. Thermit-welded frogs installed at single-track double-track crossing. No. 5. Top view of crossing, showing weld at rail intersection and flangeways built in by arc welding to give continuous flange bearing. No. 6. Bottom view of same weld showing continuity of joint and clean appearance.

with Lorain Steel Company's rail section 132-440, the frogs were welded into position by means of thermit metal. Intersections of the flangeways were built up with an electric arc welder and ground with a rail grinder so as to make a taper flange bearing over the intersection. A crossing of this kind installed more than three years ago is in perfect alignment and rendering good service today.

A similar crossing was built of Lorain Steel Company's rail section 103-478 with the frogs built up of thermit metal. In this case the flangeway of the crossing was built up with arc welding in order to make a continuous flange bearing over the entire crossing. Figs. 5 and 6 show a top and bottom view of this crossing, illustrating the manner of welding and the uniform appearance of the bottom and top of the rail.

All compromise joints are made by means of the thermit process. This type of construction is shown in Fig. 7. Other illustrations of compromise joint welds are shown in Figs. 8 and 9. A finished joint which has not been ground and needs no grinding on account of the perfect surface and gage alignment retained in making the weld is shown in Fig. 10. Renewing plates, tightening of bolts, broken bonds, and building up cups, are items of expense that do not exist with welded compromise joints, but which are important where other methods are used. The original cost of the two types of joints is approximately the same.

Compromise Joints Made by Thermit Process

No. 7. Compromise joint from L. S. Co. 90-206 to 70-lb. A.S.C.E. T-rail.

Nos. 8, 9, 10. Compromise joint between L. S. Co. rail sections 103-478 and 73-291.

CAREFUL INSTALLATION IS IMPORTANT

Thermit welds are used on both Lorain Steel Company's rail sections 132-440, 9-in. rail and on 103-478, 7-in. rail. An inspection of joints installed seven years ago which had developed a few small cups afforded an indication of how faulty workmanship in placing the metal has a detrimental effect on the life of the joint. On this particular piece of track, the regular man doing the original grinding had been replaced by another. After grinding through the cupped section, it was discovered that improper grinding had been done at the time the joint was installed. This was thought to be the cause of the failure of the joint. Where the work of preparing and welding the joint and finishing is carefully done long service may be expected.

Of the 4,500 buses owned by the London General Omnibus Company about 7 per cent are normally out of service—5 per cent for the daily inspection and greasing, and 2 per cent for accidents and annual overhaul.

Chicago Surface Lines Reroutes 1,600 Cars

Widespread Changes in Schedules and Operating Routine Required by Adoption of New Plan to Relieve Congestion — Public Advised by Liberal Use of Paid Publicity

TAKING the lead in the attempt to relieve the notoriously congested conditions in Chicago's business district, known generally as the "Loop," the Chicago Surface Lines has put into effect a complete rerouting plan for its cars. This plan, which was described and discussed in detail in the ELECTRIC RAILWAY JOURNAL of May 3, 1924, page 683, is the result of more than a year of study on the part of engineers representing the city, the companies and the Illinois Commerce Commission. The detailed plan was submitted to the local transportation committee of the Chicago City Council in the form of a report by its transportation engineer, Major R. F. Kelker, Jr. The final rerouting by the Surface Lines was put into effect by an order from the Illinois Commerce Commission and was carried out a month in advance of the requirements of the order.

Type of Sign, Mounted on Standards, Used at Important Intersections to Advise Passengers of Changes in Routes

Close-Up View of the Sign and Stanchion Used in Chicago

Approximately 1,600 cars on 35 different lines are affected by the changed routing. Sweeping revisions of schedules, transfer of cars between terminals, increases in the number of cars assigned to some terminals and decreases in others, transfers of men between terminals, changes in switches throughout the loop district, more than $100,000 of additional trackwork in the form of new loops to eliminate stub terminals and instruction of men to make them familiar with new routes have been some of the widespread operating problems to be solved in connection with the change.

In general the new routing is based on the elimination, as far as practicable, of traffic interference due to the turning movement of street cars in the business district. Left-hand turns were considered to be most objectionable, since each such turning movement temporarily interferes with traffic in both directions, Right-hand turns were considered next objectionable because such turns temporarily interfere with two lanes of traffic. Straight crossings, of course, offer the least interference.

The new plan combines certain lines so as to furnish additional through routing, removes unimportant lines from the business district and eliminates turning movements in this district by bringing cars in on one street and out on another, completing the loop outside the business district. North-and-south lines are carried through the business district before making loops. Not only are turns in the business district eliminated in this way, but a largely increased service is furnished between the north and south boundaries of the business area.

Dearborn Street, which has never been a through street for north-and-south lines, has been made a turning street for lines to and from the west side of the city. This has made necessary the use of a walking transfer between these west side lines and the north and south lines on State Street.

In addition to the track changes outlined in the previous complete description in the JOURNAL of the proposed new routing, many changes in switches in the loop area were required. This included changes to approximately 100 mechanical switches, the removal of 25 electric switches and the installation of 21 electric switches in new locations. Lever type switches were installed at all points facing crossings with straight track.

Trainmen were supplied with maps and folders some time in advance of the change and were told that it would be necessary for them to be able to pass an examination on the new routes, so that they would be qualified to answer questions on the part of the public. In addition, those men who were assigned to new through-route runs which would take them into unfamiliar sections of the city were required to ride over the proposed new route and to sign registration books at the terminals at the far end of the line, indicating that they had completed the trip. Special instruction was given to men newly assigned to service on runs making trips through the tunnels under the Chicago River, in order to make them familiar with the rules for such operation.

Approximately 140 men were voluntarily transfered between stations because of changes in car assignments. Under the labor agreements existing in Chicago, this meant the sacrifice of seniority rights for picking run assignments, on the part of these men. Schedules on all the affected lines were completely remade and were placed in the hands of division superintendents in time to allow men to pick new runs and receive proper instruction relative to the new routes.

Three million folders giving the details of the new routes were distributed direct to the public through folder pockets in the cars, hotels, banks, department stores and large industrial and commercial institutions in the city. Printed maps showing in detail the exact routing of each line through the business district were supplied to trainmen and other employees, to traffic officers of the city and to others interested in the details of the new routes. These maps were also furnished to the public on request.

In addition to this directly distributed material, cards were carried in all cars calling attention to the proposed changes in routing. A list of the changes was published in paid advertising space in all the metropolitan newspapers and in the daily foreign language press.

Thirty standards carrying conspicuous signs were placed at important intersections in the business district to direct passengers who had not become familiar with the changes through the other publicity material issued.

A total of 5,847 right-hand turns in the business district per day have been eliminated. Also, 5,381 left-hand turns and 988 stub terminal movements have been done away with. It is estimated that intersection interference between street cars has been reduced 27 per cent.

The complete change-over was made at midnight on Sept. 13. Plans had been carefully laid in advance and all instructions issued so as to make the changes with the minimum confusion. At this time the necessary changes in the connections of electric switches were made.

The final success of the new routing in reducing traffic congestion depended on subsequent regulation of other traffic movement. The Chicago Association of Commerce, as the result of studies made by its traffic committee, took official action in favor of eliminating both turning movements and parking of automobiles within the congested area in the business district. It has been pointed out by the Surface Lines that its cars constitute only 10 per cent of the number of vehicles using the streets of the business district, but that they carry more than 75 per cent of the people who ride in this area. It was contended, therefore, that the full benefit of the new plan in improved service, as well as the elimination of congestion and danger to pedestrians, could only be realized with the similar scientific routing of other vehicles using the streets.

A short trial period with the new routing of cars convinced the city authorities that an even greater improvement would be obtained by the elimination of turns in the congested district by other vehicles. Regulations eliminating left-hand turns entirely at most of the important intersections within the Loop were consequently adopted and put into effect. This has improved the conditions to such an extent that the Surface Lines are now engaged in a further study of the resulting effect on street car movement, looking toward a revision of schedules that will take advantage of the reduction in congestion to effect a saving in time for the 75 per cent of Loop passengers who ride the street cars.

The Readers' Forum

Say In Situ Treatment Is Used on 250 Miles of Track

MESSRS. C. P. SANDBERG
Consulting and Inspecting Engineers
40, Grosvenor Gardens,
LONDON, S. W. 1

Nov. 3, 1924.

To the Editors:

The Foreign Report Number of the ELECTRIC RAILWAY JOURNAL of Sept. 20, 1924, contains the advance publication of the report of the American Electric Railway Association committee on foreign operation. The observations of the committee, as expressed in the summary and also in the main report in regard to the operation of British tramways, are both cogent and intimate, and form a valuable record of the opinions of the managements of the undertakings dealt with. The report is discriminating and, as is only to be expected in a document of this kind, prominence is given throughout to the special features which obtain on the several tramways visited. On the whole the committee is to be congratulated upon its presentation of the situation in each tramway district visited, and there can be no doubt that the information published will be quite as interesting to British tramwaymen as to their confrères in the U. S. A.

It is only to be expected that minor errors have not been avoided, and our attention has been called to the observations of the committee in regard to the Sandberg *in situ* rail hardening process. In the summary it is stated that the *in situ* treatment of rails is still in the experimental stage, and in the body of the report the article on *in situ* treatment of rails expresses the opinion that British "experience is not yet of sufficient amount to provide any definite opinion as to its merits . . . and the best that can be said for it up to date is that the results have been sufficiently good that some of the tramways are making further installations as a means of gathering further data." It would appear that these observations are based solely upon the limited amount of rail treated to date on the tramways within the London area which, owing to the destructive effect of the magnetic track brake, has been, as stated, on an experimental scale.

The Sandberg *in situ* rail hardening process has, however, long since passed the experimental stage. Since its introduction six years ago over 250 miles of track have been treated in Great Britain. The process is now being developed on the Continent and in the Dominions. A number of important British tramways have adopted the process as part of their regular maintenance operations, and it will be of interest to observe that the Leeds, Liverpool and Manchester Tramways have had 25, 30 and 46 miles of track treated respectively, and a number of other systems have each placed repeat orders for the treatment of upward of 10 miles of track.

The resistance of treated rails to wear is very much greater than that claimed in the committee's report, as is shown by the following calculation based upon the average results of 30 sets of gagings taken upon representative tramways in the United Kingdom, after

the passage of 2,400,000 tons (English) of traffic in each instance:

Average wear on untreated rails, 0.0398 in. per 2,400,000 tons (Eng.)
Average wear on *in situ* treated rails, 0.0173 in. per 2,400,000 tons (Eng.)
Average wear on untreated rails = 2.3 times that on *in situ* treated rails
With a $\frac{3}{16}$ (0.1875 in.) depth of *in situ* treatment at the above average wear (0.0173 in.), treated rail would last ..... 10.83 years
At the above average wear (0.0388 in.) $\frac{3}{16}$ in. untreated rail would last ..... 4.71 years

Severe tests were carried out by the London County Council Tramways over a period of about 3 years in order to ascertain the resistance to corrugation of rails treated by the Sandberg *in situ* process. During this period the test rails both treated and untreated were traversed by 2,092,000 cars (33,000 lb.) or approximately 31,000,000 tons (English), and corrugations were removed on three occasions from the untreated rails while the rails treated by the Sandberg *in situ* process remained free from corrugations throughout the test. Similar proof of the resistance to corrugation of the treated rails has been obtained from numerous other undertakings. It will be seen from this information that very definite advantages are being derived from the Sandberg *in situ* process and that it is now extensively established in Great Britain.

C. PETER SANDBERG.

Mitten Management Considers Changing Philadelphia Wage Basis

PHILADELPHIA RAPID TRANSIT COMPANY

PHILADELPHIA, PA., Nov. 10, 1924.

To the Editors:

Your editorial in the Nov. 1 issue, regarding the method of determining street railway wages, is a heartening indication that the industry is awakening to the importance of its most vital problem. It occurred to me that you might be interested in having the viewpoint of Mitten Management on this subject.

Wages will never be properly adjusted in any industry so long as the primary object of the employer is to receive the utmost service which he can coax from the employee for the lowest possible wage; nor while the only aim of the employee is to receive the highest possible wage for the least possible work. There must be a just recognition on the part of each of the rights of the other, and a joint appreciation of the rights of the consumer, who pays both dividends and wages.

Mitten Management believes that it has found the solution of the wage problem, basing its belief on the fact that it is now rendering in both Philadelphia and Buffalo a strike-proof service, with a satisfied body of men who recognize that higher wages can only come through greater effort on their own part. This is accomplished by a plan with which you are no doubt familiar, under which the men are made partners with the management. The latest step in the plan as applied in Buffalo is contained in the inclosed Tulley Talks No. 21, which is issued today. (Published below.)

The wages of P.R.T. employees are based on the average of those prevailing in Detroit, Cleveland and Chicago. We have long recognized the inadequacy of this method of arriving at a base, because each of these cities determines its wages upon successive strike-threats and arbitration. We have now under careful consideration a plan to base the wage in Philadelphia on the purchasing power of the dollar, continuing our policy of giving the men full opportunity to secure, in higher wage, the benefit of their greater effectiveness, which is further encouraged by the investment of this added wage in the securities of their company, whose value and dividend-paying ability is thus practically underwritten by them.

J. M. SHAW,
Editor *Service Talks*.

How I. R. C. Employees Can Best Lend Their Aid

(From "Tulley Talks" No. 21)

Mitten Management is deeply grateful for the offer of support from I.R.C. employees in meeting the financial burden of the recent Niagara Falls high-speed accident, but does not feel that such sacrifices will be necessary at this time. There is a way, however, by which I.R.C. employees can aid the management without calling upon funds which are necessary to meet the needs of their adequate living and saving.

I.R.C. employees are already partners with I.R.C. management, by virtue of the investment of part of their 1924 wages in I.R.C. bonds and stock. The wages of the men are now 57½ cents per hour, 2½ cents of which is paid into the co-operative wage fund administered by elected trustees and invested in the company. The full wage agreed upon for 1924 will be paid, and the management plans, with the continued co-operative effort of I.R.C. employees, to make possible a further increase in the basic wage rate.

Mitten Management now suggests that the basic wage rate for 1925 be continued at 57½ cents per hour, and that 2½ cents of this amount be used, as now, for the purchase of I.R.C. securities by the trustees of the wage fund, and further that after I.R.C. earns and pays the 5 per cent interest on its I.R.C. bonds, an additional wage of 3 cents per hour be then added; the full amount of this added wage—a total wage of 60½ cents per hour—to be paid during 1925, or as soon thereafter as the company's financial condition makes such payment possible.

What is done with this added wage will of course lie entirely with the employees, but the management strongly recommends that it be placed in the co-operative wage fund, and that it be invested in I.R.C. bonds and stock, in furtherance of the policy of employee-ownership which has so far helped keep International on an even keel, and will, we are confident, eventually put I.R.C. upon a safe and dividend-paying basis.

This proposal is to be now placed before the general committees, and if approved by them will be submitted for the signed approval of all employees. By accepting this proposal and thus underwriting the payment of the interest on I.R.C. bonds, and by directing their trustees to invest in I.R.C. bonds and stock the 10 per cent added wage over the 55-cent rate now being paid, I.R.C. employees can best lend their aid, and bring themselves into still closer partnership with the management.

A Suggestion About Whistles

THE OHIO BRASS COMPANY

MANSFIELD, OHIO, Oct. 31, 1924.

To the Editors:

We have received a letter from one of our customers (J. C. Schade, manager railways Wisconsin Public Service Corporation, Green Bay, Wis.), asking if we can furnish some kind of a chime whistle to replace the shrill whistles now on their line.

This incident suggests a thought that you might feel worth passing on to the industry. Place in the car a blank on which passengers are requested to write any criticisms that they may have on the service, stating what if anything connected with the ride is annoying, uncomfortable or distasteful. I know from personal experience that one interurban company has its cars equipped with whistles that will give one a headache within a 30-mile ride. There are other discomforts on many lines that could be eliminated and would be, if the management knew how they unconsciously move the patron to avoid riding on the traction lines.

JAMES H. DREW,
Manager Line Material Division.

Equipment Maintenance Notes

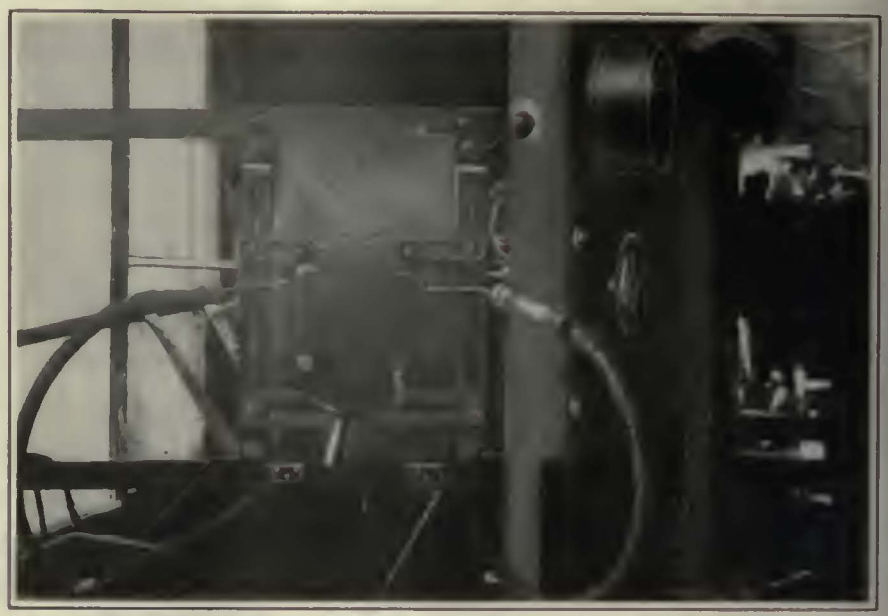
Shop Testing of Circuit Breakers

BY F. C. LYNCH
Shop Supervisor Kansas City Railways

IT IS the practice of the Kansas City Railways to set car circuit breakers at 150 per cent of the full load rating of the motors. In the past it has been found that unless these settings are carefully checked in the shop, there is a tendency on the part of operating forces to screw the settings up so high that the breaker does not operate even on severe overloads. This condition causes very high maintenance on electrical equipment.

A general mechanical department order issued to all maintenance departments shows the correct setting for each type of equipment in service. The divisions are not permitted to change the settings of breakers in service, but are instructed to return those thought to be incorrectly set to the shops, where all adjustments are made.

To do this work accurately in the shop, the test panel shown in the accompanying illustration has been provided. In addition to the panel itself, containing the various instruments required to check the setting at which the breakers open, a special type of mounting frame is provided for supporting the breakers in a position corresponding to their mounting on the various types of cars.



It Is the Practice of the Kansas City Railways to Make All Circuit Breaker Adjustments in the Shop. The Mounting Rack Shown Is Arranged so that the Breaker on Test Can Be Supported in Either a Vertical or Horizontal Position, Corresponding to the Position in Which It Is Mounted on the Car

The mounting frame is shown in the center of the illustration, with a circuit breaker in position for testing. It will be noted that vertical and horizontal straps contain long slots, so as to allow different types of breakers to be mounted readily. In addition to this, the board on which these straps are carried is hinged at the bottom and held by a catch at the top, so that the breaker can be supported for testing, in either a vertical or horizontal position.

The settings used for breakers on the various types of electrical equipment in service in Kansas City are shown in the accompanying general maintenance order issued by the mechanical department to cover this detail of practice.

KANSAS CITY RAILWAYS COMPANY
MECHANICAL DEPARTMENT

Subject: *Circuit Breaker Setting*

General Order No. 77

All circuit breakers will be adjusted and set at the shops, and will be pinned so that the setting cannot be changed.
The settings will be as follows:

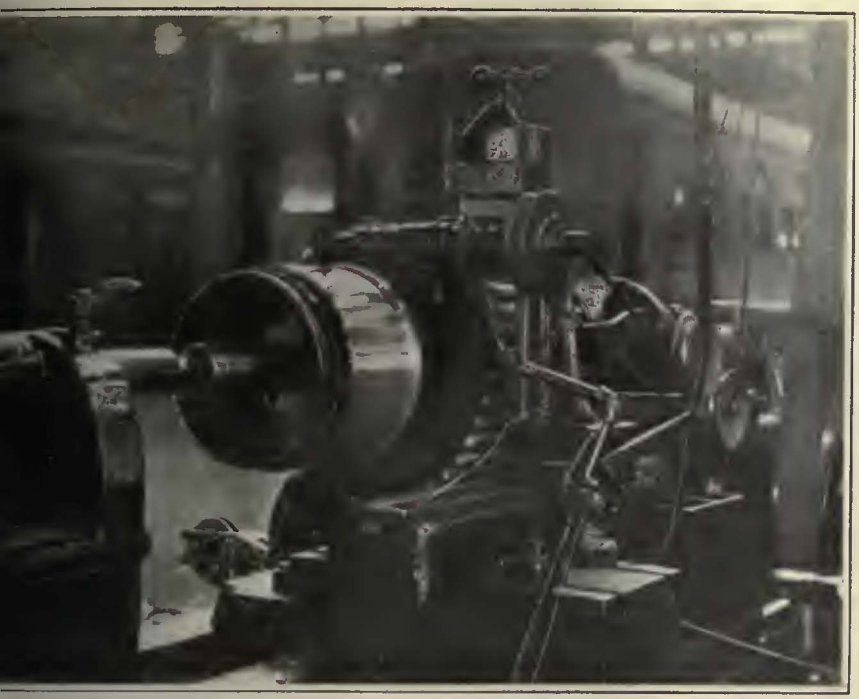
Type of Motor	Number of Motors	Circuit Breaker Setting	Full Load Current	Per Cent of Full Load Current
GE—57	4	550 Amp.	92 Amp.	150
GE—67	4	425 Amp.	72 Amp.	147
GE—67	2	210 Amp.	72 Amp.	145
GE—70	4	425 Amp.	70 Amp.	150
GE—80	4	425 Amp.	71 Amp.	150
GE—202	4	425 Amp.	74 Amp.	145
GE—247	4	315 Amp.	52 Amp.	151
GE—258	2	150 Amp.	37 Amp.	200
WH—306	4	550 Amp.	88 Amp.	155
WH—508	2	150 Amp.	37 Amp.	200

The Divisions will not attempt to change these settings. Any breakers that are found improperly set will be returned to the Shops.

This General Order Shows Correct Setting of Circuit Breakers on Each Type of Car Equipment Used in Kansas City

Commutator Slotter on Banding Lathe

IN THE Decatur shops of the Illinois Traction System a home-made commutator slotting attachment has been rigged up on a modified engine lathe. The attachment consists of a vertical standard mounted on the former tool post guide at the rear of the lathe bed. This upright slides longitudinally parallel to the axis of the lathe and carries at its upper end the milling spindle, which can be raised or lowered by means of a hand screw on top of the upright. The spindle carries a small milling cutter at one end and a 5-in. grooved pulley at the other. Two idler pulleys mounted beneath and to one side guide the raw-hide driving belt which takes power from the overhead line shaft. This arrangement permits the apparatus to be moved back and forth. Compressed air from the shop supply is used to blow



Home-Made Commutator Slotter Also Serves as a Banding Machine in the Decatur Shops of the Illinois Traction System

ıe particles of mica and copper way from the cutter, being fed ırough a rubber hose, with a regu- ting valve for the operator.

In operation, the milling cutter is ned up with the axis of the arma- ıre, which is then revolved until ıe mica is in line with the cutter. fter moving the vertical screw djustment to get the necessary epth of slot, the cut is made by iding the tool back and forth on ıe ways of the tool post guide.

The entire outfit was made in the ıops from materials at hand. The ıree pulleys are brass trolley wheels ıd the upright with screw adjust- ent is a portion of an old lathe, hile the spindle shaft and housing ere made up in the machine shop.

This lathe is also used when band- ıg armatures, so that preparation the rewound armature for service all done on one machine.

Wheel Grinding Practice in Twin Cities

FOR a number of years the Twin City Rapid Transit Company's ıechanical department has been rinding the treads of rolled-steel heels, using a Norton grinder for ıe purpose.

This practice is followed in all ıses where wheels require atten- on, except when a thin flange de- elops to a point where the wheel ıust be turned. In this event the ntire tread, as well as the flange, turned.

One interesting feature in connection with this grinding is the practice of cutting a groove in the throat of the wheel where the flange joins the tread. This is done to prevent the corner of the grinding wheel from chipping when it comes in contact with the fillet at this point.

Speed in handling wheels to and from the machine is an important element in obtaining maximum output per day. In the Snelling Avenue shops an overhead electric hoist, traveling on a track at right-angles to the machine, has enabled one man to handle wheels and operate the machine. With these facilities, one man grinds an average of between 30 and 35 pairs of wheels per working day.

A liberal flow of plain water is used to cool the grinders. This is fed by means of a centrifugal pump delivering the water from a tank under the machine. After passing over the grinding wheels, the water drains back into the tanks and is recirculated.

One Man Grinds 30 to 35 Pairs of Wheels per Day on This Norton Grinder in the Twin City Rapid Transit Company's Shop

Wood for Crossing Pavement

AT THE heaviest crossing in Fort Wayne, the double-track Calhoun Street line of of the Indiana Service Corporation crosses the three-track route of the Nickel Plate Railroad. As Calhoun Street is the main street of the town is was necessary for the street railway to provide a suitable pavement between the rails and between the tracks of its line. It was imperative that this pavement be of such construction that it could easily and quickly be removed and replaced when repairs to the crossing became necessary.

The type of pavement used is made up in sections which fit between the rails of the crossing. These sections are constructed of 3-in. planking laid in two layers, one layer being laid at right angles to the other, and the two are fastened together by means of $\frac{5}{8}$-in. bolts with washers. The lower layer is roughly cut away to fit around the irregularities and bolt heads of the crossing. The top layer is nicely fitted to the head of the guard rail.

In the center of each section is

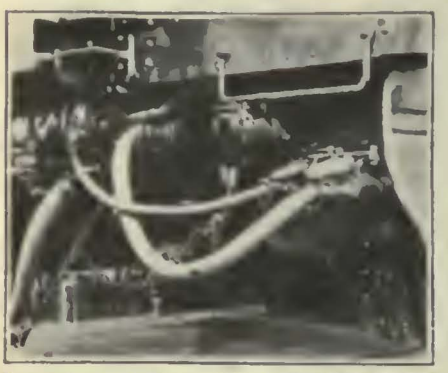
Section Raised, Showing How Lower Layer Is Hewn to Fit Bolt Heads, While Upper Layer Is Cut to Fit Head of Guard Rail

a 3-in. diameter iron ring securely fastened through the double thickness of planking with an eye-bolt. It is possible to remove the section a small derrick or by hand.

This type of crossing pavement is economical to construct and has met with the approval of the authorities of the city.

Permanent Jumpers Reduce Maintenance

THE New York, Westchester & Boston Railway uses two jumpers between cars of each train. Both are for 32-volt circuits, a 12-point train-line jumper being used for the control equipment while a 5-point jumper is used for control of the electric brakes. The company is now fastening these jumpers permanently in position in one pair of receptacles and is providing dummy receptacles for holding the loose ends. The dummy receptacles consist of the standard casing without contacts and they are being mounted on the end step support as shown in the accompanying illustration. The maintenance forces report that troubles and the maintenance of the jumpers have been reduced more than 90 per cent since this change has been undertaken.



Permanent Jumpers Used on the Cars of the New York, Westchester & Boston Railway

Dick Prescott Discusses Plans

And Prepares for the Trip with Steve

TO DICK'S delight, Steve White, the carpenter shop foreman, was selected to accompany him on the trip of inspection to gather ideas before starting in on his new work of organizing an engineering department in the shops of the Consolidated Railway & Light Company. Steve himself brought this additional good news when he returned from the office of Thomas Mullaney, general foreman.

Thus these two men, although young in comparison with some of the other men in the shop, were selected to initiate the new program of improvements. In recognizing the ambition, vision and initiative of Dick and Steve, by this selection Mullaney proved himself a capable executive despite his many years of obstinate devotion at the shrine of precedent.

"Well, Dick," said Steve, after their first burst of rejoicing had subsided, and they found themselves seated in the little carpenter shop office discussing their plans for the trip, "we're going to have a pretty stiff job getting an engineering department under way, and most of it will be up to you. From what I gather, the old man wants me to kind of follow along and give you what advice I can from the practical standpoint, and I'll give you all the help I can—you know that.

"But, as you must appreciate, the real work of organizing this new department and getting it working in harmony with the rest of the shop will be your job. That's not going to be easy, for although the old man has made up his mind that something's got to be done, you'll have to sell him your ideas every step of the way and it'll require lots of patience and courage."

"I think you're right, Steve, and I'm certainly glad to have your experience and knowledge of the shop conditions to help me over the rough places. I want to start things slowly and to demonstrate by actual performance the service an engineering department can render. Once Mr. Mullaney and the foremen are convinced that we can save them a lot of lost motion and be a real help in getting out their work, it will be easy sledding. I intend to feel my way along at first and study conditions carefully, rather than try to make a big showing at the start."

"That's the idea, Dick, and you can depend on me to help you all I can. I see where you can help my department a lot and I know the same conditions apply in other departments. When we get back from this trip I'll try to tell the advantages of the new plan to the other foremen so as to get them interested in giving you their co-operation."

"I'll certainly appreciate your help very much. There are several things that we can get started on as soon as we return. For instance, it seems to me that the shop badly needs some way to standardize maintenance practice. Maybe we can issue a uniform kind of maintenance order giving the exact practice to be followed. Such items as limits of wear for bearings, oiling periods, procedure on inspection and many other details like that could be definitely covered by such orders. That would cut out the guesswork and ought to improve our methods. My idea would be to have these standards we propose freely discussed at foremen's meetings, so that each order would actually represent the combined opinions of the department staff rather than the idea of a single individual."

"Good dope, Dick, you're thinking along the right lines. That's an instance of some of the things we can get under way when we get back. Now we ought to start out and make up an itinerary for this trip. The old man says we can have three weeks, and we want to make the most of the time. Suppose we start in and make a list of the properties we want to visit and note some of the things we want to see in each shop."

Sheet Metal Roll Smooths Armature Laminations

WHEN armature cores require rebuilding in the Snelling Avenue shops of the Twin City Rapid Transit Company, a sheet metal pressure roll, manufactured by the E. W. Bliss Company of New York, is used for reclaiming bent laminations.

This pressure-rolling machine is power driven and is found to be very effective in smoothing out the laminations. Previous to the installation of the above machine this work was done by hand. The machine method now cuts the total cost of armature rebuilding by 50 per cent in comparison with the former hand operation. In addition, the laminations are smoothed out in much better condition than was possible by hand methods, and it is found to be much easier to get them back in place on the shaft. The sheets stack up evenly so that pressing the core together after assembling is made less difficult, and a better armature is obtained.

New Type Heavy-Duty Dolly Truck

FOR transporting heavy materials, particularly steel sections such as girders, angles or plates, a heavy-duty truck has been built in the Wheaton shops of the Chicago, Aurora & Elgin Railroad. This truck is of wood frame construction, braced and reinforced by steel bars. The frame consists of two 2-in. x 4-in. members approximately 4½ ft. long joined near the ends and at the center by means of three cross-sills of the same cross-section, but only 18 in. long. Below the center cross-sill is a wood bolster made up of 3-in. oak of sufficient width to allow the wheels to have clearance over the side sills.

Heavy-Duty Truck Used for Transporting Steel from the Storage Yard to the Blacksmith Shop

The wheels are of solid oak construction 2 in. thick and of 18-in. diameter with ¼-in. steel tires. The upper frame is braced to the axle on each side by means of two 1½-in. x ¼-in. steel bars. The framework is held together by means of long through bolts, and the upper surface is covered with 2-in. x ¼-in. steel. The side sills of the frame project beyond the end sills approximately 5 in. and are tapered and shaped in the form of handles. The axle consists of 1-in. steel shafting to which the wheels are held by means of washers and cotter keys on the outside end.

The truck is so well built that it is possible for one man to move ½ ton of steel over the concrete walk from the storage yard to the blacksmith shop. The entire truck was built in the blacksmith and carpenter shops, there being no machine work in conjunction with its construction.

New Equipment Available

Small-Sized Power Hammer for General Service

GENERAL service hammers designed particularly for shops where there is insufficient blacksmithing to warrant a large investment in a power hammer are being placed on the market by Beaudry Company, Inc., Everett, Mass. These

Motor-Driven Hammer for General Service

hammers are built in three sizes with rams weighing respectively 25, 50 and 100 lb., and they may be operated by an overhead belt or can be equipped with individual motor drive.

The hammer is started, stopped and regulated through the treadle which throws a cone clutch in or out of the hammer pulley. The hammer head is of steel. Its travel is guided by external elliptical-shaped tracks. Two steel spring arms with steel rollers at the lower extremities and a helical spring at the top operate upon the curved track and lift and throw the ram, which with increased speed of hammer acquires increased travel and force of blow. Full strokes can be obtained on varying thicknesses of stock with no change of adjustment.

The ram operates in heavy V-shaped guides and has in addition an adjustable taper gib for taking up the wear. The hammers have long strokes and may be operated at high speed. Since the frame is self-contained and cast in one piece no extensive foundation is needed, and in some cases the hammers are bolted directly to the floor. These hammers may be worked to equal advantage from all sides, and as the anvil is offset long bars may be worked either way of the dies.

Connector for Temporary Work

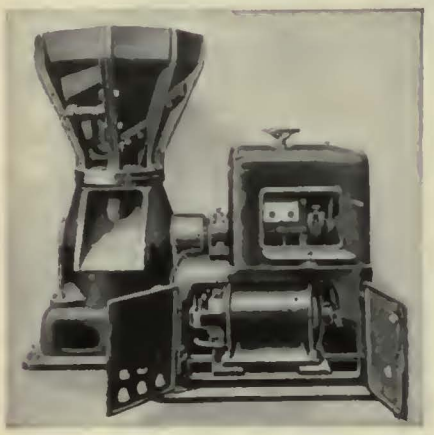
A NEW line connector suitable for use where occasional disconnection is required and where particularly quick disconnecting is not necessary has been placed on the market by the General Electric Company, Schenectady, N. Y. It is recommended particularly for making temporary connections in construction work.

The clamp is of brass with the exception of the spring, which is of phosphor bronze, and the two set screws, which are of zinc-plated steel. A standard disconnecting switch hook is used to operate the

device, which is so designed that the hook is held firmly to the connector while this is being attached or removed from a line. The connector has a current carrying capacity of 200 amp. and can be clamped to wires of diameters from ⅜ in. to ⅝ in. A ⅞-in. hole is provided for soldering a lead to the connector.

Waste Metal Crusher

A NEW electrically driven machine, known as the American chip crusher, that reduces the volume of long, loose, bushy metal turnings has been placed upon the



This Crusher Reduces Metal Turnings to ⅜ or Less in Bulk

market by the American Crusher & Machinery Corporation of New York City. It is a low-speed machine for cutting, grinding and crushing metal turnings and similar scrap into coarse, granular pieces which can be handled with shovels, magnets, belts or conveyors.

The machine is simple, the only parts subject to wear, the cutters or knives, being removable and easily replaced. The metal turnings are forked into a hopper and the cutting action is accomplished by a number of spiral knives made of specially treated steel.

A Westinghouse 4-hp. motor drives the unit. The control apparatus is all built in. To prevent the accidental entrance of solid metal pieces too large to pass through the crusher, it is equipped with devices that protect it against the breakage of knives and the strains of overloading.

The economy of storage space, the saving in handling and shipping, and the increase in salvage value of waste metal turnings, made possible by this machine, have made it popular in machine shops and with waste metal dealers. The unit illustrated has a capacity of 5 tons of ordinary turnings per day.

Vertical-Horizontal Hydraulic Press

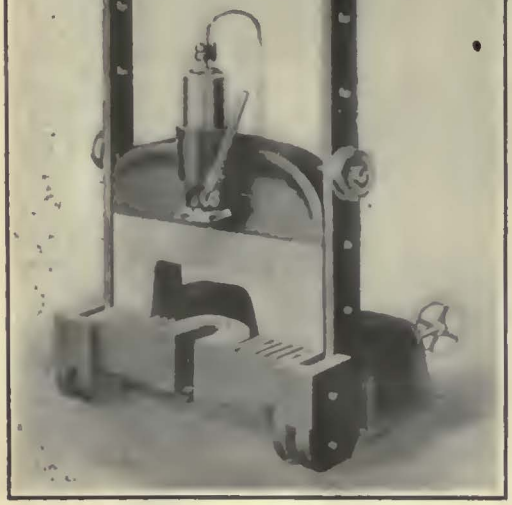
TO MEET a demand for a general utility shop press, the Watson-Stillman Company, New York, N. Y., has combined in one unit a vertical or a horizontal press for all operations which are ordinarily done in electric railway shops.

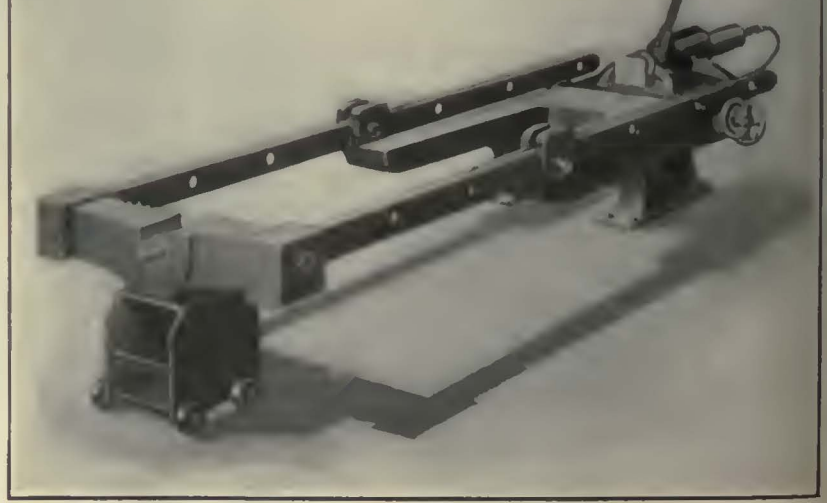
The machine may be converted from the vertical to the horizontal press by rotating the yoke by means of a hand wheel as shown in the illustration. The press is so balanced that the change from vertical to horizontal position may be made without the assistance of cranes or jacks. In the horizontal position it may be used for a variety of purposes, such as bending structural shapes, bars, pipes, etc., for forcing fittings, pressing gears on and off, forcing bearings into and out of housings, and like work. The bed of the press is planed smooth and the forcing tool on the end of the ram is supported on this bed.

For forcing long shafts, the abutment beam may be moved out a maximum of 7 ft. A four-wheel truck is provided to permit easy handling and also to support the beam when in the extended position. Hydraulic pressure is used only for the high pressure stroke of the ram. The idle portion of the forward stroke and the return movement is effected by a pinion which meshes with a rack in the ram. This rack and pinion device is of sufficient power to permit the use of this press for light arbor work without hydraulic power. The press is usually furnished with a hand pump, complete with hydraulic gage, pipe and connections. It may also be operated by a small two-plunger power pump. The press has a capacity of 60 tons and weighs 3,700 lb.

Apex CO_2 Recorder

AN ENTIRELY new and inexpensive CO_2 recorder known as the "Apex" has been introduced by the Uehling Instrument Company, Paterson, N. J. Inasmuch as the price of the new recorder is less than half that of other CO_2 machines, including the standard Uehling, it is believed that the new instrument will open up an entirely new field among the smaller plants, as it is stated that the anticipated fuel savings will warrant its adoption for boilers of 50 hp.





At Left, Press in Vertical Position. At Right, Same Press in Extended Horizontal Position

or over. The pyro-porus filter and the standard Uehling gas drier and desulphurizer are used, insuring cleanliness of the gas line and interior parts of the instrument. There are no chemical solutions and no moving parts excepting the pen mechanism. As a result the manufacturer claims that the recorder will operate accurately without any attention or adjustment other than the changing of charts and renewals of dry absorbent, which should not exceed 10 minutes weekly.

This new type of recording instrument will be exhibited for the first time, in both recording and indicating types, at the Power Show which will be held at the Grand Central Palace in New York during the first week in December.

Automatic Circuit Breaker Can Operate Manually

THE Automatic Reclosing Circuit Breaker Company, Columbus, Ohio, has recently developed a circuit breaker which normally is full-automatic in its operation, but it may at any time be operated in the same manner as a manually operated circuit breaker by depressing the operating handle.

When operating as an automatic reclosing circuit breaker it is under the control of a double pole push-button switch. When this switch is in the "off" position all of the control circuits of the breaker are completely disconnected and the breaker remains open. When the switch is in the "on" position the control circuits of the breaker are connected and the breaker closes, provided conditions on the line are proper for it to close. On overload, it opens automatically, remains open a short time interval, regardless of load conditions, and at the expiration of that time interval recloses, providing the overload or short circuit which caused it to open has been removed.

When for any reason whatever it is desired to operate the circuit breaker manually, the control switch is thrown in the "off" position and the operating handle attached to the breaker. The breaker is then closed in the usual manner by depressing the operating handle. It will open on overload or voltage failure if provided with no-voltage release. The operating handle is removed when the breaker is again placed in automatic operation. Breakers of this type are available in capacities up to and including 2,000 amp.

Improved Rivet Heater

SEVERAL improvements have been made in the electric rivet machines manufactured by the Humil Corporation, New York City. The accompanying illustration shows one of the latest types as used at the Harmon shops of the New York Central Railroad. Rivets are heated by their resistance to electric current, so the heat is generated in the rivets themselves. The machine is of rugged construction and is built entirely of metal, asbestos and mica, so as to be fireproof. All coils are impregnated with high grade insulating varnish, to make them waterproof.

Particular attention has been given to provide safety for the operator. All live primary parts are shielded and the voltage at the heads of rivets is so low that it can hardly be felt, this voltage never exceeding 3 volts. Transformers are furnished for any primary voltage available, such as the a.c. lighting circuit. Recent improvements include a redesigned control mechanism which is of the interlocking type. This is so arranged that the main stop and start switch, which is shown in the lower left of the illustration, locks the controller against movement when load is on the machine. This prevents all arcing and burning of control contacts. The stop and start switch is also locked out until the controller brush is in the proper contact position. The control contacts are made of heavy plate copper, the movable one being of the laminated brush type. The current applied to the rivets is regulated by a five-speed controller which gives five different current values and so enables the operator to govern his production rate accurately. Rivets are removed and inserted by pressing the pedal for the contacts desired.

Improved Rivet Heater in the Shops of the New York Central Railroad

All of the coils are located around a separate center core. The secondary coils of heavy cast copper inclose the core completely except for a small gap at the top to provide the open circuit necessary. This design provides for the complete cutting of all magnetic lines by both primary and secondary coils. The primary coils are wound with bare strip copper insulated with asbestos and mica tape. This provides rapid dissipation of the heat to the vertical air spaces and at the same time eliminates high voltage between layers of windings.

Rivets Are Heated Uniformly in the Electric Machine

The small illustration shows the heat developed in rivets and that the rivets are heated evenly all over. This insures faster, tighter and cleaner riveting with less chance of loose rivets.

High Strength Cable

A NEW type of messenger or feeder cable for use in connection with railway electrification has been developed by the Bridgeport Brass Company, Bridgeport, Conn. It is intended for use in sustaining the contact wire through which current is carried to the electric rolling stock and at the same time to transmit the current from the power house. For this purpose it is necessary that the cable possess high electrical conductivity, great tensile strength, and non-corrodibility.

The cable is composed of an inner core consisting of seven strands of Phono - Hi - Strength wire, 0.11 in. diameter, and having a tensile strength of 130,000 lb. per square inch. This inner core is surrounded by 12 strands of hard-drawn copper, each 0.11 in. diameter.

Association News & Discussions

Regulators Must Avoid Competition*

Essential Railways Must Be Protected from Inroads of a Competitor Not Capable of Replacing Them by Regulation that Will Develop the Bus Along Sound Lines to Its Own Best Interest and to the Public's

BY J. N. SHANNAHAN
President American Electric Railway Association

I HAVE journeyed the 2,000 miles that separate Phoenix from my home upon Chesapeake Bay, in Virginia, because I believe it is of paramount importance that whatever can be done should be done to make clear the story of the electric railway to you gentlemen, who in your official capacity have so great an influence upon the fortunes of our industry.

It is no decadent, no obsolete, no dying industry. On the contrary, its preservation and its progression are as vital to the interests of the people of the United States as they have ever been, and there is as I see it no sign anywhere that the service performed by it will grow less essential in the years to come.

In 1922 the United States Bureau of the Census reports more than 15,300,000,000 passengers were carried on the electric railways of this country. This represents a gain in 5 years of more than 825,000,000 passengers, or nearly 165,000,000 a year. And it must be remembered that these 5 years saw the restriction of imigration, the migration of millions of our young men to the battlefields of France, the manufacture in this country of more than 8,000,000 automobiles and the intensive development of the motor bus as a common carrier.

Certainly, if statistics are needed to demonstrate the essentiality of electric railway service, this record of increased traffic, under conditions admittedly unfavorable to traffic growth, offer convincing proof that the electric railway industry is advancing and not falling back.

I make to you, therefore, no plea for the mollycoddling of a passing system of local transportation, the usefulness of which is gone, and the dying agonies of which you are asked to alleviate. On the contrary, I seek your co-operation in continuing, under conditions fair alike to the public which uses it and to the companies which furnish it, a service essential to the welfare of every community of any size in this country.

SERVICE OF THE BUS SHOULD BE CO-ORDINATED WITH PRESENT SYSTEMS

Recently a new factor has appeared in the transportation problem. Without going into detail as to the merits of the motor vehicle as against the street car, it must be admitted that it has its place and its function. Certain territory in many localities can be best served by it. It is a flexible means of transportation. Many people like it. During the next few years thousands of motor vehicle routes will be laid out and franchises applied for. Instead of a deadly competition, should there not be a co-ordination of the present agency, the street car, and the motor vehicle? Instead of a situation where the street railway lines and the motor vehicle lines are straining every muscle to drive each other out of the field, why should they not blend together in order to perfect a transportation system to meet every need of the community which they desire to serve? In order that this co-ordination, this blending, this union, may be brought about several things are necessary:

First—There must be legislation which will set the motor vehicle in its proper place, on its own account and in relation to other means of transportation, as a common carrier, and on a footing with street car transportation in so far as franchises, penalties and restrictions are concerned.

Second—There must be legislation which gives the preference to the agency already serving the community to make needed extensions, whether they take the form of street railway or motor vehicle extensions.

Third—The regulation of such motor vehicle lines, whether urban, suburban or interurban, should be under the supervision of the public utility commissions of the various states, and certificates of convenience and necessity should in all cases be required.

Fourth—Where such extensions are necessary, and are demanded or requested, it should be within the power of the commission to designate what form these extensions should take.

Fifth—This legislation should be uniform, if possible, in all the states, particularly on account of the rapidly growing interstate business.

The electric railway managements of the country realize fully, I think, the advantages and the possibilities of the motor bus. According to the last available figures, 155 companies in the United States are operating 2,000 of them, and the number of companies and the number of buses are growing constantly. From the experience gained as operators, as well as from careful study and investigation, has come a conclusion, which is also borne out by the experience in Great Britain and other European countries where buses have been used in connection with electric railways for a much longer period than upon this side of the ocean. That conclusion is this:

In the handling of mass transportation, i.e., the carriage of great numbers of people within short periods of time; concretely, the carriage in our industrial centers of more than 40 per cent of all traffic in 2 hours of the early morning and 2 hours of the late afternoon, the electric car is the most efficient and most economical vehicle that can be used.

I think that this is an understatement of the situation, and that as applied to our larger communities it may with truth be said, that laying aside efficiency and economy, the electric car is the only vehicle that can perform the task at all. I reach this conclusion because the streets of few, if any, cities have sufficient area to accommodate the immense fleet of buses that would be required.

In cities that have subway or elevated systems for the operation of trains the field of the motor bus widens. It is conceivable that if such systems be extensive enough, the surface street railways may within a reasonable radius of such lines be superseded by buses, providing always that the operation of the two facilities be properly co-ordinated. But outside of New York, Boston, Chicago and Philadelphia there are no such subway or elevated systems, and so, to borrow the expression used in a famous opinion of the Public Service Commission of the Second District of New York, the street railway is the "backbone of any transportation system" in practically all of our large cities.

COMPETITION CANNOT BE TOLERATED

The motor bus is, however, an efficient auxiliary to the electric railway and within its field should be given every possible encouragement. But I need not tell you gentlemen, who are the agents to whom the task of carrying out the great policy of regulated monopoly among public utilities, that competition between the electric railways and motor buses is as destructive of public welfare as is competition between telephone utilities, gas utilities or electric utilities; or that to injure, through competition, the ability of a common carrier to perform service is to work a wrong to the people who receive that service.

Competition upon any fair or equitable basis between electric railways

*Abstract of address before National Association of Railway and Utilities Commissioners at Phoenix, Ariz., Nov. 14, 1924.

and motor buses is impossible. The motor bus owes its existence as a carrier to a public subsidy, in the shape of a right-of-way, built and paid for by the taxpayers generally, and not included in the cost of service upon which its rates are based. Without good pavements motor bus operation would be impossible. Charge to the motor bus its share of the construction and maintenance of pavement and motor bus fares would be prohibitive.

I do not argue for the imposition of additional burdens of taxation upon the bus. I do not quarrel with the policy of providing proper highways out of public funds for use by common carriers. I do, however, submit that it is the part of folly to destroy or cripple an existing necessary transit agency which pays a large portion of its income into the public treasury, by encouraging the competition of a publicly subsidized carrier, which, if it should be finally successful in eliminating its competitor, would itself surely fail under the burden of furnishing complete service.

It is but a short time ago that the proposition to put the motor vehicle under the control and regulation of the public service commission seemed rather startling. Yet slowly, but none the less surely, the idea has gained ground that the principal thing to seek and find is the public good. A system which permits a reliable medium of service to be harassed and annoyed by multitudes of parasites constantly nibbling at its patronage and its sources of revenue can hardly be said to be conducive to the public good.

Experience warrants the statement that in the average community the transportation service should be permitted by authority to take the form of a properly regulated monopoly. In many activities competition is the life of trade, but it requires no particular discernment to set it down as a fact that in the urban, suburban and interurban transportation business competition is fatal to prosperity and efficient service.

Railway Should Be Given First Opportunity to Supply Bus Service

In the average community the transportation system is very often the result of a consolidation of several lines, perhaps built at various times. The corporation owning these lines has expended large sums in bringing them to a state of efficiency; its stock has been distributed among the people of the community, and if the corporation has been properly managed a good will has been built up in the community which is worth much to the utility in its dealings with the public. It may be that for many years it has handled the transportation situation in its locality with satisfaction to its public. Such a corporation should have the first demand upon the consideration of the people of that community whenever new lines of transportation are needed, and such a community, where the existing agencies have given satisfaction, should extend first to such agencies the preference in new territory and in new franchises.

Commission regulation as a substitute for competition has worked well in the case of railroads, of electric utilities, gas utilities and, where it is still effective, in the case of local transportation utilities. I know of no movement anywhere toward a return to the old system, whereby franchises could be indiscriminately secured without sanction of a central regulatory body, only to be sold, with or without physical property to the existing utility, to increase capitalization and bring a consequent effect upon rates. But the advent of the motor bus as a common carrier has injected an element of competition into the local transportation problem, that is being controlled and regulated all too slowly for the good of the public and of the utilities. Railway men, as well as public officers, have been slow to grasp the real meaning of the movement, and have been belated in recognizing that the situation at the root of it requires the same treatment that has been successfully applied in the regulation of other classes of public utilities.

The situation is clearing up. The studies made by this organization and the principles set forth in the decisions of many of the commissions here represented are having their effect upon the public mind. We are, I hope and trust, returning to the sane and sound policy of regulation that has been successfully applied in the past, and by so doing we are going to preserve the useful service of the electric railway, and add to it the equally useful service of the motor bus.

The propositions that I have set forth in connection with motor bus operation contain nothing that is not generally applied by your commissions in connection with the regulation of other utilities; they confer no special privilege upon electric railways; nor do they impose upon motor buses any regulation that is not now imposed upon electric railways in their relations to each other. They encourage the extension of motor bus service, they conserve electric railway service and they provide a means of bringing together both services, so as to organize a complete car and bus service to meet public requirements.

In considering the motor bus problem we are not confined to city lines, or even to state lines. Interstate bus lines have become a reality, and a stern reality, to state agencies which attempt to deal with them. As long as a traffic system remains within the boundaries of a single state, it is a state problem and may be handled and dealt with as such. However, when a state line is crossed it becomes more serious and more unmanageable. State commissions can no longer lay down rules, and unless the Interstate Commerce Commission has power to deal with the situation, where does such power lie? If it does not have it, should it not possess it? It seems to me that just as the commissions in the various states must see to it that proper state legislation is enacted, so equally important and necessary is it that these agencies should inaugurate the movement to give adequate authority to the proper body to deal with a situation that may soon become serious.

I but voice the general sentiment of electric railway managements when I say that we look to the state regulatory commissions represented in this association for such public spirited and intelligent action as will solve correctly and expeditiously the problems that the competition of the motor bus has brought about. We feel sure that you recognize, as we recognize, the essentiality of electric railway service, the advantages of motor bus service, the destructive effect of competition between the two and the beneficial effect of co-ordination under proper regulation by commissions having state-wide jurisdiction.

Such legislation can find its way to the statute books more easily through the efforts, the initiative, the recommendation and the active support of the commissions themselves than in any other way. It will not be denied that the real function of a public utility commission is to see that the public receives satisfactory service and the utility a satisfactory return on its investment. In order to accomplish this there must be no duplication of service. Each territory should be served by the agency best adapted to its needs, whether it be street railway or motor vehicle, and these results can be best brought about by the preference suggested above in giving the utility which is prepared to render the proper service the first opportunity to serve.

The present attitude of the average public service commission toward the development and regulation of the various utilities has been the result of a growth. The whole body of the law has changed within a decade. The attitude of the public has changed. The idea of the man in the street that commissions were created solely to protect the people against the greed of corporations has been reformed, and if such man is keeping up with the times and has caught the modern spirit of fairness and service, he believes that the commission has other duties of a different nature altogether, viz.:

(a) Seeing that both the public and the utility get a square deal in matters of rates and regulations.

(b) Giving the public service, but insisting that it pay what such service is worth.

(c) Removing the utilities as far as possible from the uncertain and unsavory field of municipal politics, and placing them where the rule of reason and common sense regulates them rather than the whim of ward politicians and small-town regulators.

For the association of which I am president, I offer you full co-operation and assure you that its members realize the difficulties in your path and the splendid service that you render to the public, first, and the utilities, second.

Self-Ventilated Motors in Central Europe*

BY E. NIER
Manager of the Municipal Street Railways of Dresden, Germany

THE lighter street car service of earlier years kept back the wide adoption of self-ventilated motors, although Dresden, for instance, had 26 such motors in use as early as 1914. In these more strenuous days, every means of economizing power and cutting down upkeep must be exploited, so that there has been good reason to make greater use of the self-ventilated motor.

Out of 22 of the larger properties from which replies to a questionnaire were received, 10 reported no such motors at all. The remaining 12 did practically nothing in the war years, but in the year 1921 Berlin added 194 to a preceding 6 and now has 270; Dresden added 90 to the original 26 and now has 178; Hamburg began with 2 in 1922 and now has 108. Amsterdam has only 10, The Hague 74 and Vienna 72. The total number reported early in 1924 on the twelve properties was 860.

The fears that self-ventilated motors would suffer from the entrance of foreign substances, thus increasing their shopping time and upkeep, have not materialized in practice. Frequent sprinkling of the trackway is one method of minimizing the entrance of dust and other particles. Screens and filters cannot keep out dust entirely, but it is gratifying that the material picked up has not proved very harmful.

The Hagen Street Railway operated over such a dusty roadway that it arranged to take the air from the car interior through hose of 60 mm. (2.4 in.) to 100 mm. (4 in.) diameter. This hose did not last long because of the constricted space between car body and truck. Hence 54 motors were closed to operate in the ordinary way, but 32 were still run as self-ventilated motors. Vienna has also tried to use air from within the car. The Merseburg interurban railway has taken air from the roof through a pipe run through the partition between the second and third-class compartments.

A typical case of dust collection showed much dust blown out of a perfectly sound self-ventilated motor which had come into the shops after a run of 35,000 km. (21,700 miles) because of damage to some other part of the car. The motor itself apparently could have run for 50,000 km. (31,000 miles), to 60,000 km. (37,200 miles) without difficulty.

Examination of a self-ventilated motor before cleansing discloses that the deposits of foreign matter are not uniform. The commutators are usually very clean because their rotation throws off loose material. Not much more than a film of dust will be found on the upper parts of the armatures, the field coils, poles and brush-holders. Dust containing iron will be found drawn to the pole pieces without, however, causing damage. The bottom of the motor housing will contain more dust, some of it loose and the rest in the form of balls or other shapes up to the size of a small nut. These nuggets have a scaly structure and often have spiky projections. The various shapes are probably due to the mixture of the dust with oil or water and to the tumbling effect caused by the vibration of the car.

The value of internal cooling of the armature is considered questionable, especially, as the required ventilation channels weaken the armature both mechanically and electrically. Instead, the amount of air passing over the surface of armature and field coils can be increased.

The air inlets should not be so low as to suck up rain, sprinkling or puddle water from the trackway. Powdered or granulated snow, because of its entrance in quantity, may find some weak spot in the insulation, but ordinary snowflakes, rain or mist are usually vaporized before they can do any harm. The existing screens and filters cannot be considered as air purifiers but rather as catch-alls for large obstructions.

It is generally best to take air from inside the car, but as two motors require 10 to 15 cu.m. per minute, special means would be required to avoid uncomfortable drafts for the passengers. For motor-cooling, it would not be desirable in winter to draw warm air from the interior. Dresden is experimenting in the other direction by sending warm air from the motors into the car.

The companies replying stated that they overhauled these motors at their customary car-overhaul periods, which varied from 27,000 km. (16,740 miles) to 60,000 km. (37,200 miles). The only item stated by some as tending toward more upkeep was a slightly greater wear of the brushes. The best method for cleansing the motors was said to be that of blowing them out with compressed air at the time of regular overhaul. Intermediate cleansings were mostly unnecessary.

While the self-ventilated motor is not yet all it should be, it is, in the writer's opinion, the type most likely to be the street railway motor of the future.

*Abstract of a paper before the Internationaler Strassenbahn und Kleinbahn Verein, Homburg von der Höhe, September, 1924.

Track Standards in Central Europe*

BY PAUL GOETZ
Manager Leipzig Street Railway, Leipzig, Germany

ALTHOUGH the replies to a questionnaire on track standards prepared by the writer were more than a year and a half old (owing to postponement of the 1923 convention) and often incomplete, it has been possible to present some interesting facts, which are summarized as follows:

Track Gage—The prevalent gage, particularly in the larger cities, is 1.435 m. (4 ft. 8½ in.) as shown by the fact that of the 5,857 km. (3,631 miles) of route operated by 42 replying managements in Germany only 1,689 km. (1,047 miles) was of narrower gage, usually 1 m. (39.4 in.). In Austria, the ratio in favor of standard gage was almost 10:1, four users operating 653 km. (405 miles) of standard gage against three undertakings with 64 km. (39 miles) of narrow gage.

In Czechoslovakia, only one operator with 15 km. (9 miles) had standard gage, the other five totaling 78 km. (48 miles) were of narrow gage. The one Danish property replying had 168 km. (104 miles) standard gage. The six Swedish properties totaled 273 km. (169 miles) standard gage. Three Norwegian systems totaled 37.7 km. (24 miles) standard, while one property had 11 km. (7 miles) meter gage. On the three Dutch lines totaling 298 km. (185 miles) only 2 km. (1.24 miles) are narrow gage. In Switzerland, however, nine roads totaled 184 km. (114 miles) meter gage, as the only standard gage route reporting was the cross-country Thurgaubahn with 43 km. (27 miles).

Rail Sections—The reports on rail sections gave 4,845 km. (3,004 miles) of route in grooved rail and 1,010 km. (626 miles) in T-rail, but this shows but a small part of the picture. The standard practice in all the countries included is to use grooved rails in paved construction. In Berlin and other cities new streets are parkwayed in order to permit open track, T-rail construction.

Light rail is going out, the former minimum weights of 20 to 25 kg. per meter (40 to 50 lb. per yard) being replaced by rails weighing 30 to 35 kg. per meter (60 to 70 lb. per yard) and more.

The unnecessarily large variety of rail sections is deplored. During the war the properties naturally were glad to get anything they could. They have, however, since failed to take advantage of the post-war possibilities in making use of adopted standards and consequently saving money. The non-German properties show a better realization of the advantages of standard rail sections.

A noticeable tendency is the preference for rails as high as 180 mm. (7 in.) as the most practicable for block paving as well as for asphalt and wood paving on concrete base. It is poor economy to use a lighter section on routes with sparse traffic, inasmuch as the weight of the rail should be determined more by the weight of the car and the depth of the paving.

Provided the rails are welded and on good foundations, there seems no good reason for going to sections of 200 to 210 mm. (say 8 in.) height. Short lengths of 200-mm. rail have been laid at Dusseldorf, Hamburg and Kiel; and of 210-mm. rail at Munich. The last construction, although using steel ties and concrete foundation, does not show better resistance to wear than track in other large cities. Berlin still has 160-mm. (6.4-in.) rail on 90 per cent of its routes, but since the beginning of 1923 it has been installing 180-mm. (7.2-in.) rail.

Another tendency is toward the use

*Abstract of a paper before the Internationaler Strassenbahn und Kleinbahn Verein, Homburg von der Höhe, September, 1924.

of shallower and narrower grooves, which is helpful in securing more practicable special work. This is true on both German and non-German properties.

Welded Joints—In welding new rail the most common practice is to use thermit. Electric welding is preferred for old rail, although the same success would be obtainable on new rail. Electric welding is the only practicable method for "dutchmen" or similar heavy repairs. A pre-requisite for the success of welding is well-schooled labor. Welding is most common in Germany, Denmark, Switzerland and Norway. Hitherto the latter two countries have used thermit only, but the Swiss will use electric welding in the near future.

Special mechanical constructions have not found general acceptance, although the Melaun and Hesse joints respectively are in proponderant use at Berlin and Vienna. A summary of mechanical and welded joint practice shows that on the German properties 62 per cent of the joints were mechanical and 19.4 thermit, the rest being electric weld or special. Austria has 51.3 per cent mechanical and 2.8 per cent thermit, the rest being special. On the Czech properties the proportions were 87.8 per cent mechanical and 12.2 per cent electrical.

The following countries have been using thermit on all new work since 1912, so that their present ratio of thermit alone now stands: Sweden, 14.1 per cent; Norway, 43.85 per cent; Holland, 7.1 per cent; Switzerland, 40.1 per cent. All the rest is mechanical except 1.31 per cent electric welding in Sweden and 0.39 per cent in Holland.

Special Work—The standardization of special work has made great progress, the standard curvature for switches is on a radius of 50 m. (162 ft. 6 in.). In Germany, 74.4 per cent (43) of the reporting operators used the standards in varying degrees; in Austria, 87.5 per cent; in Czechoslovakia, Sweden and Holland, 66.6 per cent; in Switzerland, 80 per cent and in Norway 100 per cent.

Curved track usually ranges from 10 to 20 per cent of the total route length, except in the older cities which have many narrow and twisting streets. Heidelberg leads with 50 per cent, but even so large a city as Hamburg attains 30 per cent of curves. Munich has curves of as little radius as 13 m. (42 ft. 8 in.). The effect of curvature on life is not ascertainable because of the wide difference in conditions. Much of the trouble due to excessive curvature is said to have resulted from blindly following the original horse-traction layouts. The author believes that conditions can be alleviated if effort is made to secure the narrowing of sidewalks, the cutting off of corners, the right to lay tracks other than absolutely parallel to the curb, etc.

Retention of Block Paving in Rail Strip—There is a tendency toward monolithic paving, but there seems no reason why it should be necessary to use such paving between and alongside the rails. The asserted advantages of monolithic asphalt and wood block paving do not compensate for the greater difficulty of keeping the track structure well drained and free from upheavals due to freezing. In the first instance the demand for a concrete substructure means that the line is out of service for quite a period during the setting; and in the last instance, the upheaved substructure leads to excessive maintenance and a solid substructure transmits vibrations to adjacent houses. The elastic type of substructure, using well-drained broken stone and block paving, is to be preferred.

This discussion does not apply to all of the reporting countries, but rather to Germany, Austria, Switzerland, Denmark and to Zagreb, Jugoslavia. Norway, Sweden and Holland use block paving chiefly, while some Swiss cities have macadam. It is observed that quite a number of railways use but one layer of concrete into which the rails are bedded directly. It would be cheaper in construction, and also easier to replace rails, if they were set on a layer of concrete only 2 to 3 cm. (0.8 to 1.2 in.) thick in combination with an asphalt mixture around which a second layer of concrete would be poured. The use of cement to solidify the substructure is considered an unnecessary expense because careful work will produce uniform density with broken stone substructure and block paving.

The experience of a majority of operators is against the use of rigid track with concrete base. On the other hand, the Vienna Municipal Street Railway has had 10 years successful experience with absolutely rigid track, partly because of the excellent drainage. Of course, such construction requires exceptional skill and is doubtless expensive. In the first Vienna construction, the rails were set in reinforced concrete. The substructure was of a good mixture, but a still richer mix was used for the second layer which was carried to a height of 10 cm. (3.9 in.) above the base of the rails. Then followed a sand cushion and asphalt base for paving block 20 cm. (7.8 in.) high. In a later construction, the concrete was reinforced directly around the rail base because the rails were of greater height than the paving block. It is questionable whether such track could be readily built on pre-existing concrete substructure. In any case it is not believed that any known concrete construction can guarantee the undisturbed position of the rails during the period of their useful life.

The cost of maintaining the substructure and paving in the track strips and of street cleaning therein is almost universally borne by the street railways. Only three properties, all in Germany, reported the use of compressed-air for breaking up concrete. One Danish operator has ordered such equipment and one Swiss operator contemplates a trial.

Central Association Annual Meeting

THE annual meeting of the Central Electric Railway Association will be held at the Miami Hotel, Dayton, Ohio, Jan. 8 and 9, 1925. The program is being prepared and will be published in a later issue.

European Progress with Magnetic Track Brakes*

By Jörgen F. S. Barth
Manager Christiania Railway, Christiania, Norway

THERE was a time when cars were so small and light that all braking could be readily done by hand. As vehicles grew larger and heavier, improved hand brakes such as the Ackley and Peacock types were adopted. (Short-circuiting brakes were also added.—Eds.) Next came the magnetic track brake which was free from the handicap of a wheel brake on slippery rail.

The first magnetic brakes appeared some 20 years ago. They were fed directly from the line through a separate switch and were used chiefly for emergencies. Their stops were so abrupt that one might say the place of danger had been transferred from outside to inside the car. To overcome this defect, most magnetic brakes are now wired into the short-circuit braking contacts of the controller so that they go into action gradually. The last braking circuit contact is arranged to take line current direct in order to permit emergency stops.

To obtain definite information a questionnaire was mailed to 244 members, but as only 29 replied, it may be assumed that no more than the latter number are using magnetic track brakes. These operators have a total of 5,342 motor cars and 3,607 trailers of which 1,113 motor cars have magnetic brakes and 141 trailers are so equipped. Only three operators use magnetic track brakes on all of their motor cars. The range of braking effort is between one-half and three-fourths of the car weight.

These brakes always are operated independently of the wheels. The gap between shoe and rail ranges from 3 mm. (0.12 in.) to 20 mm. (0.8 in. Maintenance is trifling as it consists chiefly in replacing worn shoes. Zürich was the only undertaking which reported otherwise. One operator gave his rate of shoe wear as 1 mm. per 1,000 km. (620 miles). Nine operators were of the opinion that the magnetic track brake was less injurious to the motors than a short-circuiting wheel brake the others expressed no opinion. Only five operators observed any rail-tread wear ascribable to the use of the magnetic shoes. Some operators who also use air brakes, said that the latter were satisfactory but cost more to maintain than magnetic track brakes.

On the Christiania Railway three-car (one motor and two trailers) trains totaling 51 metric tons loaded are standard. The following advantages of magnetic track brakes have been found:

1. Powerful braking without disturbance to passengers.
2. Failures are very rare.
3. Skidding (locked wheels) is impossible.

*Abstract of a paper before the Internationaler Strassenbahn und Kleinbahn Verein, Homburg von der Höhe, September, 1924.

4. The chief maintenance is replacement of shoes; but the saving in wheel and wheel-brake shoe wear more than equals this upkeep.

5. Sand has been cut 50 per cent; and it is used only on up grades.

6. To assure this extra-powerful braking, the motorman need only move his regular brake handle somewhat faster.

7. The motorman enjoys the confidence of complete braking control.

8. Accidents are reduced and money saved thereby.

9. There is less strain on the motors.

10. Rail corrugation is perceptibly decreased.

Of course, these advantages are not obtained for nothing. The extra rail wear seems to amount to 1½ per cent of the track upkeep. There is also somewhat less braking current available for car heating compared with ordinary short-circuit braking, but it is hoped to improve this by some changes in connections. It may be added that the Christiania property is in a country requiring car heating some five months in the year. Fog, ice, snow and leaves also make the braking problem unusually arduous.

Correction of Headway Inequalities*

By ALEXANDER PATZ
Manager of the Budapest Street Railways, Budapest, Czechoslovakia

ONE of the important duties of the traffic director is to devise methods of keeping headway inequalities on combination routes within the lowest possible limits, aside from congestion or equipment defect causes. This subject requires the use of higher mathematics to show the relative positions of moving cars of different runs on a section common to all.

As an example, take Rakoczy Street which had been served by 12 routes having individual headways of 15, 12½, 12, 11, 11, 10, 10, 10, 9, 9, 8 and 8 minutes respectively. The combined service had cars bunched at some places and excessive spread at other places, giving an irregularity index of 74.5 per cent. By using 10 minutes as a base headwny and dropping out cars here and there, the irregularity index was reduced to 34.7 per cent.

In rush hours, the service should be increased in even multiples by going to a 5-minute headway to double the service, to 3⅓ minutes triple the service, to 2½ minutes to quadruple the service, to 2 minutes to quintuple the service and so on. On the other hand, an even interval during hours of reduced service can be secured through dropping every eleventh car to attain an 11-minute headway, every sixth car to attain a 12-minute headway, every fourth car and fifth car alternately to attain a 13-minute headway, etc. A 10-minute base headway is recommended because it is also easier for the public to remember the local time points as being 1, 2, 3 or more minutes beyond 20, 30, 40 minutes, etc.

To minimize the piling up of cars through any cause whatever, delayed motormen are instructed to report immediately upon reaching a terminal whether trouble on other cars was responsible. These reports are treated as a check upon the report of the motorman whose car was at fault. A higher standard of care is necessary for those cars that are regularly run through congested districts. Pull-in records are divided according to the two chief types of cars inherited from the predecessor private and municipal properties.

A most helpful step toward minimizing breakdowns on the line is found in the practice of posting comparative delay records of the different carhouses every four weeks, the division of troubles showing whether the delay was due to defects in equipment or in operating methods. An efficiency bogey is set up for each type of equipment. Carhouses which exceed the average delays are termed "poor" and those which fall below the average are termed "good."

The operating points on which each depot is judged include the following: Deviation from schedule; man shortage and misses; collisions with own cars; collisions with other vehicles; damage to current collectors through taking switches improperly, etc.; accidents. The equipment defects are classified as follows: Motors; control and resistors; circuit breakers and fuses; current collectors; miscellaneous electrical equipment; wheels and axles; braking; bearings; draft rigging; fenders; miscellaneous mechanical equipment; car scarcity.

In consequence of this searching four-weekly comparison of personnel and maintenance standards, the original average of 16.5 minutes delay per car or train per diem has been lowered to 2.6 minutes.

*Abstract of a paper before the Internationaler Strassenbahn und Kleinbahn Verein, Homburg von der Höhe, September, 1924.

Midwest Association to Meet in St. Louis

ANNOUNCEMENTS have been sent out by Secretary J. A. Weimer, that the midyear meeting of the Midwest Electric Railway Association will be held in St. Louis, Mo., on Nov. 24 and 25.

Many questions of importance to the electric railway industry in general, and particularly to those properties in the territory covered by the association, will be discussed at this meeting. The detailed program of the two-day session will be announced later.

National Highway Traffic Association

THE annual meeting of the National Highway Traffic Association will be held in the new clubhouse of the Automobile Club of America, 12 East 53rd Street, New York City, on Tuesday, Dec. 2, 1924. Two sessions will be held, the first beginning at 2:30 and the second at 8 p.m. A dinner open to the public will be served at 6 p.m. in the Grill Room. Requests for dinner reservations should be sent to Elmer Thompson, secretary, Automobile Club of America.

The subjects to be considered include: "Solutions of the Parking Problem in Congested Districts of Municipalities"; "Enforcement of Traffic Regulations by Utilization of a Police Traffic Bureau"; "Methods of Increasing Traffic Capacity of Streets"; "State Fees for Commercial Motor Vehicles as Private and Common Carriers"; "Regulation of Pedestrian Traffic."

Engineers Will Discuss New York City Traffic Problem

A JOINT meeting of the New York section of the American Society of Civil Engineers and the Metropolitan section of the American Society of Mechanical Engineers will be held in the auditorium of the Engineering Societies Building, 33 West Thirty-ninth Street, New York City, on Wednesday evening, Nov. 19, at 8:15 p.m.

The traffic problem of the city will be the subject of the evening. Those who are on the program to speak are Mayor J. F. Hylan, Richard E. Enright, police commissioner; John Kenlon, chief of the New York City Fire Department; Major Elihu Church, transportation engineer Port of New York Authority, and C. W. Leavitt, consulting engineer.

Preceding the meeting the members of the sections will meet for dinner at the Building Trades Employers' Association, 34 West Thirty-third Street. Dinner will be served at 6.30, so that those attending can reach the Engineering Societies Building in time for the moving pictures which will precede the regular meeting.

American Association News

Metropolitan Section Has Enthusiastic Meeting

THE Metropolitan Community Section of the American Electric Railway Association met in New York on Nov. 7, with an attendance of more than 500. The principal speaker of the evening was E. F. Wickwire, vice-president Ohio Brass Company, whose subject was "Friendlyizing," and whose talk was enthusiastically received.

This was followed by motion picture films prepared by the New York Transit Commission, entitled "The Strap-hanger," and showing the crowded conditions of the subways and the problems confronting the companies in trying to solve the difficulties.

The membership committee reported a total enrollment of 569 members, but later it was announced that the membership committee's report was made up at 5 o'clock and that since then up to 8 o'clock the enrollment had increased to 650.

This is the second meeting of the Community Section and the enthusiasm seems to bear out the feeling of President Thompson that the membership will soon reach the 1,000 mark.

The News of the Industry

Commission Has Right Over Fares

Victory for Virginia Railway & Power Company in Decision of Commission Over-ruling City's Fare Plea

Objections of the city of Richmond to the fixing of rates and valuation of property of the Virginia Railway & Power Company by the State Corporation Commission have been overruled in an order entered by the commission. It was the unanimous opinion of the commission's members that that body has the right to value the power company's property and fix rates over the traction lines, despite franchise provisions.

The order over-rules the petition of the city to dismiss the recent request of the company for such a valuation in the Richmond division. It also over-rules the city's demurrer in the case.

The company has been ordered by the commission to proceed at once to submit facts and evidence bearing upon the value of its property for rate-making purposes and otherwise proceed in the case in accordance with its petition.

Of the importance of the case the commission said:

> The case is one of great importance, and that it is not free from difficulty and doubt is manifest from the divergent views entertained by learned counsel on each side and the copious and able briefs filed, but we feel that, under the law, there is a plenary jurisdiction in the commission, and we feel confident that such a holding is conducive to the best interests of the State of Virginia and the people thereof generally.

Jurisdiction of the commission was challenged by the city of Richmond on four grounds, as follows:

> 1. That all of the four main franchises granted to the predecessor companies of the petitioner, and the extensions of these franchises, constitute inviolable contracts for the fixing of rates during the life of the franchises binding upon the state and protected by the federal and state constitutions.
>
> 2. That the General Assembly has vested the city with authority to prescribe such rates within the proviso of section 156 (h) of the Constitution.
>
> 3. That the matter is *res adjudicata* as between the city and the Richmond Passenger & Power Company, predecessor of the petitioner, and between the city and the Richmond Traction Company, predecessor of the petitioner.
>
> 4. That the company is precluded by estoppel or by waiver from litigating the question before Oct. 10, 1924.

The commission took up each of these contentions in turn and disposed of it. It said in effect that after very careful consideration of the constitutional and statutory provisions which seem to it to be pertinent and of the very able and comprehensive briefs filed by counsel, that it has jurisdiction to make proper investigation and value the railway in Richmond as a whole, to determine whether or not the existing rates are just and reasonable, and if it finds them unjust and unreasonable, to fix rates which are just and reasonable.

In addition to disposing of the four contentions previously noted the commission set down the following general propositions:

> 1. The tendency of the decisions all over the country, including Virginia, has for some time been, and is, toward recognizing the police power of the States as to rates of public service corporations as largely inallenable.
>
> 2. A like tendency has recognized, and does recognize, the advisability in the interest of the public of a central, unified, uniform and general control as to rates.
>
> 3. As to rates of a city transportation company and rates of many other city public utilities, there is manifestly more definite interest in the people of the State generally in the former than the latter.
>
> 4. Every practical consideration, in view of the complicated situation in the city of Richmond, as well as considerations of convenience and public policy, lead to the conclusion that there should be a general and uniform control as to rates of transportation in the city of Richmond, and where reason clearly demands a certain course, the law, which is based on reason and exists for the general welfare and the best interests of all, will generally be found to follow. Certainly the law should be held to follow the dictates of reason and policy and the interests of all the people, unless it clearly is contrary to such dictates.

The petition of the company asking the commission to determine the "fair value for rate-seeking purposes of its transportation system in Richmond and extending into Henrico and Chesterfield Counties and to fix such rates and charges as shall be just and reasonable" was filed on April 17. The city filed a petition asking that it be made a party defendant on May 7 and a demurrer on the same date.

Jitneys Made a Political Issue

Springfield Operators Profess to See Opportunity to Return by Election of Mayoralty Candidate Favorable to Them—Railway Now Operating Buses and Is Prepared to Expand Co-ordinated Service

THE transit situation in Springfield, Mass., presents a picture of seeming contradictions. Not since last May have any buses been run in that city in local service except by the Springfield Street Railway. At that time Mayor Leonard put into effect his rule against jitney operation. A year ago he said that he would do this, so that the jitneys had lived only on sufferance since that time. A trial was made of operation on a plan of voluntary contributions, but this was merely a gesture. The jitney men felt that there was no hope for escape from the ruling of the transportation board, made up of five members of the City Council and the Board of Aldermen, but the jitney men were determined to compel resort to the law on the part of the city officials.

While jitney competition with the Springfield Street Railway was lively, it never reached proportions attained in some other cities. It is estimated that only about 5 per cent of the total number of passengers hauled in the city were handled by the jitneys. The jitney men contend, of course, that this business was largely created by them. Too many variable factors apparently enter into the case to determine definitely whether this contention is correct. In any event, even spokesmen for the jitney men admit that the service they gave was not all that could be desired either as regards headways or types of vehicles operated. Better buses, they say, would have been put into service except for the threat of their complete expulsion from the city, which, like the sword of Damocles, hung over their heads a year. Opponents of the jitney are not so sure of this.

The bus men made their fight before the Mayor and lost. Mr. Leonard proved obdurate. One thing has been established beyond doubt. The Mayor is determined. He is not contemptuous of public opinion, but he is a man of decided opinions. A minority, organized or unorganized, has no terrors for him. Both friend and foe pay him tribute on this score. On more than one occasion he has brought down upon his own head the scorn of a particular part of the public which he has opposed, but in every instance the general opinion is that his public acts have been grounded on the conviction that he acted in the best interests of the city. On the other hand, partisan politics is charged by the jitney interests against the members of the Transportation Board or a majority of the members of that committee. This charge is, of course, stoutly resented by the members of the board. The board merely concurred with the Mayor in his decision that "the competition of independent jitney buses must be eliminated for the public welfare."

Anyway, the whole matter has got into politics. The local election in Springfield does not occur until Dec. 2, but the events incident to the national election on Nov. 4 were in some cases overshadowed by the impending local primaries which follow closely upon that event. Mayor Leonard has no desire to remain in public office, so that as an issue his recent acts do not enter into consideration except in so far as his successor might be inclined to follow the course of action by him which has resulted in the elimination of the jitneys.

In the early stages of the campaign

there were three prospective candidates, Josiah Dearborn, present city solicitor under Mayor Leonard, and Fordis C. Parker, chairman of the Board of Public Works, both Republicans, and Richard J. Talbot, counsel for the jitney men, an independent in politics and at various times a Republican and a progressive follower of Roosevelt. Every one knows where Mr. Talbot stands. He is for the jitney, first, last and all the time. Necessarily, he is a partisan. He is probably not the radical partisan that some of his opponents are inclined to make him out to be. It is certain that he will run for office. He may run as a Democrat if he gets the indorsement of that party, but run he will in any event. He can run as an Independent, for he has canvassed the situation and has indorsements sufficient to assure him the right to run. If he runs independently, Mr. Talbot will make the issue one of better transportation, meaning, as he sees it, that the jitneys have a place in the transportation field of that city. He says the jitneys are willing to go back at a 6-cent cash fare with five tickets for 25 cents. The jitneys formerly charged 7 cents. This is the same fare that was charged by the railway, but since the increased pay was awarded to the railway men, the railway fare has been made 10 cents cash, with three tickets for 25 cents.

Mr. Parker has promised that in the event of his nomination by the Republicans he will have an expert appointed to look into the transportation situation, and that if a report is made to the effect that the Springfield Street Railway is not doing all in its power to afford proper service, he will favor the return of the jitneys. Mr. Dearborn, the other candidate, did not at first commit himself to any fixed policy with respect to transit matters, but in a speech which he made on Nov. 3 indicated that he believed in the necessity of preserving the railway. He thought that a city-wide committee should be appointed to determine the minimum number of additional buses required for reasonable transportation and that the railway should be afforded a chance to indicate its own willingness to meet the situation failing which licenses should be issued to the jitneys up to the number of vehicles regarded as necessary. At the Republican caucus on Nov. 11 Mr. Parker was nominated. The Democratic primary is on Nov. 14.

But the story isn't all one-sided. Stories of this kind seldom are. The province of the outside observer is to write about them dispassionately. In the eyes of the participants, however, this he seldom does, for either one side or the other and sometimes both sides see matters through a glass darkly. One thing is certain above all others, the spirit of civic consciousness in Springfield is very highly developed. In view of the controversy over the right to run jitneys, this statement might at first be regarded as a contradiction, but it is nevertheless true.

As the railway sees it, the bus prior to last May was sucking its life blood. The story of increased railway operating costs in recent years is an old one. As proof of the correctness its contention of the narrow margin which has been left to it on which to operate, the railway cites the verdict favorable to it by the State Department of Public Utilities permitting it to increase fares. This increase was put into effect on Sept. 21. Previous to that time the fare was 7 cents. Fares were advanced with the sanction of the state body only after an arbitration award had been rendered increasing the pay of trainmen. Riding has fallen off, but an opportunity has not yet been afforded to determine what the real results are likely to be. At any rate, the railway agreed a long while ago to put in buses, and this it has done. At the present time it is operating nine up-to-date buses (one Stewart, one Yellow Coach, one Selden, four Garfords, one Federal and one White) on four routes giving adequate service to territory in which the railway lines do not operate. A general system of transfer is in effect which permits riding in one general direction, and cars and buses alike exchange transfers. The fare on the buses is the same as on the cars.

The railway stands committed to an extension of this program of co-ordination. Its contention is that it does not fear competition, but that competition means operation of two systems of transport under the same conditions. It has about 195 miles of track. Practically all of the various lines are operated over a stretch of Main Street extending from Carew to State Street, a distance of about a mile. The scheduled running for this stretch through the center of the business district during the rush hours is 12 minutes, but this is seldom achieved, and on stormy nights 30 minutes is frequently taken to make this run. The railway would gladly reroute some of its lines, but as Main Street is the principal business artery, the commercial interests have frowned on any such proposal.

This is just one of the contradictions in the situation to which reference was made in the beginning. The general feeling is that the railway did well to continue for as long a time as it did on a 7-cent fare.

The attitude of Mayor Leonard and the Transportation Board must be taken as reflecting public opinion, the proponents of the bus to the contrary notwithstanding. Critics of both are to be found, however, in all walks of life. It is no reflection upon the bus as a vehicle of transport to say that many harsh words were said about that vehicle as independently operated. There is a supervisor of traffic to look after things in the interest of the city, but many of the buses were not up to date and they were generally operated indifferently. To this the spokesman of the jitney men, as said before, replies that the threat of compulsory suspension which hung over the heads of the jitney men militated against their doing much better.

Business men everywhere express the hope that the coming election will result in the matter being settled for all time. They are not optimistic of that outcome, but the general opinion is that the people are too well informed to permit the jitneys to return on anything like the basis upon which they were formerly run.

One-Man Car Issue at Dayton Before Court

District Judge Smith Hickenlooper on Dec. 1 will hear a motion filed by City Attorney J. B. Harshman of Dayton, Ohio, asking the dismissal of the case against the use of one-man cars in Dayton on the grounds that no federal question is involved.

The five railways operating the cars in Dayton secured a temporary injunction against the city in the federal court the latter part of January, 1924, and the case has been pending since.

At the election in Dayton on Nov. 2, 1924, residents of the city voted to discontinue the one-man car service in the city. An ordinance was immediately drafted giving the railways 90 days in which to organize the two-man car system. Another extension of 30 days was granted. This put off the date of the discontinuance to Feb. 1, 1924. Upon a petition filed in the federal court by attorneys for the companies a temporary injunction was granted restraining the city from enforcing the ordinance until the case was settled.

Rapid Transit Referendum Suggested for Chicago

A resolution for a referendum of Chicago voters in February on the subject of a city-built subway has been introduced in the Chicago City Council by Alderman Kostner. He expressed the belief that the administration would be unable to get any of its numerous transportation plans ready for the February ballot because of the intention to pass on all details first. He wants simply a vote which might be construed as a mandate to build some kind of tube system under downtown Chicago, and his preference is for one linking with the elevated and surface lines at the north and south ends of the loop.

Fares Cut in Fitchburg to Stimulate Riding

Officials of the Fitchburg & Leominster Street Railway, Fitchburg, Mass., have announced that the fare reduction on the so-called Southside lines of the company has been approved by the Department of Public Utilities and has been put into operation. The same reduction has been put into effect on the Westside line in Leominster. Passengers still pay a 10-cent fare, but they receive a return check. If the check is used the same day it is issued patrons make the round trip for 10 cents, instead of 20 cents. No transfers are issued and the check is good only for that line. The reduction in fare is an experiment. It will not be continued if riding on the line is not stimulated.

New Fare in Force in Boston

The Boston Elevated Railway put its 6-cent fare into operation on Nov. 5 on its short-haul lines. On the bus lines operated by the elevated additional steps have to be taken to install the 6-cent fare, it being necessary to obtain the consent of the municipalities in which the bus lines operate.

Bus Tax Amendment Fails in California

An amendment to the constitution of California designed to place bus companies in that state on the same basis of taxation as the other public utilities was defeated at the recent elections. The measure lost by a vote of 75,000 out of a total of 750,000. The amendment was sponsored by the California Motor Carriers' Association. Its defeat is attributed principally to the opposition of the farmers and local taxing bodies and to the vote of a section of the public that is said to have regarded the impost as insufficient.

"Amendment No. 1" as it was called, was officially designated on the ballot as "State Taxation of Highway Transportation Companies." It was presented by the association to the voters as a means of equalizing the taxes of bus lines and putting them on the same basis of taxation as the other public utilities that contribute the chief revenues of the State.

It provided for the substitution of a state tax on gross earnings for other taxes to which the bus lines are now subject but did not exempt them from the state gasoline tax. It would also have maintained the present state rate of 4 per cent on gross earnings until the rate was changed by the Legislature.

The Motor Carriers' Association now represents the interests of 677 motor transportation lines in California—substantially the entire highway transportation industry that has been built up in the state within the past two decades and which last year accommodated more than 29,000,000 passengers.

Pittsburgh Pass Puts Sunday Back on Traffic Map

Nov. 2 was the second Sunday of the "Sunday-only" pass of the Pittsburgh Railways. The results attained indicated that all that was needed was to give the public of so large a community a chance to understand what the privilege meant.

On Oct. 26 17,500 passes at 25 cents each had been provided, but so great was the demand that most conductors were sold out by noon. The number actually sold was 15,179. This was equal to 9.1 per cent of the receipts. On Nov. 2 pass sales amounted to 33,168, or 18.8 per cent of the receipts.

The company had already in operation a liberalized Sunday transfer costing 10 cents or 20 cents for just one round trip. The effect of the pass the first Sunday was to cut the sale of these transfers from a former average of 18,000-19,000 to 16,013. On the second Sunday. despite the enormous increase in the sale of 25-cent passes good for any number of rides, 12,258 specials were sold. This itself was double the number sold before the 10-cent transfer was liberalized to give a full 8½-cent ride on each side of the center. It may seem curious that so many persons would not pay an extra nickel for unlimited service, but it is likely that even if the number of specials decreases there will still be a market for this particular transport bargain.

The Sunday pass innovation has met with much praise from various elements of the public. Aside from the good-will effect, the revenue has shown a most gratifying increase. The second Sunday, which really gave the pass its first opportunity, produced $42,786. This was $4,230 in excess of the same Sunday last year and $2,500 in excess of the average of the four Sundays preceding Nov. 2.

Bus Bids Made in Indianapolis

After nearly three hours of arguments on the part of those who participated in a recent public hearing the Board of Park Commissioners at Indianapolis has indicated that if the Indianapolis Street Railway does not submit a definite proposal for handling transportation on Capitol Avenue north of Fortieth Street within two weeks, the proposal of the People's Motor Coach Company would probably be approved. Robert I. Todd, president of the railway, said a definite proposal will be submitted. Mayor Shank asked how soon each could begin operation on Capitol Avenue.

"I'll guarantee them in sixty days," Mr. Bowman answered.

"I'll guarantee them in thirty days," Mr. Todd retorted.

"This question of bus transportation is becoming serious," Mayor Shank said at one point. "Everyone knows that without a street car system the city wouldn't be worth a nickel. However, I think that Mr. Todd should promise to give relief immediately to people in the north part of Indianapolis who demand some method of transportation."

$25,000,000 Rapid Transit Program Outlined for Philadelphia

Plans for a Chestnut Street surface car subway and transit service over the Delaware River bridge were outlined on Nov. 10 at a special meeting of the city's Transit Commission by Thomas E. Mitten, chairman of the board of directors of the Philadelphia Rapid Transit Company, who suggested that the city finance its construction.

The plans provide for a subway under Chestnut Street from Fifth to Twenty-third Street, where it would continue as an elevated line westward over the Schuylkill River, and thence on Sansom Street to Thirty-seventh Street. There would also be underground sidewalks from Sixth Street to Nineteenth. Mr. Mitten estimated the cost of the subway at about $20,000,000 and the sidewalks about $5,000,000. He said if the city authorized the construction the transit company would undertake to pay the interest and sinking fund necessary to retire the $20,000,000 during the life of fifty years, bonds to be issued by the municipality.

On Nov. 13 the company offered to spend $500,000 to build tracks across the Delaware River Bridge and a loop in Camden, to maintain those tracks, to provide equipment and to furnish service to and from Camdem at the same rates of fare and with the same transfer privileges that may prevail in Philadelphia, provided it received exclusive operating rights.

Municipal Bus System Knocked in Head

New York City has no right to own and operate buses, Corporation Counsel George P. Nicholson stated in an official report to the Board of Estimate of that city, Nov. 10.

Comptroller Charles L. Craig, whose bills introduced into the Municipal Assembly recently to provide for city ownership and operation of buses were the reason for the corporation counsel's report to the board, declared that Mayor John F. Hylan and his supporters were attempting to intimidate the Municipal Assembly. He said that the corporation counsel's report was an effort to defeat his bus bills by convincing the members of the local assembly that they had no legal right to pass them. On Nov. 14 Mr. Craig again insisted that the city has the right to legislate on the bus matter just as the Legislature had this exclusive right before the passage of the home-rule act last winter. Another hearing is set for Nov. 17.

I. T. S. Line Renews Wage Agreement

Employees and officials of the St. Louis Electric Terminal Railway, a subsidiary of the Illinois Traction System, operating between St. Louis, Mo., and Granite City, Ill., via the McKinley Bridge, reached an agreement regarding wages and working conditions at midnight on Nov. 7. The settlement calls for a continuation of the wage scale that expired on Nov. 1.

The workers had demanded an increase from 58 cents to 61 cents an hour effective from Oct. 1. Company officials held out for a decrease of 5 cents an hour. It was finally agreed that the old wage scale and working agreement should continue in effect until Nov. 1, 1925.

$9,531,204 in Subway Contracts Awarded in New York

The Board of Transportation, which now is charged with responsibility for all new subway construction and routing in New York City, on Nov. 11 awarded three contracts, aggregating $9,531,204, for the construction of the extension of the Fourteenth Street-Eastern District subway from Boerum Street and Bushwick Avenue to Wyckoff Avenue and Halsey Street, 2.14 miles, in Brooklyn. The contracts, in accordance with the law, were submitted to the Board of Estimate for approval.

To expedite construction the extension is to be built in three sections. The first section, 0.7 of a mile, was awarded to the Underpinning & Foundation Company for $2,733,227. The second section, 1.85 mile, was awarded to the Oakdale Contracting Company for $3,595,038. The third section, 0.59 of a mile, was awarded to the Oakdale Contracting Company for $3,202,939.

Under the provisions of these contracts the route will have to be sufficiently completed for the operation of trains within twenty-eight months and finished entirely within thirty-three months from the time that work is commenced by the contractors.

First Railway Bus Line in St. Louis Opened

The St. Louis Motorbus Company, a subsidiary of the United Railways, St. Louis, Mo., opened its first bus line on Sunday, Nov. 9. The line operates on Natural Bridge Avenue from the end of the Natural Bridge division to Line Lawn in St. Louis County, intersecting the Union boulevard line and the Kirkwood-Ferguson division.

For a 10-cent fare passengers are furnished a transfer to the United Railways city street cars, while street car patrons who desire to transfer to the buses receive a transfer for an extra 3-cent fare, as the city car fare is 7 cents.

Four single deck buses constructed by the White Company have been installed on the line. Each bus holds twenty-nine passengers. The driver collects the fares as the passengers enter.

Electrification and Motor Haul Data Sought by I.C.C.

In its annual report form, to be sent out to all railroads about Dec. 1 and returned by March, 1925, the Interstate Commerce Commission will request data on the use of electricity for motive power, and information regarding gasoline-propelled railroad cars. The commission will also seek to find out the results attained with the use of motor trucks by the companies as supplementing regular service. Some of the country's railroads, including the Pennsylvania, utilize motor trucks on short hauls.

The most recent available figures of the commission show that the eastern part of the country has 286 electric locomotives in heavy railroad operation; the south has 17 and the west has 69. Most of the big railroads of the country have portions of their lines electrified now.

Joint Operation in Texas a Success

The Dallas-Denton line of the Texas Interurban Company has not produced the business expected of it by the management. This statement is based on returns for the first month of operation. According to General Manager Richard Meriwether, the combined traffic is barely enough to pay operating expenses, but the returns from freight and express have been good. He is quoted as follows:

> The first month the line has been in operation has demonstrated the practicability of using the same tracks for steam and electrically driven cars, but aside from that the results so far are rather disappointing. We hope the business will increase as the people of the territory become familiar with the service. There are enough people in that territory to produce a satisfactory business, and we are confident it will come to us when everybody along the line begins to use the interurban cars.

The Texas Interurban Railway is cooperating with the Missouri, Kansas & Texas Railroad in operating a joint line between Dallas and Denton. Joint operation was planned when the interurban company, in fulfilling a contract with the city of Dallas, decided that Denton was the best town in the surrounding territory to include in the network of connecting electric lines. A proposition was made to the railroad company to rent its track, obviating the construction of a parallel road.

A joint dispatching system, under the supervision of the steam line company, is maintained. Each electric passenger train and each steam passenger train is considered first-class, the electric express train second class and the steam freight trains third class.

The interurban company pays a stipulated rental monthly for the use of the track, and in addition pays a sum for the maintenance of the right of way, and its pro rata share of the dispatching cost.

Results with Trackless Line at Baltimore Disappointing

The United Railways & Electric Company, Baltimore, Md., is seeking a way to minimize the loss on the trackless trolley between Gwynn Oak Junction and Randallstown. When the trackless trolley was first proposed, Liberty Road residents made a contract with the railway in which they agreed to make up deficits in the operation of the line to the extent of $10,000 the first year, $7,500 the second year and $5,000 a year thereafter, until $37,500 had been paid.

The trolley was placed in operation in July, 1922, and the Liberty Road residents have had to pay the first two years' installments on the deficit guarantee. The contract has three years to run.

A statement by the railways says:

> The United Railways has been steadily losing money on this line.
>
> The guarantee has never equaled the deficit. Our officials have been conferring with officials of the Public Service Commission for some time in an effort to work out a satisfactory solution.
>
> The company has no intention of abandoning the territory. We will continue to give the people there adequate transportation service, but some way must be found to minimize our losses.
>
> Operating economies will have to be brought about. Perhaps that can best be done by substituting gasoline buses.
>
> The company has no intention of asking for an increase of fare on the line, nor an increase of the guarantee fund posted by the citizens there.

Buses Run by Railway at Sapulpa

Bus service has been substituted for railway service in Sapulpa, Okla., and started between Mounds and Okmulgee. Electric railway service in Sapulpa, a town of 11,600, could not be made profitable. Two short lines will be abandoned entirely and about 1½ miles of track probably will be removed. The Mounds-Okmulgee buses will be operated pending completion of the electric railway extension from Mounds to Okmulgee, after which the buses will be used as feeders to the electric line on such routes as offer possibility of developing business. J. A. Frates, vice-president of the Oklahoma Union Railway, states that the company expects to add buses as line feeders as rapidly as the electric line is extended until all tributary territory is given adequate service and annexed by interurban lines to the system being developed by that company. The bus service is being given in the name of the Union Transportation Company.

New Buffalo Bus Line Starts

Double-deck buses were placed in service on Delaware Avenue, Buffalo, N. Y., on Nov. 2 by the International Railway. The fare is 10 cents. This line will be extended to Kenmore Avenue at an early date, and the Delavan Avenue line will be opened as soon as buses can be secured. Free transfers are given with connecting street car lines in a forward direction.

Buses now in use are of the open-top type, seating 67 passengers, as now operated on Fifth Avenue—New York, and Roosevelt Boulevard—Philadelphia. These buses, however, are for temporary use, and will be replaced in the early spring by the Mitten-Management bus, which has a front exit, inside stairway, semi-enclosed top and electric drive. The company says:

> Traffic congestion is becoming more and more alarming in Buffalo. It will be greatly relieved by a proper use of the bus. Sixty-seven seated bus passengers occupy about the same street space as 4 private car passengers, and when the automobilist learns of the speed and comfort possible for a 10-cent fare, he will hesitate before assuming the cost of bringing his private car into the downtown traffic, and inflicting upon the public generally the delays caused by over-congestion in the city streets. A regular motorbus service will appeal to the economical motorist as well as the comprehensive city planner.

More One-Man Cars for Milwaukee

Following a series of hearings covering nearly a year before the Railroad Commission on the petition of the Milwaukee Electric Railway & Light Company to introduce one-man cars on its Clybourn Street line a permit has been granted to establish the service. Testimony introduced before the commission showed that the company has found it absolutely necessary to reduce operating expenses wherever possible in order to give car riders adequate service at a reasonable fare.

The equipment to be used on the Clybourn line will not be like that in use on the three other one-man lines in the city. The company proposes to equip the Clybourn Street line with cars of the rear-door type so as to facilitate the unloading of passengers, especially in the downtown section of the city.

As indicated in the ELECTRIC RAILWAY JOURNAL for Nov. 8, page 821, an application by the company to extend its one-man car service to the Walnut Street line is now pending before the Railroad Commission.

More Bus Permits Issued to Public Service

Permits have been issued by the Board of Public Utility Commissioners of New Jersey to the Public Service Transportation Company for the operation of 17 buses on the Passaic-Garfield-Lodi route. This route is about 4 miles long. It parallels on the same streets

the tracks of the Public Service Railway, of which the bus company is a subsidiary. The rate of fare is to be 5 cents from Burgess Place, Passaic, N. J., to the end of the line in Lodi. The railway has discontinued its trolley service on the Main-Lodi line in Passaic, Wall and Main Streets and Passaic Avenue and on its private right of way from Main Street, Lodi, to Lodi Junction, and has substituted buses.

Co-ordination Proposed at Topeka

A. M. Patten, general manager of the Topeka Railway, Topeka, Kan., has admitted that plans have been discussed looking toward the establishment of a service with buses by his company in co-ordination with the railway lines. The tentative plans now being considered are for the buses to enlarge the trade territory of the North Topeka merchants by extending operation beyond the city limits.

Whether the buses are to be operated from the ends of the present lines or whether they should operate from the south side of the river, the street cars being eliminated north of the river, still is a matter to be decided.

It is stated that the railway officials are considering a plan whereby the street cars would be operated to the Union Pacific station and passengers for other than the trains, to be transferred there to buses.

The Topeka system is controlled by the Illinois Power & Light Corporation, which is successfully operating buses in co-ordination with its railways lines in other cities, notably Wichita, Kan., and Decatur, Ill.

Interurban Passengers to Go Into Detroit by Bus

Interurban cars of the Detroit United Railway will probably cease to operate at the Detroit city limits on Dec. 1 under a plan to put a system of buses into operation for transporting interurban passengers from the city limits to the company's main terminal station at Jefferson Avenue and Bates Street. The company's outbound buses will be reserved for interurban car passengers.

Incoming passengers will leave the cars at sub-terminals, to be established by the company, and there board buses. Outbound passengers will be transported in buses from the interurban station in the business center of Detroit to the city limits to board the cars at the sub-terminals.

After the new bus system is put into use the parlor cars of the railway will be the only interurbans to proceed over the city streets to the main terminal station.

At least 50 buses will be placed in service. They have been ordered from the Yellow Coach Company, Chicago, and are to be of the single-deck type.

The D.U.R. already has buses in service on its Trenton division covering the entire interurban route. A sub-terminal and transfer station on Gratiot Avenue is being completed and will be the first one used. It will be followed by two others so that the buses on the Pontiac and Mount Clemens division will not go farther than the city limits.

News Notes

$169,000 Spent in Grand Rapids.—Keeping pace with the development of Grand Rapids, Mich., the Grand Rapids Railway up to Nov. 1 spent $169,000 this year in improving its service. The largest projects were in the downtown section to relieve traffic congestion.

Fare Increase Sought for Interurban.—The Virginia Railway & Power Company, Richmond, Va., has petitioned the Virginia State Corporation Commission for an increase of fares on the Richmond-Petersburg interurban electric line. The company is not receiving a reasonable return, the petition alleges.

Wisconsin Town Bans Bus.—Acting on the conviction that street cars offer all the people the safest and cheapest form of transportation, the village board of Port Edwards, Wis., has passed an ordinance which it believes will protect the Wisconsin Rapids Street Railway, an 8.25 mile line, against unregulated bus competition. The ordinance requires the payment of $5 a day for each bus operating on the streets in the village. Violators of the ordinance will be fined from $1 to $100 for each offense, or may be sent to jail for 90 days.

North Shore Purchase Postponed.—The Board of Estimate of New York on Nov. 7 decided to put off the matter of approving the contracts for the purchase of the rights and interests in the New York & North Shore Traction Company for $50,000 and also the question of authorizing Controller Craig to buy the carhouse and yards on State Street, Flushing, for a sum not exceeding $15,000.

Extension of Franchise Sought.—A request for a 20-year franchise to operate cars in the city of Piqua has been filed with the city by the Western Ohio Railway. The company's franchise expires in two years.

Offices of St. Joseph Company in New Location. — The St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., has opened for business in its new quarters in the Tootle Building, Sixth and Francis Streets. The offices of the general manager, superintendent of railways, engineering, accounting, claim and publicity departments took up quarters in the new building some time ago. The company has occupied its present quarters since the old Tootle Building at Sixth and Francis Streets was destroyed by fire two years ago. In its new location the company will occupy all of the west half of the first floor, fronting on Francis Street, and the entire second floor. The salesrooms will be on the first floor.

School Buses Run by Railway.—Two morning and evening school bus runs for the exclusive use of pupils of the Fremont High School, Los Angeles, Cal., were started by the Los Angeles Railway on Nov. 3.

Deadlock on One-Man Car Operation.—The city of Quebec and the Quebec Power Company, Ltd., are deadlocked on the question of the number of men who will operate the street cars of the city. Unless the company meets the demands of the city the fare will, on and after Nov. 15, revert to 5 cents, the rate charged in 1919. At present the rate is 7 cents.

Electric Extensions Planned.—It is reported that a steam railway line, with electric extensions, is being planned to span the oil fields, east and west, of northern Oklahoma. C. E. Burlingame, Bartlesville, is head of the temporary organization. The company is to be capitalized at $1,000,000.

More Bus Permits Sought.—The Los Angeles Railway Corporation, Los Angeles, Cal., has applied to the Railroad Commission for a certificate to operate bus service along a portion of Florence Avenue from the city of Los Angeles to the city of Huntington Park.

Insurance Policies for Nashville Employees. — The Nashville Railway & Light Company, Nashville, Tenn., through J. P. W. Brown, its general superintendent, has announced that it had issued life insurance policies of from $500 to $1,500 to its 1,089 employees. At the same time, B. C. Edgar, vice-president and general manager of the Tennessee Electric Power Company, of which the Nashville Company is a subsidiary organization, announced that a total of 2,800 employees had been given similar policies totaling $2,000,000. Protection by these policies became effective on Nov. 1. The contract for this insurance was given to the Provident Life & Accident Insurance Company, which has its home office in Chattanooga.

Tells About Railway and Bus Operations.—Service to the public was stressed by the Altoona & Logan Valley Electric Railway and Logan Valley Bus Company in connection with the Better Homes Exposition staged by Altoona, Pa., merchants and corporations. The railway had a booth with company employees in attendance. The booth contained a large map showing the territory over which the company operates, giving the trolley lines and bus routes. Numerous placards contained company statistics and gave the salient features of traffic conditions. Other bulletins announced that the Logan Valley trolley cars and buses hauled 19,000,000 passengers in one year, the cars traveling 3,000,000 car-miles. The company used 21,000 tons of coal, employs 360 men and women, operates 132 cars on 576 miles of track, and it informed the visitors through a placard that wages have increased in the past ten years by 100 per cent, materials have increased 70 per cent and fares but 40 per cent.

Bridge Will Be Constructed.—The vehicular traffic and street car bridge across the New Basin Canal at Carrollton Avenue in New Orleans, La., will be built. The New Orleans Public Service, Inc., sought to have it erected, and offered to advance the cost of construction, estimated at $150,000, to be reimbursed subsequently by the city of New Orleans. Action on the matter was delayed by a ruling of the City Attorney's office, which has been removed. The bridge will have a double street car track, with ample space on either side for vehicles and two lines of traffic.

Financial and Corporate

Surplus Increased

Montreal Tramways Has Surplus of $548,695 Compared with $347,553 in 1923 and $187,947 in 1922

The thirteenth annual report of the Montreal Tramways, Montreal, Que., shows separately the results obtained from the operations under the contract with the city and the share of the gross revenue accruing to the company under the provisions of the contract and its disposition. The report of the president and directors was recently submitted to the shareholders. It is for the year ended June 30, 1924.

Operations under the contract show a gross revenue of $12,463,799, which included $12,131,181 for passenger earnings. The total operating expenses amounted to $8,875,224 and the net earnings were $3,588,574. After the distribution of the net earnings, the total revenue from the contract, together with the operating profit of $48,555, equaled $2,358,448. An amount of $181,431 was carried direct to "Reserve for Financing." To the city of Montreal for the yearly rental the sum of $500,000 was given, and for payment on account of accrued rentals unearned in previous years $548,695, which, added to the company's revenue from the contract and expenses for financing, makes $3,588,574. The city rental up to June 30, 1924, amounts to $3,192,694, of which sum there has been earned $2,809,056, leaving a balance of unearned rental payable as earned of $383,638.

The share of the gross revenue for the year accruing to the company, together with the miscellaneous revenue from other sources, shows a distribution of total revenue of $2,449,175 and total expenses of $1,885,621, leaving a net income of $563,554. Subtracting a dividend total of $400,000, the surplus for the year was $163,554. A sum of $592,979 is added to it for the surplus at June 30, 1923, giving a total of $756,533. There has been charged against this account $87,780 for the value of discarded property, leaving a balance in the general surplus account of $668,753.

During the year the company expended on new construction $1,145,505 and has written off capital account for the value of property discarded $377,466, making a net addition to capital value of $768,038. During the year the company purchased 25 new motor cars and 25 new trailers.

The efforts of the company to meet demands upon its system is reflected in the large amount of new construction work carried on throughout the year.

A comparison of operation for the year ended June 30, 1924, with the previous year is given in the accompanying table.

The annual meeting of the company was held on Nov. 5. The directorate is now composed of Julian C. Smith, president; Howard Murray, Gordon W. MacDougall, George H. Montgomery, J. L. Perron, William C. Finley, Col. J. E. Hutcheson, Lorne C. Webster, Beaudry Leman, Senator Casgrain. Mr. Hutcheson, the general manager, was in addition made a vice-president.

	Year Ending June 30, 1923	Year Ending June 30, 1924
Gross receipts	$12,056,355	$12,463,798
Operating expenses and taxes	6,099,993	6,246,889
Operating profit	48,304	48,554
Maintenance and renewals	2,492,792	2,579,779
Total	8,641,090	8,875,224
Balance	3,415,264	3,588,574
Allowances due company:		
Six per cent on capital value	2,177,177	2,177,177
On additions to capital	164,973	175,918
Six per cent on working capital	2,530	5,351
Financing expense	181,431	181,431
Total	2,526,113	2,539,879
Balance Dr.	a889,151	a1,048,695
Payable when earned:		
City of Montreal rental	500,000	500,000
Contingent reserve fund	b41,597	.....
Total	541,597	500,000
Deficit	....	.....
Surplus	$347,553	$548,695

a Surplus.
b The contingent reserve fund is limited by the contract to $500,000.

Foreign Tramway Issue Sold in New York Market

Instances are being presented almost daily of the growing participation of United States investors in the work of helping to finance issues of foreign origin. In the past these operations have been confined very largely to government and municipal issues and to the securities of some of the better known steam railroads. On Nov. 10, however, announcement was made that investors at home had bought $1,400,000 of Christiania Tramways Corporation two-year 5 per cent gold notes. The subscription price was 100¼ and interest, to yield about 4¾ per cent. The offering syndicate comprised White, Weld & Company, Blair & Company, Inc., and Brown Brothers & Company, New York.

The Christiania Tramways Corporation was organized on May 1, 1924, as a consolidation of the two privately owned companies. It does all the street railway business in the city, serving a population estimated at 260,000. Fifty-one per cent of the stock of the company is owned by the city, which is the capital and largest city of the Kingdom of Norway. The city unconditionally guarantees the note of the company by indorsement. The note to the bank is in the form of a single instrument. Certificates of participation in the denomination of $1,000 each are to be issued by the National Bank of Commerce, New York, trustee.

10.27 Cents per Passenger Is Cost on Staten Island Lines

Transit Commissioner LeRoy T. Harkness has made public the substance of a special investigation made by order of Controller Charles L. Craig of the city of New York which showed that some of Mayor Hylan's municipally operated trolley lines on Staten Island had sustained losses of $57,118 in eighteen months. It was disclosed further that the actual cost of every so-called "5-cent ride" on the routes examined was 10.27 cents.

The Craig report was prepared by R. B. McIntyre, a statistician of the Department of Finance. It states that from Oct. 14, 1921, to March 14, 1923, the total revenue earned by the lines was only $54,171, while the operating and maintenance expenses were $111,289.65.

Commissioner Harkness said that similar losses were now being incurred on the other municipal lines operating on Staten Island, despite the use of policemen to help in the task of loading at the ferry station, the help of trucks belonging to a city department and the aid of labor from other branches of the city government. He said:

> If a strict accounting were kept of what the city actually spends in maintaining these lines, the Department of Plant and Structures would show an appalling financial loss on all.

In commenting upon the assertion that the actual cost of every ride is 10.27 cents, the report says:

> In other words, every passenger paying 5 cents has been riding at the expense of the taxpayers of the City of New York to the additional extent of 5.27 cents.

Despite the excessive cost of operation, Mr. Harkness pointed out, the Staten Island service has been so inefficient and inadequate that residents are demanding the installation of bus routes and extension of a steam railroad. He said:

> The operation of the Staten Island trolleys by the city has been so extremely atrocious that, if it had been the performance of any private company under the jurisdiction of this Transit Commission, it would not have been allowed to continue, by application of the statutes which govern negligent and ineffective operation.
>
> From the standpoints of safety, of service and financing, the attempt of Mayor Hylan to furnish transportation has been a pathetic failure.

Mr. Harkness's statement followed a number of protests by Staten Island commuters, who asserted that they were facing a winter of unheated cars, inadequate in number and running on uncertain schedules.

In confirmation of these protests, Mr. Harkness made public a report by William O. Smith, Transit Commission inspector, to George F. Daggett, chief of the Transit Bureau, which cited instances of overloading on several Staten Island lines, ranging from 102 to 350 per cent.

New Wisconsin Valuation Policy Attacked

Public utility companies in Wisconsin, through the Wisconsin Utilities Association, are protesting against the Wisconsin Tax Commission's new valuation policy toward them. This policy is on a basis of 100 per cent of the

present value regardless of the percentage used by local assessors in valuing other private property. General property, however, is assessed at 80 per cent, while the properties of gas, electric and electric railway companies will be assessed 100 per cent of their true value. The association brands the new policy as unjust and discriminatory unless it is extended to all property owners.

Further Progress Reported in St. Louis Reorganization

Argument before the court in the suit of the St. Louis & Suburban Railway bondholders for a separate receivership and foreclosure on that portion of the United Railways set for trial in the United States District Court in St. Louis has been continued until Nov. 15. As a consequence it is freely predicted in St. Louis that an early agreement with the Suburban bondholders will be reached by the reorganization committee of the United Railways.

It is said that only one point remains to be cleared up, the question of the period of extension of the maturity date of the $4,500,000 Suburban bonds. A virtual agreement has been reached on all other points at issue, it is said. It is possible that when the Suburban foreclosure case is again called before Judge Faris announcement will be made that an agreement has been reached covering all the points in dispute.

San Francisco Municipal Line Using Up Capital

Objection to the practice of the San Francisco Board of Supervisors in using depreciation reserve of the Municipal Railway to finance extensions and betterments, has again been over-ridden, although voiced by the city engineer and leading civic organizations. The Supervisors have adopted a resolution declaring they will appropriate $393,180 out of this depreciation reserve to pay for the city's part in driving another tunnel through the western hills to improve transportation into the so-called Sunset district. The tunnel would be used by the Municipal Railway and be paid for through an assessment district and by the city. An effort to authorize a $400,000 appropriation from the city's general fund has been tabled.

There was $1,184,737 in the depreciation fund in April last. Necessary carhouse and car shop extensions and the building of extensions ordered by supervisors, including trackage which would follow the bore, would convert this balance into a $94,000 deficit, it is estimated. Other necessities and proposals, which seemingly depend upon the same fund, if executed would enlarge that deficit to more than $3,000,000.

Observers of the Municipal Railway believe the city is storing up trouble in failing to maintain an adequate depreciation reserve to insure continued operation of the lines in the future. As one observer put it, on the basis of capital cost of properties and their expected life, the present depreciation reserve balance appears wholly inadequate without further withdrawals.

Dividend on Savings Association

At a recent meeting of the board of directors of the Savings & Loan Association of the United Railways, St. Louis, Mo., a semi-annual dividend at the rate of 6 per cent per annum payable to stockholders of record on Aug. 31, 1924, was declared. The sum to be disbursed is $71,000. This brings the total dividends paid in the past twelve months to $134,700. A grand total of $487,000 has been paid to members of the association since it was formed nine years ago. The association comprises 5,369 members, employees of the United Railways and their families. It has placed 1,558 members in their homes. At a special meeting of the stockholders on Sept. 16 the authorized capitalization of the association was increased from $8,000,000 to $9,000,000, the second million in authorized capital stock voted this year.

Schenectady Railway Earnings Improve

News comes from Schenectady, N. Y., that the local railway has turned a 270,000 deficit into a net of $80,000 for the quarter ended Sept. 30, 1924, as compared to the same period of 1923. The figures follow:

	1923	1924
Operating revenues	$119,930	$389,837
Operating expenses	390,629	309,801
Net revenue	$270,699*	$80,036
Taxes assignable to railway operation	23,847	27,224
Operating income	$294,546*	$52,812
Non-operat. Income	295	605
Gross Income	$294,250*	$53,417
Total deduction from gross income	42,707	53,226
Net corporate inc.	$336,958*	$191

*Signifies loss.

This is the first news indicating that E. M. Walker, president during the past year, is getting under way. The situation in Schenectady is considered one of the worst remaining in the industry. Mr. Walker has had a tremendously difficult task. He is making real headway, but the railway is still a long way from being on a satisfactory basis. What has been accomplished thus far in the way of improved service and better earnings is all the more remarkable in view of the fact that no new money has been put into the property. It seems obvious that further development of the property depends very largely on a program of modernization, which will necessitate new money.

Valuation Finding at Denver Still Before Court

The outcome of the litigation between the city of Denver and the Denver Tramway is expected to be known before Jan. 1 if present plans do not go amiss. The case is before Judge Robert E. Lewis of the United States Circuit Court of Appeals at St. Louis.

It will be recalled that it was Judge Lewis who named Ernest Stenger receiver for the company and authorized an 8-cent cash fare, the company cutting the amount of fare by selling two tickets for 15 cents.

The principal points to be passed on by Judge Lewis is: What is the proper valuation of the company's properties, and what is a fair return on its investment?

In this connection the city claims that the valuation is about $7,500,000. The company says the value is $30,000,000. Special Master in Chancery Dubbs fixed the valuation at $20,105,707. Judge Dubbs' report cited that 7½ per cent was fair on the $20,105,707 valuation. The city takes exception to the valuation of both Judge Dubbs and the company.

$1,000,000 Erie Issue Quickly Subscribed

Myron S. Hall & Company, New York, offered on Nov. 11 a new issue of $1,000,000 Erie Railways first and refunding mortgage 6 per cent bonds, due Oct. 1, 1954. The company owns about 67 miles of track serving a population of 128,000 in Erie, Pa. Valuation of the property by the Public Service Commission of Pennsylvania amounts to twice the total funded debt, while strong provisions surround issuance of further bonds under this mortgage. The bankers report an oversubscription to this issue. The bonds were priced at 95 and interest to yield 6⅜ per cent. The present Erie Railways comprises part of the property formerly included in the system of the Buffalo & Lake Erie Traction Company, segregated following foreclosure.

Power Company After Niagara Gorge Railroad

Application has been made by the Niagara Falls Power Company, Niagara Falls, N. Y., to the Public Service Commission for permission to acquire and hold all or any part of the capital stock of the Niagara Gorge Railroad, operating a scenic belt line in the lower Niagara gorge between Lewiston and Niagara Falls.

The application also asks permission to pledge as security for $1,000,000 of 5 per cent bonds of the Niagara Gorge Railroad an equal amount of 5 per cent bonds of the Niagara Falls Power Company. As its reason for acquiring the stock of the gorge route the application of the power company sets forth that the railroad owns valuable riparian rights along the shore of the gorge for a distance of more than 5 miles; that the Gorge Railroad is the owner of the stock of the Niagara Gorge Power Company, and that the free and paramount use of the railroad is essential in any construction work for hydro-electric development which may be undertaken along the lower Niagara gorge.

Paul A. Schoellkopf, president of the Niagara Falls Power Company, says that the value of the gorge line for scenic purposes is not to be disregarded and no effort will be spared to give the public the opportunity of seeing the lower group from the right-of-way of the electric route.

The Niagara Gorge Railroad is owner of all of the capital stock of Lewiston & Youngstown Frontier Railway, which is operated by the Niagara Gorge Railroad, in conjunction with its own Lewiston-Youngstown line.

Arbitration Award Delay Helps Financing

According to the Toronto *Globe* the intricacies of finance are illustrated by the issue of $7,900,000 in civic debentures to pay the balance due on the purchase price of the Toronto Railway system. Finance Commissioner Ross figures that, while the appeal to the Privy Council over the original award means that the city will have to pay more for the property than provided by the award, in the long run the city will save money. Had there been no appeal from the award when the majority of the Arbitration Board reported on the price to be paid by the municipality for the railway, the city would have had to issue debentures carrying 6.40 per cent interest. In the meantime money has become cheaper, and money that would have to carry 6.40 per cent early last year can be obtained now for 4½ per cent.

Mr. Ross roughly calculated that the delay of more than a year and a half will save the city about $2,000,000. Supposing the amount of the debentures to be issued in 1923 and now was the same, $7,900,000, the difference between one year's interest at 6.40 per cent and 4½ per cent is more than $156,000. This alone will show that the Finance Commissioner's deduction about a $2,000,000 saving during the full life of the debentures is quite reasonable.

Civic railway system debentures totaling about $1,300,000 issued in 1911-1912 carry 4 per cent. Five issues, amounting to approximately $700,000, issued between 1912 and 1915, carry 4½ per cent, and since then issues of about $32,000,000 have carried 5 or 6 per cent.

Stockholders of the Toronto Railway, Toronto, Ont., the property of which was taken over several years ago by the city subject to arbitration of the purchase price, will meet on Dec. 1 to consider the winding up of the company and if this is decided upon to appoint a liquidator. Transfer books will close on Nov. 28 and if the decision to wind up is taken, all transactions in the shares will cease from the date of the closing of the books. The meeting will take the first step in the distribution of assets.

$20,000,000 Issue Placed

The first financing undertaken on behalf of the Cities Service Power & Light Company, the newly created $100,000,000 subsidiary of the Cities Service Company, New York, into which all of the latter's public utility properties are to be placed, consists of $20,000,000 of 20-year 6 per cent sinking fund secured gold bonds, offered by a syndicate headed by Dillon, Read & Company, Federal Securities Corporation, and A. B. Leach & Company. New York, at 94½ and interest, to yield about 6½ per cent. The bonds will be specifically secured by pledge of the common stocks of the six most important operating companies in the Cities Service Power & Light Company, viz.: Toledo Traction, Light & Power Company, (owning the Toledo Edison Company), Ohio Public Service Company, Public Service Company of Colorado, Kansas City (Mo.) Gas Company, Wyandotte County Gas Company (Kansas City, Kan.), Empire District Electric Company (southwestern Missouri), and St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.

Tax Refund Is Denied to the Philadelphia Rapid Transit

The federal government has refused to refund to the Philadelphia Rapid Transit Company $5,000,000 of income and excess profits taxes, which both the company and the city believes were erroneously paid. City Solicitor Gaffney is disappointed at the ruling and has said he would advise the Mayor to take an appeal to the Commissioner of Internal Revenue. The appeal will be based on the ground that the Government's decision is a discrimination against Philadelphia, inasmuch as in a similar case a decision was given favorable to Kansas City.

The Rapid Transit Company early this year appealed to the committee on appeals and review of the Treasury Department for a refund of $5,000,000 in income and excess profits taxes, paid by the company during and since 1917. The appeal was denied. Later the city decided to intervene in the matter on the ground that a section of the former Federal Revenue Act exempted from taxation any public utility in which a municipality or other political subdivision had an interest, such as the city has in the Philadelphia railway system by reason of the agreement of 1907.

Before the city appealed to the federal authorities it entered into a contract with the P. R. T. Company, whereby it was provided that if the $5,000,000 were recovered it should be used by the company for making improvements. The case was argued last August.

The recommendation made by the solicitor to the commissioner follows:

> With the exception of one point, the arguments of the City Solicitor merely reiterate with emphasis those presented by the Rapid Transit Company before the committee. Reference is made to the recommendation for a detailed statement of the facts and contentions. These have been again carefully considered, and this office remains unconvinced that error was committed in deciding that the agreement entered into between the Rapid Transit Company and the city was not such as under Section 11 (b) of the act of 1916, as amended by the act of Oct. 3, 1917, would entitle the corporation to exemption from federal income and excess profits taxes.
>
> The validity of the ordinance and contract may be questioned, for it hardly seems probable that a city would be empowered to act as a collecting agent for a corporation even though it was to receive the total amount collected, and there appears to be no other consideration for the contract, but in any event a sufficient answer to any argument founded upon them is found in the words of the proviso of Section 11 (b):
>
> " . . . . whenever any State . . . or political subdivision of a State . . . has prior to the passage of this title entered in good faith into a contract . . . the object of which is to acquire a public utility, no tax shall be levied.
>
> Certainly the tax status of the Transit Company, under the act cited, cannot be affected by a contract entered into in 1924, even though it be in modification of a contract executed in 1907.
>
> It is, therefore, recommended that the protest of the city of Philadelphia, intervening on behalf of the Philadelphia Rapid Transit Company, be denied.

The case was argued orally in behalf of the city before the solicitor on Aug. 7.

Receiver Appointed for Michigan Railroad

The United States District Court for the eastern district of Michigan, Southern Division, Judge Charles C. Sumon presiding, has appointed John F. Collins, Jackson, receiver of the Michigan Railroad. He has been authorized to continue the operation of the railway lines under the direction of the court.

The receiver was appointed on the application of the Union Railway, Gas & Electric Company of New Jersey, owner of all the stock of the Michigan Railroad, excepting directors' qualifying shares, a general creditor of the company to the amount of $1,465,903, for moneys loaned and the holder and owner of $4,000,000 of the company's general mortgage bonds. The company's property is also subject to a first mortgage of $4,050,000, which it was thought could be extended.

The bill of complaint shows that the offer of the company to extend its $4,050,000 of first mortgage bonds, which matured on May 1, 1924, could not be effected because earnings have decreased to such an extent that the company cannot pay the interest.

The Michigan Railroad consists of the high-speed third-rail line operated between Kalamazoo and Grand Rapids, between Allegan and Battle Creek, and a line connecting Bay City, Saginaw and Flint, covering a trackage of 148 miles.

Holders of more than 85 per cent of the face value of the bonds agreed to an extension of the maturity date, but some of the minority threatened suit to collect. In order equally to protect all the holders the receivership action was started.

Modification Sought for Plan of Abandonment

An unusual situation was created recently by the announcement that the Visalia Electric Railroad, Exeter, Cal., had asked permission to continue a mail and express special car to handle mail and express business which, in the request for abandonment of passenger service, it had been assumed was to be dropped. The Visalia line is 54 miles.

The Al Askin Stage Line has been granted a permit to operate between Visalia, Woodlake, Lemon Cove and Exeter, replacing the service of the Visalia Electric Railroad, but Manager E. L. Askin stated that company will not begin operations until there is something definite done about mail and express business. It is on this traffic that the stage line bases its hope for some remuneration.

Another Issue Offered to Employees.—Subscriptions will be received by the Dominion Power & Transmission Company, which controls more than 100 miles of electric railway and supplies light and power to cities of Hamilton, St. Catharines and Brantford, Ontario, for 2,500 shares of 7 per cent cumulative preferred stock. Shareholders and employees will be first to receive opportunity to subscribe, after which a public offering will be made.

Will Redeem Outstanding Bonds.—The Public Service Corporation of New Jersey has elected to redeem on Dec. 1, at 107½ and interest, all its outstanding 20-year secured 7 per cent gold bonds due Dec. 1, 1941. Holders of the bonds are required to present and surrender them with all unmatured coupons attached for redemption and payment on Dec. 1, 1924.

Statistics on New Orleans.—Commissioner Paul H. Maloney of the Department of Public Utilities of New Orleans, La., has given out some interesting figures on the public utilities of that city, based upon the report of the New Orleans Public Service, Inc., recently submitted to him for the year ended Sept. 30. According to Mr. Maloney, the citizens ride the cars 106,673,420 times in a year and use 35,654,436 transfers. The total money invested in utilities in the city of New Orleans is $74,866,386. During a year New Orleans, not including Algiers, pays $7,517,091 for electric railway fares.

Traffic Decreases in St. Louis.—The report of the United Railways, St. Louis, Mo., for the quarter ended Sept. 30 shows a drop of about 4,000,000 passengers for the period compared with the same months in 1923. The total passengers carried in the quarter this year was 63,282,885, against 57,859,171 in the same period of 1923. For the quarter ended June 30 a decrease of 3,856,112 passengers was experienced, making the loss for the past six months more than 8,000,000 compared with the same months in 1923.

Charter Amended for Additional Stock Issue.—Complying with a permit granted recently by the Public Service Commission, the Georgia Railway & Power Company, Atlanta, Ga., will amend its charter so as to issue $2,500,000 of additional 7 per cent cumulative preferred stock. The stock will be redeemable at any time after Jan. 1, 1938, at $115 a share. The present increase will give the Georgia company $15,000,000 in common stock, $10,000,000 in second preferred stock and $6,400,000 in first preferred, making a total capitalization of $31,400,000.

Arkansas Central Stock to Be Offered.—Offering has just been made of 5,000 shares of Arkansas Central Power Company cumulative preferred stock by W. C. Langley & Company, New York, and the Old Colony Trust Company. The stock will be priced at $98 a share to yield 7.14 per cent. The company is the successor to the Little Rock Railway & Electric Company.

Deficit in Net Income.—The Boston Elevated Railway, Boston, Mass., in a return filed with the Massachusetts Department of Public Utilities reveals a deficit in its net income of $786,099 for the nine months ended Sept. 30. An increase in operating expenses and fixed charges is given as the reason. The report shows an increase in passengers carried for the nine months of 4,255,663 over a similar period in 1923, which, however, was not sufficient to offset increased operating expenses and fixed charges. Passengers carried in the nine months totaled 281,088,673 and for the same period this year 285,344,336. The first nine months of 1924, compared with the same period in 1923, shows a loss of $650,004 in operating income and $20,570 in non-operating income. The gross income for the nine months of 1924 was $5,212,357, against $5,882,923 for 1923.

Duluth-Superior Earnings Off.—Net income of the Duluth-Superior Traction Company, Duluth, Minn., for the third quarter of 1924 amounted to $10,061. This is a decrease of 73.84 per cent compared with the net income of $38,453 for the corresponding period of last year. Gross revenues for the quarter were $429,237, a decrease of 8.59 per cent. Operating expenses were $349,393. This is 1.88 per cent below the record for the corresponding period of last year. Net revenue was $79,844. This is a decrease of 29.63 per cent. Fixed charges and taxes were $69,782, a decrease of 6.97 per cent. For the nine months ended with September net income stood at $17,510, which compares with $124,873 for the first nine months of last year.

Algiers Properties Sold.—The liquidators of the Home Bank of Canada have, with the approval of the court and of the inspectors appointed to represent creditors, sold the interests of tne bank in the West New Orleans Light & Traction Company and the South New Orleans Light & Traction Company, Algiers, La., to E. W. Burgis, of New Orleans, president and general manager of the companies, for the sum of $800,000 cash. The outlays of the Home Bank of Canada in connection with the railway and light enterprises amounted, with unpaid interest, to approximately $1,150,000 at the date of suspension of the bank.

Additional Offering of Debenture Bonds.—Bonbright & Company, New York, announce an additional offering of $5,000,000 of the American Power & Light Company's gold debenture bonds. The bonds are dated March 1, 1916, and are due March 1, 2016. The price is 94½ and accrued interest, to yield 6.35 per cent. The American Power & Light Company owns practically all the common stocks of companies supplying directly or indirectly 397 communities. The territory served included many important cities such as Portland, Ore.; Wichita, Council Bluffs, Duluth and other cities.

Traffic Decreases.—According to the report submitted to the Public Service Commission, approximately 40,000 fewer fares were collected during September on the lines of the United Railways & Electric Company, Baltimore, Md., than in August. There were also 1,480,158 fewer passengers in September of this year than in September a year ago. For June, July, August and September of the current year 71,890,389 passengers rode the cars, compared with 78,724,396 in the same four months in 1923.

Deficit for Interborough.—The total revenue of the Interborough Rapid Transit Company, New York, N. Y., for the three months ended Sept. 30, 1924, were $13,279,939, an increase of $445,607 over the similar three months of the year previous. The operating expenses, taxes and rentals paid the city for the old subway amounted to $9,201,167, a decrease of $281,153. The income available for all purposes was $3,672,858, an increase of $1,166,589 over the three months ended Sept. 30, 1923. After providing for actual maintenance there was a deficit of $923,184 for the three months period ended Sept. 30, 1924. This figure represents an increase of $936,854 over the balance for the similar three months period ended Sept. 30 a year ago.

Earnings Increase.—According to preliminary figures of the September gross earnings of the Indianapolis Street Railway, Indianapolis, Ind., an increase of 5.48 per cent is shown over gross earnings of September, 1923, while there is an increase of almost 2 per cent over the August earnings of this year. In round figures, there was an increase of $16,000 in earnings over September, 1923, and a gain of $10,000 over last August's receipts. Although the present rate of earnings is not so great as was expected when the company was granted an increase in fares last May, last month's record was by far the most satisfactory, as viewed from the company's standpoint, since the increase in fares became effective.

Municipal Line at Calgary Hard Hit.—The Canadian *Financial Post* says that continued deficits in the operation of the Calgary Municipal Railway, Calgary, Alberta, due to the marked falling off in passenger traffic, is the biggest problem facing Calgary. Administration and overhead expenditures have been reduced almost to a minimum, and the commissioners are now endeavoring to work out some system that will improve the situation. The introduction of buses in some sections is receiving serious consideration. The operation of street cars in the outlying districts of the city, where the passenger traffic is not sufficient to pay for the service, is largely responsible for the present condition.

Power Company Seeks to Purchase Railroad.—The Niagara, Lockport & Ontario Power Company is seeking authority from the Public Service Commission to purchase all of the outstanding capital stock of the Warren & Jamestown Street Railway, which runs between the borough of Warren, Warren County, Pa., and the city of Jamestown, N. Y. The stock is owned by the Venango Public Service Corporation of Pennsylvania. The prospective purchaser says it could furnish motive power to the railroad either directly or through its subsidiary, the Western New York Electric Company, and could effect economies by using existing transmission lines of the railroad for the distribution of electricity for light, heat and power.

Earnings Decrease.—The gross earnings of the railway department of the Cumberland County Power & Light Company, Portland, Me., for the first nine months of the present year showed a decrease of $92,291 over the same nine months in 1923. The operating expenses were $915,613, while for the first nine months of 1923 they were $982,565. This decrease was brought about largely through the reduction of schedules and limitation of shop crews. With interest, rentals and taxes taken into consideration, the department's deficit for the first nine months of this year was $26,331.

Personal Items

Lieut.-Col. J. E. Hutcheson Made Vice-President at Montreal

Lieut.-Col. J. E. Hutcheson, general manager Montreal Tramway and its predecessor, Montreal Street Railway, since 1912, has in addition to that office been elected vice-president of the company. From 1891 to 1912 Col. Hutcheson served with the Ottawa Electric Railway. At the time he joined that company the road was under construction. He served with it in various capacities, finally becoming superintendent. It was this post that he was filling when overtures were made to him from the Montreal company. Mr. Hutcheson entered railroad work in 1876 with the Grand Trunk Railroad as a telegraph operator. In 1884 he became connected with the Canadian Pacific Railroad at Ottawa as train dispatcher. Later he was made trainmaster of the company and continued in that capacity until 1891. He then went to Ottawa. Mr. Hutcheson was born in Brockville, Ont., on Sept. 15, 1858.

B. W. Roberts has been appointed purchasing agent of the Southern New York Railway, Hartwich, N. Y., succeeding Mrs. A. B. Brockway, resigned.

George Tracey has been promoted by the Southern New York Railway, Hartwich, to be superintendent in charge of transportation.

Sir Ernest Clark, Permanent Secretary of Ministry of Finance, and head of the Civil Service of Northern Ireland, will, at the invitation of Lord Ashfield, chairman of the London Underground Railways, join the staff of that group of companies. He is to be attached to the financial side of the undertakings. Sir Ernest has held various important colonial and Irish financial positions with great success.

C. G. Britton has recently been appointed superintendent of the Auburn & Syracuse Electric Railroad, Auburn, N. Y., operating 65 miles of city and interurban railway under the management of Peck, Shannahan & Cherry, Inc. Mr. Britton's first work was in 1903 as a commercial telegrapher. He held various positions in this capacity until 1904. He then entered the railroad field as station operator and later became a train dispatcher on a branch of the Pennsylvania Railroad. In 1906 he became connected with the Annapolis Short Line Railroad, holding positions as train dispatcher, trainmaster and superintendent of transportation until 1921. That year the road was merged with the Washington, Baltimore & Annapolis Electric Railroad, after which he engaged in other business until 1922, when he accepted a position with the Chesapeake Beach Railway as chief dispatcher. He remained with this company until he accepted his present position with the Auburn & Syracuse Electric Railroad.

Samuel A. Wallace, formerly with the London General Omnibus Company, London, England, will be in charge of the new plant of the Public Service Transportation Company at Irvington, N. J., purchased this year for use as a bus maintenance shop where major repairs will be made. The transportation company is the bus operating subsidiary of the Public Service Railway, Newark.

Clark Verner Wood, Jr., is now superintendent of the bus division of the United Electric Railways, Providence, R. I. He has been with the Providence company since March, 1923, in the capacity of assistant to R. R. Anderson, superintendent of transportation. Mr. Wood is the son of Clark V. Wood, president of the Worcester Consolidated Street Railway and the Springfield Street Railway in Massachusetts. Previous to his work with the United Electric Railways, he was for several years in charge of the power-saving departments of the Worcester and the Springfield companies. A brief outline of Mr. Wood's activities appeared in the ELECTRIC RAILWAY JOURNAL, March 24, 1923.

Vincent E. Keenan, superintendent of the bus department, United Electric Railways, Providence, R. I., has left the employ of that company to take charge of the mechanical department of the bus division of the Public Service Railway, Newark, N. J. Mr. Keenan has been connected with the United Electric Railways since April, 1923. For the preceding three years he was on the staff of the Fifth Avenue Coach Company, New York, in the capacity of research engineer, and previous to that time he was in charge of the experimental department of the Locomobile Company of America at Bridgeport, Conn. He was educated at Clason Point Military Academy, Westchester, N. Y., and Cornell University.

Charles W. Ford has resigned as general superintendent of the Kansas City, Clay County & St. Joseph Railway to become district representative of the Yellow Coach Manufacturing Company, with headquarters in Kansas City, Mo. His resignation becomes effective Dec. 1. Mr. Ford has had an experience of 25 years as general superintendent in charge of mechanical and operating details of both transportation and electrical properties. He has been with the Clay County electric line the last 10 years. He is president of the Midwest Electric Railway Association.

R. S. Mahan, claim and general passenger agent of the Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., has been appointed general superintendent of the company to succeed Charles W. Ford, who has become connected with the Yellow Coach Manufacturing Company. Mr. Mahan has been connected with the railway in an official capacity ever since the company was organized.

Obituary

Dr. Walter Boveri

President of Noted Swiss Manufacturing Concern—Economist and Organizer of Electric Industry

Dr. Walter Boveri, president of the famous firm of Brown, Boveri & Company, died at his home at Baden, Switzerland, on Oct. 28. The immediate cause of his death was a heart lesion which he suffered in September. Doctor Boveri had actually never recovered from an automobile accident which he met with in August, 1922.

Doctor Boveri was a man of charming personality and one who never knew what it was to be confounded by any obstacle. He had many friends in the United States as well as in all the countries of Europe. He was an honorary citizen of the town of Baden and a member of many electrical and scientific societies.

Doctor Boveri acted as president of Brown, Boveri & Company from the inception of the company to his death. He was never a designing engineer. He was best known as an organizer and was a deep student of economics, but he did play a very important part in the development of the mercury-vapor rectifier as applied to electric railways, both tramway and trunk line, now coming into fairly wide use in Germany. He was primarily responsible for the creation of the associated companies with factories at various places in the eight countries and with affiliated sales agencies in virtually every country in the world.

Dr. Walter Boveri

Walter Boveri was born in Bamberg, Bavaria, in 1865, of Italian-Swiss parentage. He attended the industrial school at Nürnberg and after completing his studies there entered the services of the Oerlikon Machine Works, where he was chiefly in charge of installation work. In 1890 he left the Oerlikon works and with the elder Charles Brown, who was chief designer at Oerlikon, started the plant at Baden, which has since developed to be one of the best-known electrical manufacturing concerns in the world. The firm was founded as a purely electrical manufacturing concern with the modest

capital of about $120,000. As early as 1892 it added mechanical products to its line.

In 1916 the Federal Technical High School of Zürich bestowed a diploma conferring the degree of doctor of engineering science upon Mr. Boveri "in acknowledgment of his great merits in the development of electricity in general and the Swiss electrical industry in particular."

Henry Procter Waugh, well known in newspaper life in New York for 20 years, died, on Nov. 12, after an operation for cancer of the throat. For many years Mr. Waugh had been publicity director of the Interborough Rapid Transit Company and editor of both the *Interborough Bulletin* and the *New York Railways Magazine*, published in the interest of the employees of those companies. He came to New York 25 years ago from the South, where he had worked on his home town paper in Morristown, Tenn. His newspaper experience also included a period on the *Courier-Journal*. Starting in New York as a reporter on the *World*, he remained with that paper for 12 years, finally becoming assistant city editor. He went with the Interborough in March, 1909. He was 50 years of age.

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

Public Service Will Buy 100 New Buses

The intention of the Public Service Transportation Company, a subsidiary of Public Service Railway, to purchase 100 new buses has just been announced by officials of the company. Conferences have been held between M. R. Boylan, vice-president and general manager of the railway, and representatives of various bus makers. Specifications for the new buses have not yet been made public, but it is understood that the railway wishes to include certain special features in the design. Quick delivery is very much desired.

Tentative permission to proceed with plans to buy the new buses has been given to the operating officials of the railway by Thomas N. McCarter, president. Final approval of the move is expected to be given at the next meeting of the board of directors of the corporation.

The large scale operations of the company in the purchase of existing buses during recent months have placed it in possession of many vehicles of antiquated design. It is the desire to replace these by modern buses at the earliest possible moment. Pending the deliveries of those now being negotiated for, the railway is making efforts to borrow buses from other cities.

New Company to Finance Bus Purchases

The directors of White Motor Company have organized White Motor Securities Corporation to increase facilities for financing time sales of White trucks and buses. The new company will have an authorized capital of $5,000,000. Walter C. White, president of White Motor Company, said heretofore the White Company had financed all of its customers' paper through its own resources without any rediscounting. However, the large increase in purchases by railroads and other transportation as well as a general increase in time sales makes it advisable for White Motor Company to anticipate requirements for additional facilities for financing such sales without impairing working capital. The new company will provide such facilities at the lowest possible cost to customers and will enable the company to take advantage of desirable business.

New York Railways Awards Oil Contract

An important electric railway lubricating contract was closed Nov. 8 when the business of supplying oil for the entire lubricating requirements of the New York Railways was awarded to the Texas Company.

The New York Railways operates 1,593 motor passenger cars over 72.43 miles of route in Greater New York. The contract with the Texas Company does not include oil for use in power stations as the railway purchases its energy from the Interborough Rapid Transit Company. The contract became effective on Nov. 1.

Bids Asked for New Carhouse at Grand Rapids

The Grand Rapids Railway, Grand Rapids, Mich., will rebuild the carhouse destroyed by fire on July 19, 1924, under plans by Williams, Crow & Proctor, Grand Rapids architects. When estimates have been obtained the company will be prepared to proceed with construction.

The new building will consist of two units. One, 16 ft. by 30 ft., will be an office building with two stories and basement. It will have a general office and cashier's office on the first floor, foreman's office and men's quarters on the second and a heating plant in the basement.

The other unit will include the car inspection shop and car washroom, with boiler room and a substation, the larger building being 38 ft. by 224 ft. and the substation 16 ft. by 65 ft. The present substation, 22 ft. by 33 ft., will be used for storage of sand and salt. The car inspection building will cover three tracks. Cars not in need of attention will be stored in the open.

The car inspection building will be one story and of brick construction like the other buildings now in use. It will include space for storage, heating plant, coal for the cars, oils and tool room.

Formation of a Court of Commerce Suggested

Bernard M. Baruch, former head of the War Industries Board, reviewing business conditions and their relationship to government, has suggested the formation of a Court of Commerce, which would decide for business men important questions that might confront them. This court, he said, would differ from the Federal Trade Commission, which he termed an "inquisitorial body," and would appeal to the business man as the Supreme Court does to the lawyer. Mr. Baruch made his suggestion at the Waldorf-Astoria at the fifth annual luncheon reunion of the former members of the War Industries Board.

He said that the country must soon determine what to do with great aggregations of capital. By encouraging them will it be made more difficult for individuals to start a business and cause them to enter the service of these great corporations in order to make a livelihood and career for themselves? He said in part:

> What shall be the attitude of government toward business? During the war we built up great combinations of industry, some of which have remained in the form of associations. These are capable of great good and possibly great harm. A grave question is. Shall the Sherman anti-trust law prevent such great combinations and associations, or shall business be permitted to combine for better production and distribution, thereby cheapening both and resulting in lower prices for the consumer; and if they are permitted to function, what regulatory or supervisory power should be exercised? These combinations, by their mass production, increase the standard of living by placing in the hands of the greatest number of people many of the things which they need.
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> One of the ideas that we discussed among ourselves was the establishment of a Court of Commerce, before which business men would come with such questions as whether in time of overproduction and low prices they could cut down production and fix a price. If it were possible to establish such a court to say what could and what could not be done, instead of an inquisitorial body like the Federal Trade Commission, would it not appeal as much to the business man as the Supreme Court to the lawyer? Broadly, this court would encourage such practices of co-operation and co-ordination in industry as would be found to be clearly of public benefit, but it should watch against abuses.

Metal, Coal and Material Prices

Metals—New York	Nov. 11, 1924
Copper, electrolytic, cents per lb.	13.625
Copper wire base, cents per lb.	16.25
Lead, cents per lb.	8.65
Zinc, cents per lb.	6.762
Tin, Straits, cents per lb.	54.375
Bituminous Coal f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.325
Somerset mine run, Boston, net tons	2.175
Pittsburgh mine run, Pittsburgh, net tons	1.875
Franklin, Ill., screenings, Chicago, net tons	1.375
Central, Ill., screenings, Chicago, net tons	1.275
Kansas screenings, Kansas City, net tons	2.00
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$5.25
Weatherproof wire base, N. Y., cents per lb.	17.75
Cement, Chicago net prices, without bags	2.20
Linseed oil (5-lb. lots), N. Y., per gal.	1.14
White lead, in oil (100-lb. keg), N. Y., cents per lb., carload lots	0.152
Turpentine (bbl. lots), N. Y., per gal.	0.875

Rolling Stock

Brooklyn City Railroad will probably place the order for its new cars, which has previously been referred to in this paper, some time during the week ended Nov. 22. The order will comprise 335 new double-truck four-motor cars very similar in type to the 250 purchased last year. This order will call for an expenditure of more than $5,000,000.

Illinois Central Railroad, Chicago, Ill., it was reported on Nov. 10 was holding up temporarily the matter of the awards for the 250 new multiple-unit cars to be supplied to it for use in its terminal electrification project, but the opinion was expressed that the delay was a matter of only a few days. Specifications for the new cars were sent out early in September. Meanwhile, of course, announcement is delayed with respect to the probable award of contracts for the electrical equipment.

New York, Westchester & Boston Railway, New York, expects that the first of its 10 new all steel cars will be delivered at the Van Nest Shops about Nov. 18. The cars were built by the Pressed Steel Car Company and the first shipment was made on Nov. 5. The new car is 72 ft. 7¼ in. long, weighs 120,000 lb. and has a seating capacity of 80. The cars are equipped for multiple-unit operation at high speed. Dimensions and details of the equipment follow:

Type of car	Vestibuled Passenger
Weight:	
Car body	77,500 lb.
Motor truck	16,620 lb.
Trailer truck	12,580 lb.
Equipment	13,300 lb.
Total	120,000 lb.
Bolster centers, length	47 ft. 7½ in.
Length over all	72 ft. 7½ in.
Truck wheelbase	8 ft. 0 in.
Width over all	10 ft. 4 in.
Height, rail to trolley base	14 ft., 5 in.
Body	All steel
Interior trim	Agasote
Headlining	Agasote
Roof	Arch
Air brakes	Westinghouse
Armature bearings	Bronze
Axles	Standard Steel Works
Buffers	Pullman
Car signal system	Westinghouse conductor's whistle
Car trimmings	James L. Howard & Co.
Center and side bearings	Perry
Conduits and junction boxes	Westinghouse
Control	Westinghouse
Curtain fixtures	Morton Manufacturing Co.
Curtain material	Fabrikold
Destination signs	Ellcon
Door-operating mechanism	National Pneumatic
Draft gear	Pitt-Forsyth
Gears and pinions	Nuttall BP pinion and flexible gear
Hand brakes	Blackall
Heater equipment	Gold
Headlights	Golden Glow
Journal bearings	Bronze
Journal boxes	Symington—5½ in. x 10 in.
Motors	Westinghouse 409-B, inside hung
Paint	Veluvine enamel
Sash fixtures	O. M. Edwards
Seats	Heywood-Wakefield
Seating material	Pantasote
Slack adjuster	Westinghouse Type L
Springs	Semi-elliptic
Step treads	Kass safety
Pantograph	Nuttall U. S. No. 131
Pantograph shoe	No. 14 gage steel
Trucks	Pressed Steel Car Company
Ventilators	Garland
Wheels:	
Motor truck	42-in. steel tired
Trailer truck	36-in. rolled steel

Grand Rapids Railway, Grand Rapids, Mich., plans to conduct a comparative test this winter of light-weight noiseless electric street cars, St. Louis and Brill cars. Last July the company lost 65 cars by fire, and since then has been reported to be in the market for 30 cars of the one-man, two-man type.

South Carolina Gas & Electric Company, Spartanburg, S. C., has received the first of the four new buses recently ordered by it for operation in the city supplementary to the street car lines. The vehicle has a seating capacity of 22 persons. It is of Dodge-Graham make. Three more vehicles of the same size and type are expected soon.

Track and Line

Spokane United Railways, Spokane, Wash., has been doing repair work on Sprague Avenue and on the Rockwood line. New ties have been put in, curves have been rebuilt and broken rails cut out. At Hamilton and Baldwin Streets new frogs have been installed and the track structure has been rebuilt.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has completed the construction of the eight-block extension of the Center Street line bridging the gap between Twenty-seventh Street and Thirty-fifth Street. The extension required an expenditure of approximately $100,000. It covers 2,700 ft. of trackage, 2,440 ft. of double track and 260 ft. of single track, the latter to be double tracked when grade crossing improvements are under way by the railroad which crosses this line.

Key System Transit Company, Oakland, Cal., has started reconstructing track and laying permanent pavement on West Twelfth Street at a cost of $103,000. The extension of the Lakeshore line on Walla Vista Avenue a distance of 1,787 ft. east will cost $25,000.

Stockton Electric Railroad, Stockton, Cal., will build a half mile double track extension to the College of the Pacific. General Manager Webster has secured an appropriation of $40,000 for the extension and work will start as soon as rights of way are secured and the franchise granted by the City Council.

Coral Gables Utilities Company, Miami, Fla., has been granted a 25-year franchise to build and operate a railway. Work on the new line, which will be approximately 3½ miles long, is to be started immediately. The estimated cost is $150,000. The downtown and city portion of the line will operate over municipal tracks and over tracks owned by the Coral Gables Utilities Company for the remainder of the distance. It is said that an arrangement has been made with the Florida Power & Light Company, lessee of the municipal traction line for using the tracks and furnishing power.

Dallas Railway, Dallas, Tex., celebrated recently the opening of the Southwest Oak Cliff route and the completion of the Hampton Place car line, an extension of about 2 miles from Tyler Street and Jefferson Avenue in Dallas, Tex. The extension has been completed at a cost of $136,000, a portion of which was borne by the Dallas Railway and the remainder by the Moss-Tate Investment Company.

Trade Notes

Heine Boiler Company, Inc., St. Louis, Mo., announces that R. C. Broach, formerly in the general sales department at St. Louis, has been appointed its southeastern district manager, with offices in the Glenn Building, Atlanta, Ga. S. B. Alexander will continue as special representative in North and South Carolina.

Gibb Instrument Company, Bay City, Mich., manufacturers of electric welding and electric heating equipment, announces the appointment of H. V. Beronius to represent it in Iowa, Kansas, Nebraska, Oklahoma and northwestern Missouri. His headquarters will be 33 Linwood Terrace, Kansas City, Mo.

Fuller-Lehigh Company, New York, N. Y., has entered into an agreement with Babcock & Wilcox, Ltd., of London, to operate under the Fuller-Lehigh Company patents, whereby everything in connection with its pulverized coal business will be handled in the various countries throughout the world by Babcock & Wilcox, Ltd., of London, with the exception of the United States, its dependencies, Canada and Mexico. Babcock & Wilcox, Ltd., has taken over a large number of the members of the Fuller organization who have specialized for years in work of this kind.

Globe Electric Supply Company, Denver, Col., has been appointed district representative for the Kuhlman Electric Company of Bay City, Mich. The territory involved includes the states of Wyoming, Colorado and New Mexico. The Kuhlman company expects to have a stock of transformers placed shortly with this new representative.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., will complete about Dec. 1 the $2,000,000 annex to its plant at Lester, Pa. The new plant, now partly in operation, is known as the turbine blading shop. Work upon the structure was begun last spring. Two buildings of steel, hollow tile and concrete and covering more than a city block are included in the new unit.

New Advertising Literature

Rail Welding & Bonding Company, Cleveland, Ohio, has issued Bulletin No. 112, covering Una Rod 300. The bulletin states "Una Rod 300 welds as easily as a low carbon steel and deposits a pad of clean high carbon metal as hard as the rail."

Triumph Electric Company, Cincinnati, Ohio, has issued a bulletin on the TR self-start motor.

Walter A. Zelnicker Supply Company, St. Louis, Mo., has issued Bulletin No. 329, listing information on locomotive equipment, rail material and power plant and contractors' machinery.

General Electric Company, Schenectady, N. Y., has issued a 27-page bulletin, designated as No. 47731, on automatic station control equipment. It describes briefly the uses and advantages of this type of equipment and is well illustrated.

Here's the test!

Try this on your cars!

Slack off the brake shoes until full piston travel is required to set brake.

Release air brakes.

Then try to set hand brake!

Will it hold?

That's the test which proves the point. Unless the hand brake holds when the piston travel exceeds say 5½ inches, it's useless to struggle with it. Yet there are thousands of cars operating every day the brakes of which cannot meet this simple test of safety. Are any of your cars like this?

PEACOCK STAFFLESS BRAKES will always pass this safety test—

Their unequalled facility for winding in almost any length of chain enables Peacock Staffless Brakes to overcome any condition of excessive piston travel, slack brake shoes or the like, and actually make a powerful brake application. This is a guarantee of safety which you cannot afford to overlook.

National Brake Co., Inc.

890 Ellicott Sq., Buffalo, N. Y.

Canadian Representatives:

Lyman Tube & Supply Company, Limited. Montreal. Canada

Bankers and Engineers

LUMNITE CEMENT

Defies Cold Weather

Spaces between and along trolley tracks on the Boston Post Road at Darien, Conn. Eighteen hours after pouring, the pavement was opened to traffic, including heavy commercial trucks. Had ordinary concrete been used, weeks would have been lost

Columbia University Laboratory, in a test of Lumnite Cement under freezing conditions, placed cylinders of 1-2-4 Lumnite Cement concrete, immediately after mixing, in a refrigerator, the temperature of which was below freezing.

After being kept in the refrigerator for twenty-four hours and then thawed, the cylinders showed compressive strength of 2348 pounds to the square inch. Cylinders kept in the refrigerator for twenty-eight days showed compressive strength of 3315 pounds to the square inch.

THE speed possible with Atlas Lumnite Cement will insure the completion of your concrete work before freezing weather.

It can also be used at much lower temperature than other building cements.

For work that must be done in cold weather, Lumnite has the additional advantage that it can be used in much colder weather than other cements. It is less subject to injury from frost for two reasons:

First, the early hardening of Lumnite Cement brings the concrete, in a few hours, to a point in its curing beyond the danger of frost attack.

Second, this rapid hardening, a chemical action, produces in Lumnite Cement concrete very considerable heat. This is an additional insurance against the attack of frost.

Atlas Lumnite Cement makes *twenty-eight-day concrete in twenty-four hours* without the use of artificial accelerators. Lumnite Cement, because of its principal ingredient, obtained from high-grade aluminum ore, Bauxite, develops at twenty-four hours greater strength than that developed by other building cements at twenty-eight days.

The early completion, now, of your job, through the use of Lumnite, may effect big economies in time and money.

Whatever your construction problem, you should investigate the big savings Lumnite can make for you.

THE ATLAS LUMNITE CEMENT CO.

25 *Broadway*, NEW YORK CITY

Brown-Marx Bldg., Birmingham 134 S. LaSalle St., Chicago

N. E. R. R. J.

SEND THIS COUPON TODAY

Please send your booklet on Lumnite, also detailed information on Lumnite's use for_____

*Name*_____

*Address*_____

THE ATLAS LUMNITE CEMENT COMPANY — ATLAS LUMNITE CEMENT — NEW YORK, N.Y.

Keeps the Repair Shops Busy

A BLOW is as great a shock to the hammer as to the object struck. In street railway operation, the track is the anvil—the rolling stock the hammer. Since shock works both ways, it destroys the rolling stock no less than the track.

And there you have the reason for much of the repair to rolling stock. Little, perhaps, does the repair shop foreman realize that the track is to blame for so much of the work he has to do. In other words, the condition of the track largely determines the amount of rolling stock repair. Sagging joints and uneven track soon knock rolling stock to pieces. Rigid track is no less harmful.

Only by cushioning the shock of traffic can you eliminate this costly evil.

Resilient track construction is what is required to overcome the destructive effects of shock. Resiliency is now recognized as the one indispensable requisite for efficient tracks.

There you have the reason why the use of Dayton Resilient Track is increasing so rapidly. More of it will be laid this year than ever before in its history.

Write us for any further information desired.

The Dayton Mechanical Tie Co.

707 Commercial Building, Dayton, Ohio

Resilient TIE

Cushions the Shock On Rolling Stock

If you did not attend the Convention

THERE was never an idle minute at the exhibit of SAFEWAY Six Wheel Coaches at the A. E. R. A. Convention. Day after day it was the center of an enthusiastic audience of transportation men and railway officials. Close observation of the SAFEWAY chassis in actual operation and a brief explanation of SAFEWAY engineering features demonstrated to these men that a new era in motor transportation had been born.

This quick and ready conviction is not to be wondered at. It is due to the work of railway engineers that four wheel rail equipment is now obsolete. These men immediately recognized the advantages of more wheels for heavy duty motor vehicles—they needed no prophet to predict the early arrival of the day when four wheel motor trucks and passenger coaches will be as antiquated as four wheel railway coaches.

If you did not see the SAFEWAY Six Wheel exhibit at Atlantic City, you missed the demonstration of a development in modern transportation which is of the utmost importance to the future of your business.

The SAFEWAY story is told completely in a catalog now ready for distribution. We shall be glad to mail this catalog to any interested, responsible person upon request.

THE SAFEWAY SIX-WHEELER

Made by the Six Wheel Company, 1800 W. Lehigh Avenue, Phila., Penna.

Tune in on the weekly programs from STATION CCH

THIS is Station CCH, — the Consolidated Car-Heating Company, broadcasting the announcement of a series of weekly programs of vital interest to the electric railway industry, direct from its factory at Albany. This station is operating on a wave length of 100 per cent satisfaction.

For years, Consolidated Devices have been steadily building a reputation in the electric railway field for car comfort, car safety and car efficiency.

Just as Albany is recognized as headquarters of government for the Empire State, so is the Consolidated plant, located in the Capital City recognized as headquarters for devices that contribute to car service.

Each week, Station CCH will broadcast in *Electric Railway Journal,* interesting points regarding Consolidated Devices—

Electric Car Heaters and Control

Pneumatic Door Operating Equipment

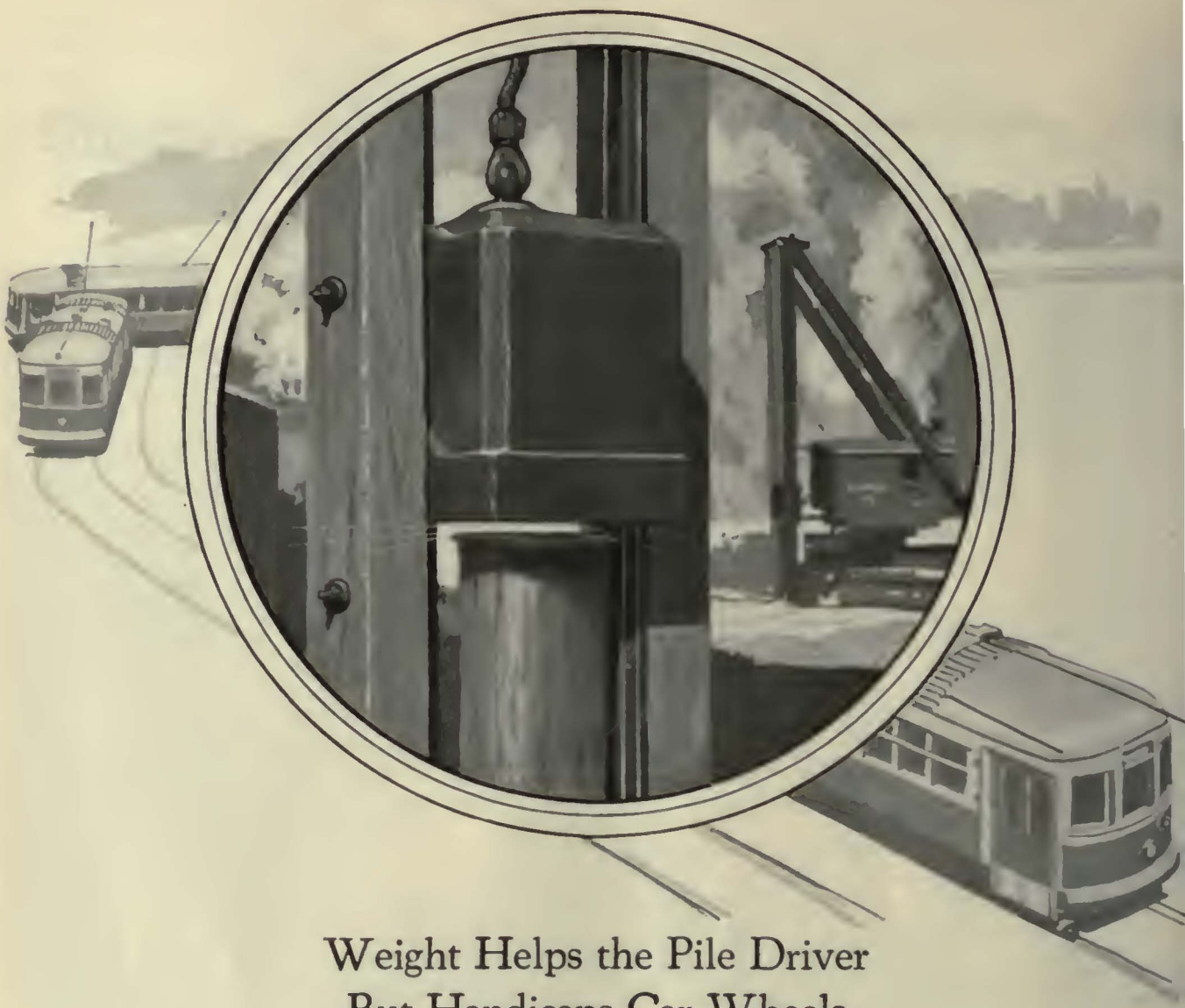
Car Signaling Devices

Tune in on the weekly programs.

CONSOLIDATED DEVICES

CONSOLIDATED CAR-HEATING COMPANY

New York ALBANY Chicago



Weight Helps the Pile Driver But Handicaps Car Wheels

WEIGHT is all right in a pile driver, but why move a heavy weight unless you are going to hit something with it?

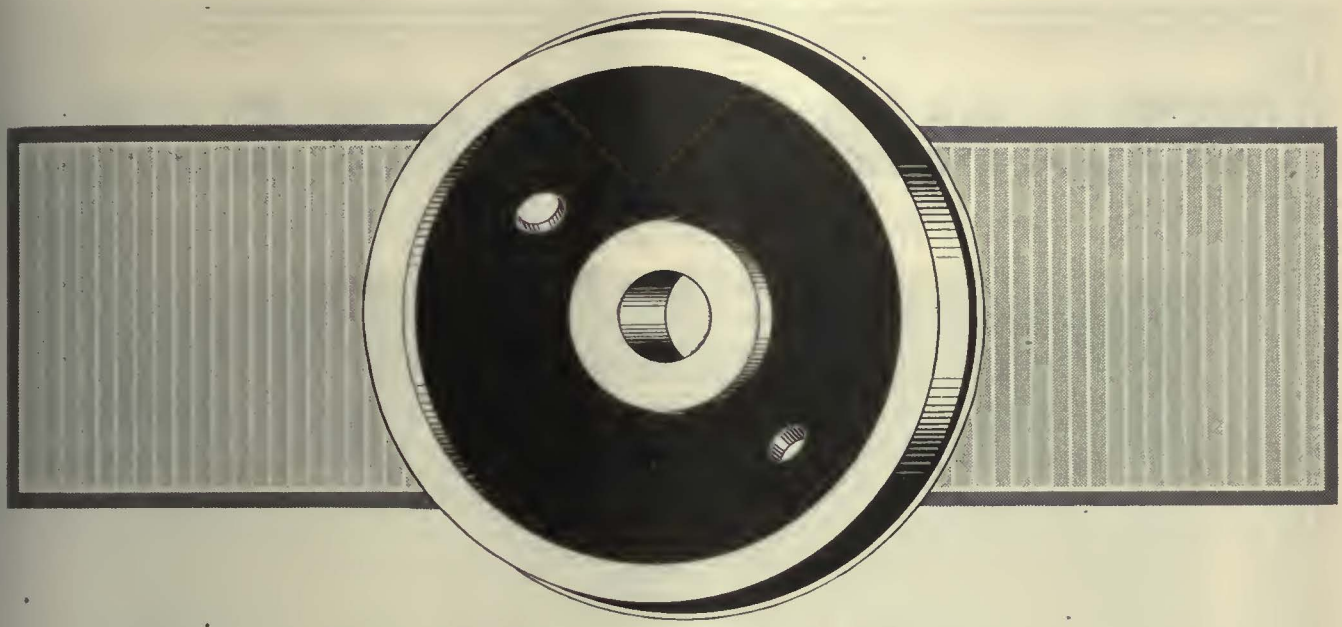
Weight in an electric railway car costs money to haul around.

To secure the stronger wheels demanded by modern service conditions it is unnecessary to go to heavier wheels.

Davis "One Wear" Steel Wheels are made from a tough, high manganese steel, superhardened by heat treatment, thus providing unequalled resistance to impact loads and permitting the safe use of a far lighter wheel.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS



Quieter Operation of Street Railways Is Being Demanded

THE insistent demand of many communities for the quieter operation of street railways necessitates the equipment of cars with wheels of the highest grade which will not readily develop flat spots.

Cambria Rolled Steel Car Wheels—made at the Cambria Plant of Bethlehem Steel Company at Johnstown, Pa., will satisfy this demand in every respect.

They are made by a combination forging and rolling process at the proper temperature, which builds up an outside skin on the wheel tread and gives it a much longer wearing surface, thus adding materially to the life of the wheel.

Wheels are sized in solid dies to eliminate all eccentricity and flat spots, which insures quiet operation and maximum mileage.

A large quantity of rolled steel wheels are regularly carried in stock to facilitate deliveries. These wheels are of standard sizes and can be bored to meet customers' requirements.

Cambria Forged Axles for Street, Interurban, Subway and Elevated cars and armature shafts for electric service are made in the Axle Plant at the same works to meet any reasonable specification: treated or untreated; solid or hollow bored; smooth forged only; rough turned all over; or rough turned on journals and wheel seats.

Specify Cambria Rolled Steel Car Wheels and Forged Axles on your next order.

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

Sales Offices:

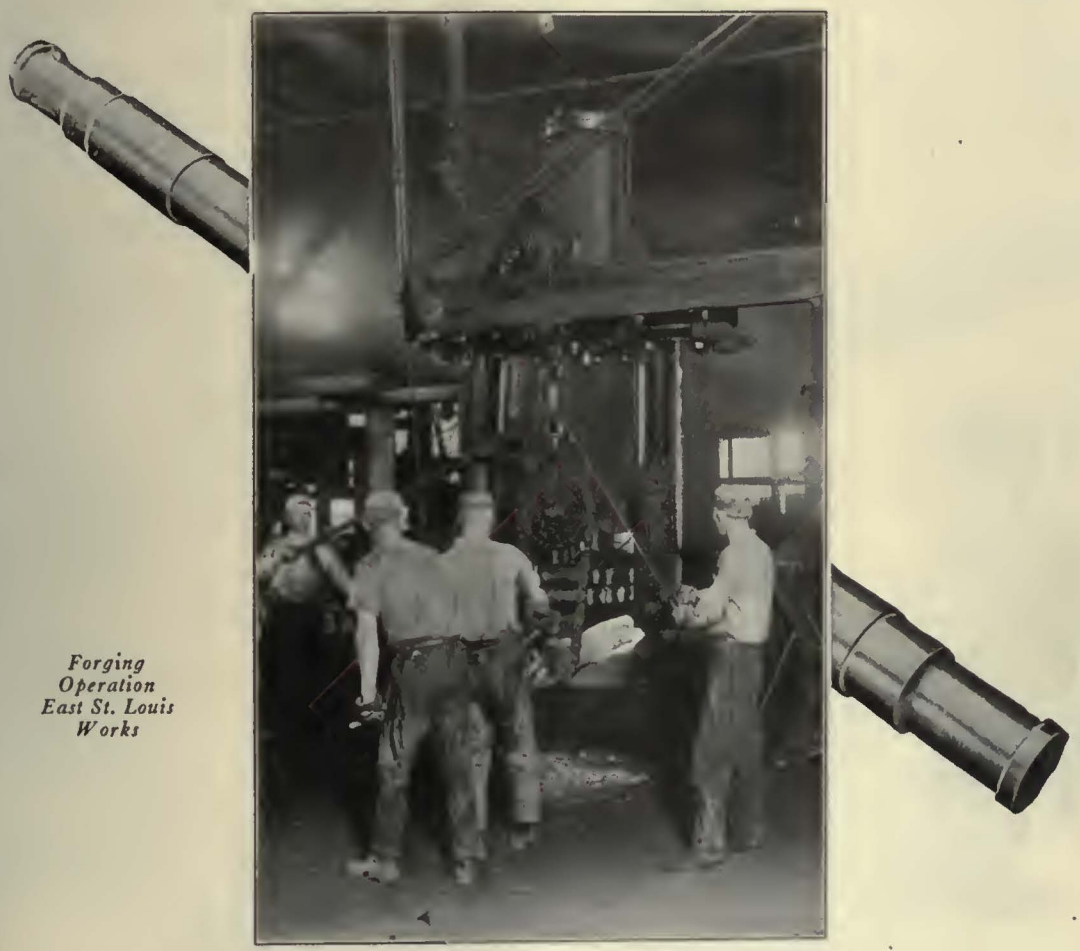
New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh
Buffalo Cleveland Detroit Cincinnati Chicago St. Louis San Francisco

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

BETHLEHEM

LACLEDE *Heat-Treated* AXLES

TRADE **VALSCO** MARK



Forging Operation East St. Louis Works

Heat-treated axles insure economy. In Valsco axles an interesting story has been built around competent experts, latest type of equipment and scientific procedure. Valsco axles mean profitable investment and afford the desirable degree of safety.

LACLEDE STEEL CO.

Works:
Alton, Illinois
Madison, Illinois
East St. Louis, Illinois

General Offices:
ARCADE BLDG., ST. LOUIS

District Offices:
Chicago, Illinois
Kansas City, Mo.
Detroit, Mich.

Help 100,000 Destitute Children on "Golden Rule Sunday"

On Sunday, December 7th, there will be a world-wide observance of the Golden Rule—

"Whatsoever ye would that men should do to you, do ye even so to them."

The thousands of people who observe Golden Rule Sunday will eat on that day a meal of soup, bread, stewed fruit and cocoa. As they eat that simple meal, they will put themselves in the place of the thousands of orphan children who lack even such food. These men and women will remember the Golden Rule and give their contributions to buy food for the 100,000 hungry children in the Near East—fatherless, homeless and destitute children in Greece, Syria, Palestine and Armenia.

The lasting joy that comes from a simple act of kindness—an observance of the Golden Rule—can be yours, too. Every dollar you give to the Near East will buy twenty dinners of soup, bread, rice and cocoa for the Near East orphans. And $100 a year will feed, clothe and educate one of these children.

Remember the Golden Rule on Sunday, December 7th

Remittance Form for Use on Monday, December 8th

To CLEVELAND H. DODGE, *Treasurer,*
Near East Relief, 151 Fifth Avenue, New York City

To help one of the orphaned children in the Near East under your care, I enclose $.....

NAME .....

ADDRESS .....

Quality

The first consideration for good economical street car operation must be quality of equipment. Years ago More-Jones products successfully demonstrated that one of their features was fine quality—and this feature has come to be a characteristic one. Buyers of street car equipment think of More-Jones in terms of quality. Make a test of what this quality means in your service and specify More-Jones products the next time you order.

Further information and prices on application

MORE-JONES BRASS & METAL CO.
St. Louis, Mo.

"Tiger" Bronze Axle and Armature Bearings

Their exceptional toughness and high anti-frictional qualities insure great strength and slow, even rate of wear.

M-J Armature Babbitt

—for railway armature bearings, scientifically compounded of pure new tin, copper, antimony and metallic nickel—no lead. Lasts much longer, and guaranteed most economical.

M-J Lubricated and V-K Oilless Trolley Wheels and Non-Arcing Harps

The pure, new metal used in the wheels is exceedingly tough, yet does not grind away the metal of the wire. Perfect lubrication is accomplished automatically.

MORE-JONES QUALITY PRODUCTS

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

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

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

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

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

DISPLAYED—RATE PER INCH:

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

Rates for larger spaces, or yearly rates, on request.

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

E.F.J.

POSITION VACANT

ELECTRIC tramway superintendent wanted for West Indies. Excellent living conditions, delightful climate, good pay. Position suitable for young man with professional training and practical experience. P-751, Elec. Ry. Journal, 10th Ave. at 36th St., New York.

POSITIONS WANTED

AUDITOR or assistant. Twenty years' experience in electric light, power and railways. At present employed but desire to make change. PW-750, Elec. Ry. Journal, Leader-News Bldg., Cleveland, Ohio.

EXECUTIVE. Urban and interurban. Wide successful experience in all departments of construction and operation. PW-740, Electric Railway Journal, Leader-News Bldg., Cleveland, Ohio.

EXPERIENCED operating man, now employed, desires change. Technical graduate, forty-one years of age, sixteen years' experience covering all branches of electric railway operation, eight years in the transportation end, with large railway company in the east. Best of references from men high in electric railway field. Desire to connect with company where ability can be demonstrated and where there is opportunity for advancement. PW-747, Electric Railway Journal, 10th Ave. at 36th St., New York.

When Writing Your Ad

Provide an indexing or subject word.

Write it as the first word of your ad.

If it is a Position Wanted or Position Vacant ad, make the first word the kind of position sought or offered.

This will assure proper classification in the column.

The right is reserved to reject, revise or properly classify all Want Advertisements.

Proper Classification

increases the possibility of

Prompt Returns

0301

In Small Lots As Well As Large

THERE is a class of rail buyers, occasionally in need of only small tonnages, who are paying a premium on their purchases elsewhere because they believe that we do not seek their patronage.

We maintain a large organization to give efficient service on small orders. Our tremendous volume gives us unequaled buying power and saves our clients money regardless of the tonnage required.

Immense stocks at strategic distributing points provide complete assortments near you. This adds a saving in freight to our already unbeatable prices.

Next time you need rails, let us know your requirements.

We guarantee the same prompt, efficient service to all.

HYMAN-MICHAELS COMPANY

"The House of Dependable Service"

122 South Michigan Avenue, Chicago

Dealers in New and Relaying Rails, Locomotives and Railway Equipment

District Offices: New York, Woolworth Bldg.; St. Louis, Railway Exchange Bldg.; Pittsburgh, First Nat'l Bank Bldg.; San Francisco, 234 Steuart St.

Yards: St. Louis, East Chicago, Ind., McKee's Rocks, Pa., San Francisco.

Cable Address: "Hymanmikel"

World's Largest Distributors of Rails

WANTED

SEVERAL RAILS

Second Hand

Lorain Steel Company's section 90, No. 317.

ROME RAILWAY & LIGHT COMPANY
Rome, Georgia

WE WANT TO BUY

30—West. 306-C.V.-4

MOTORS

Have you any to offer?

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

NEW GEARS, PINIONS AND GEAR CASES FOR SALE

GE-1000 Motor:
173 15 tooth pinions
107 69 tooth gears
16 Sheet iron gear cases

GE-800 Motor:
4 malleable gear cases and 3 bottom halves

FS-749, Electric Railway Journal
10th Ave. at 36th St., New York City

RAILS

New 1 TON or 1000 **Relaying**

FROGS
SWITCHES
SPLICE BARS
BOLTS
NUTS
TIE PLATES
RAIL
BRACES

All Rails and Track Materials shipped subject to inspection and approval at destination.

L. B. Foster Co.

PITTSBURGH-PA
NEW YORK

L.B.F.CO.

FOR SALE

MOTORS

18—G.E. 264; practically new.

TRANSIT EQUIPMENT COMPANY
501 Fifth Ave., New York

WHAT AND WHERE TO BUY

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

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

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

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

Armature Shop Tools
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Johnson & Co., J. R.
St. Louis Car Co.
Standard Steel Works

Axles, Steel
Carnegie Steel Co.
Laclede Steel Co.

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

Bearings and Bearing Metals
Bemis Car Truck Co.
General Electric Co.
More-Jones Brass & Metal Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Stucki Co., A.

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

Boilers
Babcock & Wilcox Co.

Bond Testers
Amer. Steel & Wire Co
Elec. Service Supplies Co.

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

Bonds, Rail
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.
Westinghouse E. & M. 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.

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

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

Brakes, Brake Systems and Brake Parts
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.

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

Brush Holders
D. R. Flower

Brushes, Wire, Pneumatic
Ingersoll-Rand Co.

Bulkheads
Haskelite Mfg. Co.

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

Bus Seats
Hale-Kilburn Co.
Heywood-Wakefield 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
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.

Car Steps Safety
Irving Iron Works

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
Anderson Mfg. Co., A. & J. M.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
American Steel Foundries
Bemis Car Truck Co.
St. Louis Car Co
Standard Steel Works

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

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

Catenary Construction
Archbold-Brady Co.

Cement Products
Atlas Lumnite Co.

Change Carriers
Cleveland Fare Box Co.

Circuit-Breakers
Anderson A. & J. M., Mfg. Co.
General Electric Co
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
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.

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
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 & Spliceing)
Johns-Manville, Inc.

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

Compressors, Air Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compressors, Gas
Sullivan Machinery Co.

Concrete Flooring Surface
Irving Iron Works

Concrete Reinforcing Bars
Laclede Steel Co.

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

Condenser Papers
Irvington Varnish & Ins. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
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
Columbia M. W. & M. I. Co.

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

Cranes
Allis-Chalmers Mfg. Co.
Industrial Works

Cranes, Gas or Electric
Industrial Works

Cranes, Locomotive, Motor Truck & Portable
Industrial Works

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.
St. Louis Car Co.

Dealer's Machinery
Elec. Equipment Co.
Hyman-Michaels 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.
General Electric Co.
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.

Drills, Rock
Sullivan Machinery Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.

Ears
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.

Ebony Asbestos Wood
Johns-Manville, Inc.

Electrical Wires and Cables
Amer. Electrical Works
Roebling's Sons & Co., J. A.

Electric Grinders
Railway Track-work Co.
Rail Welding & Bonding Co.

Electrodes, Carbon
Railway Track-work Co.

Electrodes, Steel
Railway Track-work Co.

Engineers, Consulting, Contracting and Operating
Allison & Co., J. S.
Archbold-Brady Co.
Beeler, John A.
Buchanan & Layng Corp.
Bureau of Comm. Economics, Inc.
Byllesby & Co., H. M.
Day & Zimmermann, Inc.
Drum & Co., A. L.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Ong, Joe R.
Railway Audit & Inspection Co.
Richey, Albert S.
Robinson & Co., D. P.
Sanderson & Porter
Stevens & Wood, Inc.
Stone & Webster
White Eng. Corp., The J. G

Engines, Gas, Oil or Steam
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Exterior Side Panels
Haskelite Mfg. Co.

Fare Boxes
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Ry. Appliance Co

Fences, Woven Wire and Fence Posts
Amer. Steel & Wire Co.
Cyclone Fence Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Consolidated Car Fender Co
Elec. Service Supplies Co
St. Louis Car Co.
Star Brass Works

Fibre and Fibre Tubing
Johns-Manville, Inc.
Westinghouse E. & M. Co

Field Coils (See Coils)

Fire Extinguishers
Johns-Manville, Inc.

Flaxlinum Insulation
Nat'l Ry. Appliance Co.

Floodlights
Elec. Service Supplies Co.

Flooring Composition
Johns-Manville, Inc.

Flooring, Fireproof
Irving Iron Works

Flooring, Non-Slipping
Irving Iron Works

Flooring, Open Steel
Irving Iron Works

Flooring, Steel Subway
Irving Iron Works

Flooring, Ventilating
Irving Iron Works

Forgings
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Ramapo Ajax Corp

Frogs, Track (See Track Work)

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

Fuses, Cartridge, Non-Refillable and High Voltage
Johns-Pratt Co.

Fuses, Cartridge, Refillable
Johns-Pratt Co.

Fuses and Fuse Boxes
General Electric Co.
Westinghouse E. & M. Co.

Fuses, Refillable
General Electric Co.

Gaskets
Johns-Manville, Inc
Westinghouse Tr. Br. Co.

Gas-Electric Cars
General Electric Co.

Gas Producers
Westinghouse E. & M. Co

Gates, Car
Brill Co., The J. G.
St. Louis Car Co.

Gear Blanks
Bethlehem Steel Co.
Standard Steel Wks. Co.

Gear Cases
Chillingworth Mfg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.
Nuttall Co., R. D.
Tool Steel Gear & Pinion Co.

Generating Sets, Gas-Electric
General Electric Co.

Generators
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Goog (See Bells and Gongs)

Grating, Steel Subway
Irving Iron Works

Greases (See Lubricants)

Grinders and Grind. Supplies
Railway Track-work Co.

Grinders, Portable
Buda Company
Railway Track-work Co

Grinders, Portable Electric
Railway Track-work Co

Grinding Blocks and Wheels
Railway Track-work Co.

Ground Wires
Page Steel & Wire Co.

Guard Rail Clamps
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.

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

Hammers, Pneumatic
Ingersoll-Rand Co.

Harps, Trolley
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D. & Co.
Star Brass Works
Thornton Trolley Wheel Co

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
St. Louis Car Co.

Headlining
Haskelite Mfg. Co.
Panelyte Co.

Heaters, Bus
N. A. Petry Co., Inc.

Heaters, Car (Electric)
Gold Car Heat. & Light. Co.
Nat'l Ry. Appliance Co.
Smith Heater Co., Peter

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

Helmets—Welding
Railway Track-work Co.

Hoists & Lifts
Ford Chain Block Co.

Hoists, Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hydraulic Machinery
Allis-Chalmers Mfg. Co.

Indicating Signals
Oakel Equipment Co.

Industrial Flooring
Johns-Manville, Inc.

Instruments, Measuring, Testing and Recording
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Insulating Cloth, Paper and Tape
General Electric Co
Irvington Varnish & Ins Co
Johns-Manville, Inc.
Mica Insulator Co.
Mitchell-Rand Mfg. Co.
Okonite Co
Stand. Underground Cable Co.
Westinghouse E. & M. Co.

Insulating Silk
Irvington Varnish & Ins. Co.

Insulating Varnishes
Irvington Varnish & Ins. Co

Insulation (See also Paints)
Electric Ry. Equipment Co.
Electric Service Sup. Co.

General Electric Co.
Irvington Varnish & Ins. Co.
Johns-Manville, Inc.
Mica Insulator Co.
Mitchell-Rand Mfg. Co.
Okonite Co.
Westinghouse E. & M. Co.

Insulation Slot
Irvington Varnish & Ins. Co.

Insulators (See also Line Material)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Hemingray Glass Co.
Irvington Varnish & Ins. Co.
Ohio Brass Co
Westinghouse E & M. Co

Insulator Pins
Elec. Service Supplies Co.
Hubbard & Co.

Insulators, High Voltage
Lapp Insulator Co., Inc.

Jacks (See also Cranes, Hoists and Lifts)
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., J. G.
St. Louis Car Co.

Junction Boxes
Std. Underground Cable Co.

Lamps, Guards and Fixtures
Elec. Service Sup. Co.
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Nichols-Lintern Co.

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.)
Archbold-Brady Co.
Columbia M. W. & M. I. Co.
Electric Ry Equipment Co.
Elec. Service Sup. Co.
Hubbard & Co.
Johns-Manville, Inc.
More-Jones Brass & Metal Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locomotives, Electric
General Electric Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.
Westinghouse E. & M. Co.

Locomotives, Oil Engine, Electric Driven
Ingersoll-Rand Co.

Lubricating Engineers
Galena Signal Oil Co.
Standard Oil Co. of Ind.
Universal Lubricating Co.

Lubricants, Oil and Grease
Galena-Signal Oil Co.
Standard Oil Co. of Ind.
Universal Lubricating Co.

Machinery, Insulating
Amer. Insulating Mach. Co.

Manganese Steel Guard Rails
Ramapo Ajax Corp.

Manganese Steel Switches, Frogs & Crossings
Bethlehem Steel Co.
Ramapo Ajax Corp.

Manganese Steel, Special Track Work
Bethlehem Steel Co.

Meters (See Instruments)

Mica
Mica Insulator Co.

Molding, Metal
Allis-Chalmers Mfg. Co.

Motor Buses (See Buses, Motor)

Motors, Electric
Westinghouse E. & M. Co.

Motors and Generator Sets
General Electric Co.

Motormen's Seats
Allis-Chalmers Mfg. Co.
Brill Co., J. G.
Elec. Service Sup. Co.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.
Wood Co., Chas. N.

Nuts and Bolts
Barbour-Stockwell Co.
Bethlehem Steel Co.
Bemis Car Truck Co.
Hubbard & Co.

Oils (See Lubricants)

Omnibuses (See Buses, Motor)

Oxy-Acetylene (See Cutting Apparatus Oxy-Acetylene)

Oxygen
International Oxygen Co.

Packing
Johns-Manville, Inc.

Paints and Varnishes (Insulating)
Mica Insulator Co
Mitchell-Rand Mfg. Co.
National Ry. Appliance Co.

Pavement Breakers
Ingersoll-Rand Co.
Sullivan Machinery Co.

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.

Pins, Wood & Iron
Sharp, Ew. P.

Pipe Fittings
Standard Steel Wks.
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Sup. Co.

Pneumatic Tools
Ingersoll-Rand Co.

Pole Line Hardware
Bethlehem Steel Co.
Ohio Brass Co.

Poles, Metal Street
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.
Hubbard & 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
National Ry. Appliance Co.

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

Pumps
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.

Pumps, Air Lift
Sullivan Machinery Co.

Pumps, Vacuum
Ingersoll-Rand Co.
Sullivan Machinery Co.

Punches, Ticket
Bonney-Vehslage Tool Co.
Intern'l Register Co., The
Wood Co., Chas. N.

Rail Braces & Fastenings
Ramapo Ajax Corp.

Rail Filler
Carey Co., Philip

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Rail Joint Co.

Rail Joints—Welded
Lorain Steel Co.

Rails Relaying
L. B. Foster Co.
Ilyman-Michaels Co.

Rails, Steel
Bethlehem Steel Co.
L. B. Foster Co.
Carnegie Steel Co.

Railway Paving Guards, Steel
Godwin Co., Inc., W. S.

Railway Safety Switches
Westinghouse E. & M. Co.

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

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.

Roofing Asbestos (Car)
Johns-Manville, Inc.

Roofs
Haskelite Mfg. Co.

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.

Seating Materials
Brill Co., J. G.
Heywood-Wakefield Co.
St. Louis Car Co.

Second Hand Equipment
Electric Equipment Co.
Ilyman-Michaels Co.
Transit Equip. Co.

Shades, Vestibule
Brill Co., The J. G.

Shovels
Allis-Chalmers Mfg. Co.
Brill Co., The J. G.
Hubbard & Co.

Side Bearings (See Bearings Center and Side)

Signals, Car Starting
Elec. Service Sup. Co.
Nat'l Pneumatic Co., Inc.

Signals, Indicating
Nichols-Lintern Co.
Oskel Equipment Co.

Signal Systems, Block
Elec. Service Sup. Co.
Nachod Signal Co., Inc.
U. S. Electric Signal Co.
Wood Co., Chas. N.

Signal Systems, Highway Crossing
Nachod Signal Co., Inc.
U. S. Electric Signal Co.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Anderson Mfg. Co., A. & J. M.
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.

Smokestacks, Car
Nichols-Lintern Co.

Snow Sweepers, Rattan
Heywood-Wakefield Co.

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Consolidated Car Fender Co.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Sockets and Receptacles
Johns-Manville, Inc.

Soldering and Brazing Apparatus (See Welding Processes and Apparatus)

Special Adhesive Papers
Irvington Varnish & Ins. Co.

Special Trackwork
Bethlehem Steel Co.
Buda Company
Lorain Steel Co.

Spikes
Amer. Steel & Wire Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clamps and Connectors)

Springs, Car and Truck
Amer. Steel & Wire Co.
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Fort Pitt Spring & Mfg. Co.
St. Louis Car Co.
Standard Steel Works

Sprinklers, Track and Road
Brill Co., The J. G.
McGuire-Cummings Mfg. Co.
St. Louis Car Co.

Stair Steps, Safety
Irving Iron Works

Steel and Steel Products
Morton Mfg. Co.

Steps, Car
Morton Mfg. Co.

Stokers, Mechanical
Babcock & Wilcox Co.
Westinghouse E. & M. Co.

Stop Signals
Oskel Equipment Co.

Storage Batteries (See Batteries, Storage)

Strain, Insulators
Anderson Mfg. Co., A. & J. M.
Ohio Brass Co.

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

Subway Boxes
Johns-Pratt Co.

Superheaters
Babcock & Wilcox Co.

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

Switchboxes
Johns-Manville, Inc.

Switch Stands & Fixtures
Ramapo Ajax Corp.

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
Allis-Chalmers Mfg Co.
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Tampers, Tie
Ingersoll-Rand Co.
Railway Track-work Co.

Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co
Ramapo Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.

Terminals, Cable
Std. Underground Cable Co.

Testing Devices, Meter
Johns-Pratt Co.

Testing Instruments (See Instruments, Electrical Measuring, Testing, etc.)

Thermostats
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Elec. Service Supplies Co.

Ties, All Metal
Metal Safety R.R. Tie Co.

Ties and Tie Rods, Steel
Barbour-Stockwell Co.
Carnegie Steel Co.
International Steel Tie Co.

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

Tool Steel
Bethlehem Steel Co.

Tools, Track & Miscellaneous
Amer. Steel & Wire Co.
Elec. Service Supplies Co.
Hubbard & Co.
Railway Track-work Co.

Torches, Acetylene (See Cutting Apparatus)

Tower Wagons and Auto Trucks
McCardell & Co., J. R.

Towers and Transmission Structures
Archbold-Brady Co.
Bates Expanded Steel Truss Co.
Westinghouse E. & M. Co.

Track Grinders
Railway Track-work Co.
Rail Welding & Bonding Co.

Trackless Trolley Cars
St. Louis Car Co.

Track, Special Work
Barbour-Stockwell Co.
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton, Jr., & Co., Inc., W.

Transfer (See Tickets)

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Treads, Safety, Stair, Car Step
Morton Mfg. Co.

Trolley Bases
Anderson Mfg. Co., A. J. & J. M.
Elec. Service Supplies Co.
General Electric Co.
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Bases, Retrieving
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
Nuttall Co., R. D.
Ohio Brass Co.

Trolley Buses
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Trolley Material (Overhead)
Bates Expanded Steel Truss
Anderson Mfg. Co., A. & J. M.
Elec. Service Supplies Co.
More-Jones Brass & Metal Co.
Ohio Brass Co.

Trolleys & Trolley System
Ford Chain Block Co.

Trolley Wheels (See Wheels, Trolley)

Trolley Wheel Bushings
More-Jones Brass & Metal Co.

Trolley Wheels & Harps
More-Jones Brass & Metal Co.
Thornton Trolley Wheel Co.

Trolley Wire
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
Page Steel & Wire Co.
Roebling's Sons Co., J. A.

Trucks, Car
Bemis Car Truck Co.
Brill Co., The J. G.
McGuire-Cummings Mfg Co.
St. Louis Car Co.

Tubing, Yellow & Black, Flexible Varnish
Irvington Varnish & Ins. Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Turnstiles
Elec. Service Supplies Co.
Perey Mfg. Co., Inc.

Valves
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Varnished Papers
Irvington Varnish & Ins. Co.

Varnished Silks
Irvington Varnish & Ins. Co.

Varnishes
Beckwith-Chandler Co.

Vestibules, Car
Brill Co., The J. G.
Nat'l Ry. Appliance Co
Nichols-Lintern Co.
Railway Utility Co.
St. Louis Car Co.

Vestibule Linings
Haskelite Mfg. Co.

Welded Rail Joints
Alumino-Thermic Corp.
Electric Railway Impt. Co
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co

Welders, Portable Electric
Electric Railway Impt. Co
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co

Welding & Cutting Tools
International Oxygen Co.

Welding Processes and Apparatus
Alumino-Thermic Corp.
General Electric Co.
Electric Railway Impt. Co.
International Oxygen Co.
Ohio Brass Co.
Railway Track-work Co.
Rail Welding & Bonding Co
Westinghouse E. & M. Co

Welding Steel
Electric Railway Impt. Co
Railway Track-work Co
Rail Welding & Bonding Co

Welding Wire & Rods
Page Steel & Wire Co

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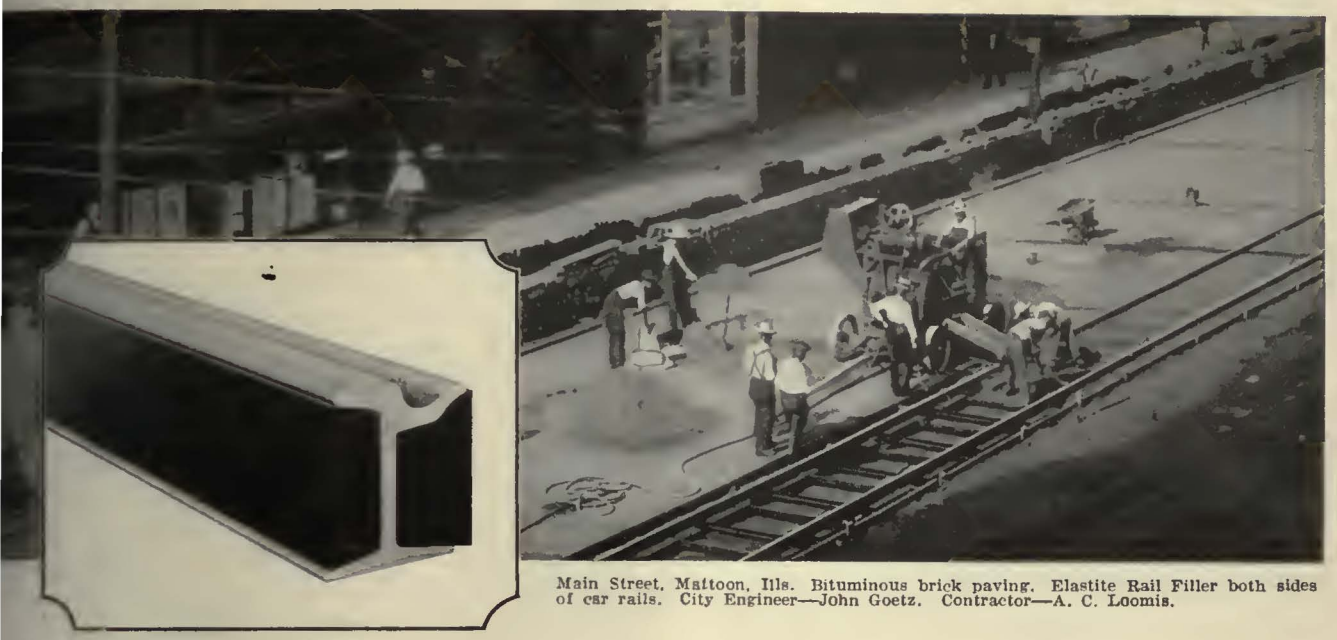

Main Street, Mattoon, Ills. Bituminous brick paving. Elastite Rail Filler both sides of car rails. City Engineer—John Goetz. Contractor—A. C. Loomis.

This is the way to reduce track repair costs

The principal causes of paving deterioration along car rails are *vibration and impact.* Secondly—*water seepage* and *frost-action.*

Carey Elastite Rail Filler absorbs this destructive vibration and cushions the paving against traffic shocks. It maintains a close water-tight joint and keeps water and frost out. It reduces traffic noise to a minimum.

Years of service in extensive installations show conclusively the great savings in repair costs effected by Elastite Rail Filler. It does not wear out and never needs replacement. It saves upkeep costs and lengthens the life of trackage investment.

Supplied to fit any weight or contour of rail. Write for literature. Send exact sketch of rail size and contour and state lineal feet required in writing for prices.

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Elastite Rail Filler Is Easy to Install

a tap of a mallet holds it in the web of the rail.

Carey Elastite Rail Filler is a composition of specially-tempered asphalt and fibre which is used as a resilient cushion between the rail and the pavement, absorbing traffic-impact, rail vibration, and traffic-noise. It is preformed to fit any rail-section and is readily shaped on the job to fit any track-curve. It is unaffected by moisture or temperature changes and is enduring under all service conditions.

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RAIL FILLER

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